CTBTO
PREPARATORY COMMISSION

preparatory commission for the comprehensive nuclear-test-ban treaty organization

Annual Report 2006

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ARTICLE I
of the Treaty

BASIC OBLIGATIONS

1. Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.

2. Each State Party undertakes, furthermore, to refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion.

Paragraph 1 of the Text on the Establishment of a Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization

1. There is hereby established the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (hereinafter referred to as “the Commission”) for the purpose of carrying out the necessary preparations for the effective implementation of the Comprehensive Nuclear-Test-Ban Treaty, and for preparing for the first session of the Conference of the States Parties to the Treaty.

Verification Activities

Under the terms of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), a global verification regime to monitor compliance with the Treaty must be operational when the Treaty enters into force. Such a verification regime must be capable of detecting nuclear explosions in all environments: underground, in water and in the atmosphere. Establishing this regime is the main activity of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO).

Foreword

by the Executive Secretary

Among the occurrences of 2006 that had significance for the CTBT and the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, there are three which deserve special attention.

The first was the marking of the occasion of the first ten years since the CTBT was adopted at the United Nations General Assembly on 10 September 1996. In this first decade of its existence, the CTBT contributed greatly to international nuclear non-proliferation and disarmament efforts by providing an international norm against nuclear testing.

Over the same period, the Preparatory Commission and its Provisional Technical Secretariat (PTS), established in 1997, made good progress in building up the international verification regime, including the International Monitoring System (IMS), a unique network of 321 monitoring stations and 16 radionuclide laboratories worldwide whose purpose is to detect any kind of nuclear explosion. Nearly three quarters of the network is now installed and over half of the stations have been certified as meeting the stringent specifications of the Commission.

These achievements would not have been possible without strong support from the international community and, in particular, without cooperation with the scientific world. It is in this context that we organized a scientific symposium, CTBT: Synergies with Science, 1996–2006 and Beyond. The symposium was held at the Hofburg Congress Centre in Vienna, where we successfully made use of the tenth anniversary in launching efforts to strengthen links between the political and scientific constituencies.

In the midst of the tenth anniversary celebrations came the announcement of the Democratic People's Republic of Korea that it had conducted a nuclear test on 9 October 2006. However, this event presented us with an unplanned opportunity to prove that our achievements were real and worthwhile. Within hours, States Signatories received reliable data and analyst-reviewed data products relating to the event, which was well recorded throughout the world by the IMS even though less than 60% of the stations were contributing to provisional operation of the system. Our response to the event demonstrated that the PTS is capable of receiving and reviewing data for an event of special interest in accordance with the time lines envisaged in the Treaty, and of providing States Signatories with relevant data products. Thus the challenge posed by the event provided a chance to show that, once complete, the global verification regime of the CTBT would be feasible and credible. This was the second important development for the Commission in 2006.

The third important development was in the area of civil and scientific applications of the CTBT verification technologies. While the purpose of the verification regime is to ensure compliance with the Treaty, the verification technologies are also useful for civil and scientific purposes. Following the tsunami of December 2004 in the Indian Ocean, which killed hundreds of thousands, we started to support international and national tsunami early warning efforts by exploring whether our verification regime could contribute to this important humanitarian endeavour. The Preparatory Commission took a decision at its

Twenty-Seventh Session in November last year which has enabled the PTS to formalize interim arrangements to provide real time and continuous data to relevant tsunami warning organizations.

These three significant occurrences are described at greater length in this annual report. As usual, the report also gives an account of the substantial progress made by the PTS in all aspects of its work to establish the verification regime and to prepare for the entry into force of the Treaty.

In 2006, the PTS made considerable advances in installation and certification during the further build-up of the IMS. By the end of the year, a total of 244 IMS stations had been established, representing 76% of the stations planned. A further 28 stations and three radionuclide laboratories were certified, bringing the total number of certified stations to 184 (equivalent to 57% of the IMS) and the total number of certified radionuclide laboratories to nine (corresponding to 56%). In January 2007, another 2 stations were certified. States hosting IMS facilities continued their valuable cooperation with the Commission. Three additional IMS facility agreements were concluded with Italy, Cape Verde and Cameroon and the agreements with Iceland, Paraguay, Senegal and the Russian Federation entered into force. At present, appropriate legal arrangements are in place for 327 facilities in 84 countries.

The International Data Centre (IDC) in Vienna received, analysed, reported on and archived the waveform and radionuclide data from a growing number of IMS stations. The PTS in 2006 made substantial progress in connecting IMS facilities to IDC operations, with 16 new or upgraded waveform monitoring stations and 6 radionuclide particulate stations being integrated into the IDC operational system. The number of stations in IDC operations reached 190 (59%), substantially enhancing the geographical coverage of data being received. Importantly, a new, state of the art Operations Centre serving the entire PTS was built during 2006 and was officially opened in January 2007.

The Global Communications Infrastructure (GCI), which provides communications links to IMS sites as well as to National Data Centres and station operators, continued to expand throughout 2006. In July, the 200th very small aperture terminal (VSAT) of the GCI was installed. By December, 208 VSATs had been installed, representing 83.8% of the total planned. The volume of data received by the IDC increased from about 7500 to slightly over 8300 megabytes per day. Almost 6800 megabytes per day were transported from the IDC to remote sites. At the same time, in view of the fact that the current GCI contract will expire in September 2008, the procurement process for the contract for the next GCI continued. The preliminary design phase was completed in December 2006.

By the end of 2006, 94 secure signatory accounts had been established – an increase of 4 over last year – and a total of 808 users were authorized to access IMS data and IDC products and receive technical support, which is 71 more than in 2005. Over 800 requests from authorized users regarding technical information were received and resolved during the year, compared with 700 in 2005. In addition, by the end of 2006, the 'NDC in a box' software had been distributed to 97 States Signatories, an increase of 13 over 2005.

These figures demonstrate that the capacity and coverage of the verification system are increasing, and that more and more States Signatories are accessing the data and data products provided by the PTS and receiving technical support. Thus more effective arrangements for PTS interaction with station operators,

National Data Centres and the GCI contractor are being put in place and States Signatories are thereby deriving greater benefit from the investment they have made in the verification system.

During the year, we continued to give priority to preparations for the Integrated Field Exercise in Kazakhstan in 2008. This exercise will be an important part of our endeavours to address the concerns of delegations that progress in establishing the on-site inspection (OSI) regime should not fall behind progress in other areas. The preparations included setting up a task force to coordinate efforts and conducting a successful small scale exercise in Croatia. The PTS also continued developing the plan for training and exercise activities for future inspectors. Moreover, important progress was made in testing and evaluation of equipment for measuring radioactive noble gas isotopes during an OSI.

As an outcome of the Quality Management Workshop held last year, I endorsed a quality policy for the PTS in August 2006. This policy is an important component of our overall quality management efforts, which will ultimately provide users with greater confidence in the functioning and products of the PTS.

The year also saw the restructuring of the PTS on the basis of the final report of an external review team that was adopted by the Commission in November 2005. In September 2006, I approved changes to the organizational structures of the IMS and IDC Divisions along the lines recommended by the final report. This significant step will enhance further the coordination within the PTS in response to the increasing degree of integration of the various components of the verification system.

Activities in 2006 to support the verification regime as well as to promote the Treaty, such as training courses and workshops, were held around the world with the participation of about 350 representatives from more than 100 States. I am grateful to Australia, Austria, Azerbaijan, Canada, Croatia, Egypt, Hungary, Japan, Kazakhstan, Malaysia, Mexico, Nigeria, Ukraine and the United States of America for successfully hosting these events. In addition, I would like to express my appreciation to the Netherlands for its voluntary contribution of funds during 2006 in support of the Commission's outreach activities.

Multilateral fora provide valuable opportunities to promote the support of the international community for the cause of the Treaty as well as the work of the Commission. In this context, during the year the PTS continued to develop contacts and cooperation with relevant global and regional international organizations. I personally participated in the summits of the African Union, the Non-Aligned Movement and the Organisation internationale de la Francophonie in order to enhance cooperation with these international organizations.

As a result of these and other outreach efforts, in 2006 the number of signatories to the Treaty increased by one and the number of ratifiers by 11. The number of new ratifications was almost twice that achieved in 2005. As of 31 March 2007, the Treaty had 177 signatures and 138 ratifications, including ratifications by 34 of the 44 States listed in Annex 2 to the Treaty, whose ratification is required for the Treaty to enter into force, and is moving ever closer to achieving the status of universality. I would also like to refer to the efforts of States to promote the Treaty. In September 2006, a ministerial meeting of the Friends of the CTBT was held in New York, co-hosted by Australia, Canada, Finland, Japan and the Netherlands and attended by representatives of 61 States, including 22 Ministers and Deputy Ministers of Foreign Affairs. The Joint Ministerial Statement that was issued during the meeting reaffirmed full support for the objectives of the CTBT and the

work of the Commission. Recently, States decided to convene the next Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty from 17 to 18 September this year in Vienna. We hope that the conference will further strengthen this positive momentum for the entry into force of the CTBT. The PTS, for its part, is committed to assisting these endeavours.

With these achievements and positive developments, I am pleased to present the annual report of the organization for 2006, in which you can find further details of what I have described above.

Tibor Tóth
Executive Secretary

CTBTO Preparatory Commission

Vienna
April 2007

Contents

Abbreviations

ATM	atmospheric transport modelling
AU	African Union
CD	continuous data
CIF	Capital Investment Fund
DE06	OSI directed exercise in 2006
DOTS	Database of the Technical Secretariat
ECOWAS	Economic Community of West African States
GCI	Global Communications Infrastructure
GIS	geographical information system
IDC	International Data Centre
IFE	Integrated Field Exercise
IMS	International Monitoring System
IOC	Intergovernmental Oceanographic Commission
NDC	National Data Centre
OSI	on-site inspection
PTS	Provisional Technical Secretariat
QMS	Quality Management System
REB	Reviewed Event Bulletin
SAINT	Simulation Assisted Interactive Nuclide Review Tool
SAMS	Seismic Aftershock Monitoring System
SPT1	first system-wide performance test
UNESCO	United Nations Educational, Scientific and Cultural Organization
VSAT	very small aperture terminal
WMO	World Meteorological Organization

International Monitoring System

International Monitoring System

Introduction

The International Monitoring System (IMS) consists of 321 monitoring stations and 16 radionuclide laboratories throughout the world that monitor the earth for evidence of a nuclear explosion. The IMS uses seismic, hydroacoustic and infrasound monitoring technologies to detect the transient signals created when energy from an explosion or a naturally occurring event is released in the underground, underwater and atmospheric environments. The digital waveforms recorded by their sensors provide diagnostic information to detect, locate and characterize the energy source. The radionuclide monitoring technology is based on air samplers which collect atmospheric particulate matter on filters. The samples are then analysed for evidence of physical products that have been created by a nuclear explosion and carried by the winds. The analysis of the radionuclide content can confirm whether a nuclear explosion has actually occurred.

Auxiliary seismic station AS65, La Paz, Baja California Sur, Mexico.

HIGHLIGHTS OF ACTIVITIES IN 2006

During 2006, significant progress was made towards the completion of the IMS, with further build-up in all four technologies (seismic, hydroacoustic, infrasound and radionuclide). Installations were completed at 25 additional stations, resulting in a total of 244 stations, or 76% of the IMS, established at the end of 2006. Also, 28 stations and three radionuclide laboratories were certified as meeting the technical requirements of the Preparatory Commission, bringing the total number of certified stations to 184 (57%) and the total number of certified radionuclide laboratories to nine (56%).

In the area of IMS sustainability, work continued on configuration management of stations. The Database of the Technical Secretariat (DOTS) contained a minimum set of baseline information on about 130 stations, representing 70% of all certified stations. The development of models of life cycle costs and discussions on recapitalization requirements also continued. Requests for proposals for several equipment support contracts were issued and negotiations were subsequently initiated during the year. In December 2006, 174 certified stations were in the operational system and required support services from the newly established Monitoring Facilities Support Section.

IMS ESTABLISHMENT

Table 1 summarizes the status of the establishment of the IMS in each of the monitoring technologies.

Significant progress was made in the installation and certification of IMS facilities in 2006, with 28 stations and three radionuclide laboratories being certified. By the end of the year, 184 stations and nine radionuclide laboratories were certified, corresponding to 57% of the 321 stations and 56% of the 16 radionuclide laboratories. Additionally, during 2006 installation was completed at 25 stations and 19 others were under construction. At the end of 2006, for 244 stations (76%) the installation was complete.

The installation process for hydroacoustic station HA11 on Wake Island (United States of America) commenced at the end of 2006. Once this station is installed and certified, the hydroacoustic monitoring network will be complete. Additionally, in December 2006, a cable repair operation was

Auxiliary seismic station AS97, Babate, Senegal.

Antenna for Global Positioning System on vault of auxiliary seismic station AS13, Dease Lake, British Columbia, Canada.

successfully completed at HA3 on Juan Fernández Island (Chile) to restore the telemetry to the north hydrophones. The repair of the south hydrophones is a more complicated endeavour and will be scheduled when sufficient funding is available.

Table 1. Status of the Station Installation Programme as of 31 December 2006

IMS Station Type	Installation Complete		Under Construction	Contract Under Negotiation	Not Started
	Certified	Not Certified			
Primary seismic	36	6	2	2	4
Auxiliary seismic	61	38	2	9	10
Hydroacoustic	9	1	1	0	0
Infrasound	37	1	4	6	12
Radionuclide	41	14	10	4	11
Total	**184**	**60**	**19**	**21**	**37**

In October 2006, an infrasound technology workshop was held in Fairbanks, Alaska, USA. The workshop covered station hardware and equipment as well as data analysis and applications for the infrasound technology.

With the installation of seven noble gas systems in 2006, at the end of the year there were 11 systems installed in the noble gas network that is providing data to the International Noble Gas Experiment. Significant progress was also made in the development of certification requirements for noble gas systems. In November, a noble gas workshop was held in Melbourne, Australia. The workshop focused on the operational testing of noble gas equipment and on the development of a noble gas categorization scheme, certification requirements and a quality assurance/quality control system for the network.

FACILITY AGREEMENTS

IMS facility agreements entered into force with Iceland (January 2006), Paraguay (January 2006), Senegal (March 2006) and the Russian Federation (December 2006), whereas only one facility agreement entered into force the previous year. Moreover, IMS facility agreements were concluded with Italy (March 2006), Cape Verde (November 2006) and Cameroon (November 2006). In comparison, two facility agreements were concluded in 2005.

Facility Agreements or Arrangements with States Hosting IMS Facilities (31 December 2006)

State	Date(s) of Signature	Date(s) of Entry into Force
Argentina	9 December 1999	2 March 2004
Australia	13 March 2000	17 August 2000
Cameroon[a]	16 November 2006	
Canada	19 October 1998	19 October 1998
		(Articles 6, 8 and 9 on 1 March 2000)
Cape Verde[a]	10 November 2006	
	23 November 2006	
Cook Islands	31 March 2000	14 April 2000
	14 April 2000	
Czech Republic	13 November 2002	29 January 2004
Finland	12 May 2000	6 June 2000
France	13 July 2001	1 May 2004
Guatemala	26 November 2002	2 June 2005
Iceland	13 October 2005	26 January 2006
Israel[a]	23 September 2004	
Italy[a]	29 March 2006	
Jordan	11 November 1999	11 November 1999
Kazakhstan[a]	9 September 2004	
Kenya	14 October 1999	29 October 1999
	29 October 1999	
Mauritania	16 September 2003	17 September 2003
	17 September 2003	
Mongolia	5 June 2000	25 May 2001
New Zealand	13 November 1998	19 December 2000
Niger	20 November 2000	24 November 2000
	24 November 2000	
Norway	10 June 2002	10 June 2002
Oman[a]	19 May 2004	
Palau	16 April 2002	29 April 2002
	29 April 2002	
Panama	26 November 2003	26 November 2003
Paraguay	4 April 2003	27 January 2006
Peru	14 March 2001	8 July 2002
Philippines	14 April 2003	8 January 2004
Romania	13 June 2003	13 October 2004
Russian Federation	22 March 2005	27 December 2006
Senegal	22 May 2001	24 March 2006
South Africa	20 May 1999	20 May 1999
Spain	14 September 2000	12 December 2003
Sri Lanka[a]	14 June 2000	
Ukraine	17 September 1999	20 April 2001
	27 September 1999	
United Kingdom	12 November 1999	16 June 2004
Zambia	18 September 2001	20 October 2001
	20 October 2001	

[a] Agreement or arrangement had not yet entered into force.

Right: Antenna for infrasound station IS48, Kesra, Tunisia.

Far right: Central recording facility for primary seismic station PS42 and infrasound station IS48, Kesra, Tunisia.

In total, 36 facility agreements or arrangements have been concluded, of which 29 have entered into force. IMS facility agreements and arrangements are concluded between the Commission and States hosting IMS facilities in order to regulate activities such as site surveys, installation or upgrading work, the certification of facilities and post-certification activities. The IMS host States with which the Commission has concluded facility agreements or arrangements are listed opposite. Appropriate legal arrangements are in place for 327 facilities in 84 countries. The number of concluded agreements or arrangements and the number of agreements or arrangements that have entered into force indicate strong support by States for the establishment of the global verification regime.

IMS SUSTAINMENT AND MAINTENANCE

During 2006, efforts continued in planning future IMS sustainment and maintenance, including initiatives to establish a high degree of preparedness to facilitate the rapid resolution of problems. Activities required to move the IMS from an installation to an operational phase were initiated. Furthermore, the need to start planning and budgeting for recapitalization of equipment and systems was identified.

Logistics Support

In 2006, with certified stations growing in number, the long term sustainment strategies for the IMS continued to be developed and implemented. The support provided for the provisional operation of these stations was focused on more extensive corrective and repair activities.

Terms of reference and requests for proposals for equipment support contracts were issued and subsequently negotiated during 2006. Central management and coordination were introduced for the replenishment of spare parts necessary for IMS facilities to be kept operational. Training of staff was organized for the development and sustainment of technical support capabilities within the Provisional Technical Secretariat (PTS).

Throughout the year, efforts in configuration management of IMS stations continued. DOTS contained a minimum set of baseline information on about 130 stations. This still only corresponds, however, to 70% of all certified stations. Work began on revalidating the information for a small number of these stations and expanding the range of information in the configuration module of DOTS.

Detail of an inlet port of the wind noise reducing system at infrasound station IS7, Warramunga, Northern Territory, Australia.

Above: Cable repair at hydroacoustic station HA3, Juan Fernández Island (Chile).

Above right: Radionuclide station RN17, St. John's, Newfoundland and Labrador, Canada.

The response to the recommendations of the integrated logistics study was elaborated further. In particular, IMS sustainment issues were developed, including life cycle cost analysis, obsolescence management, sparing policy and ensuring that repairs can be conducted with minimum system down time.

Maintenance of IMS Facilities

The IMS maintenance requirement has increased with the number of certified stations. Between September 2006, when the Monitoring Facilities Support Section was established, and the end of the year the PTS dealt with more than one hundred specific IMS maintenance issues.

Engineering Support

Within the function of engineering support lies responsibility for the provision of engineering, scientific and project management expertise to support an integrated technology development programme. An obsolescence gap analysis of the IMS technologies and certified stations was presented to Working Group B in the third quarter of 2006 and a draft obsolescence management plan was developed within the PTS at the end of the year. Coordination between the Monitoring Facilities Support Section and the Installation and Certification Group was also established to cope with any situation where immediate engineering attention was necessary to address obsolescence issues. The issues related to recapitalization and the growing requirement to fund it were presented to States Signatories and still need to be addressed.

Systems Infrastructure Support

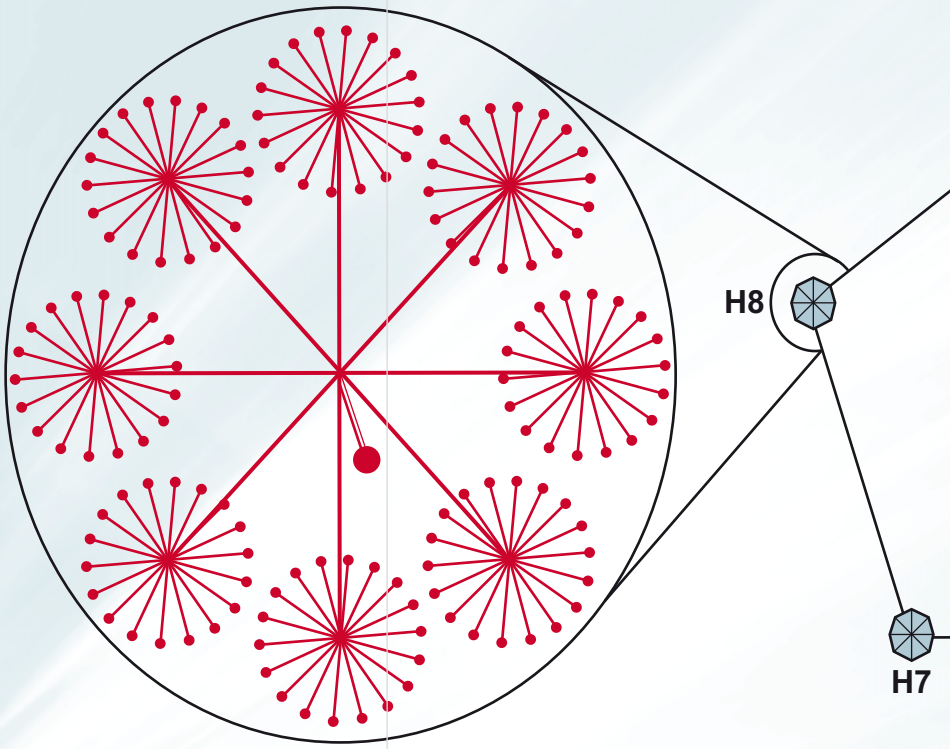
All ageing computer hardware was being replaced and the preferred underlying operating system will be replaced with either Solaris or Linux, depending on compatibility with applications. The replacement programme was continuing in accordance with a five year hardware replacement cycle. The new platforms for Solaris and Linux are now standardized on 64 bit computing.

Radionuclide station RN73, Palmer Station, Antarctica (USA).

RESTRUCTURING OF IMS DIVISION

As a result of restructuring in the PTS in 2006, two new Sections were established in the IMS Division, while the operations function (formerly part of the Provisional Operation and Maintenance Coordination in the IMS Division) was

transferred to the International Data Centre (IDC) Division. The new Monitoring Facilities Support Section provides management and support for the sustainment and maintenance of all IMS facilities. The new Network and Systems Support Section assumed two functions formerly under the responsibility of the IDC Division: support and maintenance of network and computer systems of the PTS and the communications infrastructure, and support for office automation and information systems. In addition, a third group was formed within the IMS Division to focus on installation and certification of the remaining stations. Once installation and certification activities diminish, the Installation and Certification Group will evolve into the IMS Engineering Section.



Global Communications Infrastructure

Global Communications Infrastructure

Introduction

The Global Communications Infrastructure (GCI) is designed to transmit data in near real time from the 337 facilities of the IMS to the IDC in Vienna for processing and analysis. The GCI is also used to distribute to States Signatories data and reports relevant to verification of compliance with the Treaty. Digital signatures and keys are employed to ensure that the transmitted data are authentic and have not been tampered with.

The GCI is the first global satellite communications network based on very small aperture terminal (VSAT) technology. IMS facilities and States Signatories in all but near-polar areas of the world can exchange data via their local VSAT earth stations through one of three geosynchronous satellites. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC by terrestrial links. The GCI uses two additional satellites for more economical coverage of North America and Europe. Upon request from States hosting IMS stations, their data may be routed through national communication nodes before being routed into the GCI. The GCI is designed to be cost effective, to operate with 99.5% availability and to provide data within seconds from origin to final destination. It became functional in mid-1999.

HIGHLIGHTS OF ACTIVITIES IN 2006

GCI coverage continued to expand, with nine VSATSs being installed in 2006. By the end of December, 208 VSATs (83.8%) had been installed at IMS stations, National Data Centres (NDCs) and development sites, and 216 licences (87.1%) had been obtained in 74 of 91 countries.

The volume of traffic carried by the GCI and special links to the IDC increased during the year from about 7500 to slightly over 8300 megabytes per day. The average GCI virtual circuit availability in 2006 was 97.85%, representing a significant improvement over the previous calendar year.

CURRENT GCI

Implementation

The year was marked by installation in July of the 200th VSAT at auxiliary seismic station AS103 in Uganda. Dual VSATs were installed on Wake Island (USA) to support the three IMS stations collocated there. One GCI link connecting AS107 (Tuckaleechee Caverns, Tennessee, USA) was relocated to a new station connection point; at the same time the VSAT equipment was changed.

GCI coverage continued to expand throughout 2006, with 9 new VSATs installed. At the end of the year, 208 VSATs had been installed out of 248 planned for the GCI network. The number of planned GCI VSATs has been reduced owing to conversion of some sites to an independent subnetwork topology or because the sites (mostly NDCs) were provided with a connection through a virtual private network.

As of 31 December 2006, eight additional GCI site surveys had been completed. Six radio frequency licences, including some which had been outstanding for a long time, were obtained. GCI site surveys had been completed for 240 VSATs (96.7% of the total number planned); 208 VSATs (83.8%) had been installed at IMS stations, NDCs and development sites; and 216 licences (87.1%) had been obtained in 74 of 91 countries. To support the testing at tsunami warning centres, three connections by means of virtual private networks were established between the IDC and each centre.

The volume of traffic carried by the GCI and special links to the IDC increased during the year from about 7500 to slightly over 8300 megabytes per day. In the other direction, almost 6800 megabytes per day were transported from the IDC to remote sites.

The average GCI virtual circuit availability in 2006 was 97.85%, representing a significant improvement over the previous calendar year. It included all outages in the GCI VSAT and terrestrial circuits. With only the outages counted against the GCI contractor taken into account, the adjusted average GCI virtual circuit availability was 99.55%.

Topology

Discussions continued on how to increase the coverage of auxiliary seismic station AS114 at the South Pole, which was available for only 12 hours a day. A solution utilizing an Iridium satellite was developed and tested during 2006 in conjunction with the US National Science Foundation, and was to be implemented in early 2007 to add the other 12 hours of coverage.

Space segment capacity was increased by an average of 28% in all VSAT regions in response to the growth of traffic over the GCI. This increase was expected to be sufficient until the end of the current GCI contract.

NEXT GCI

In the framework of the procurement of the next GCI, and following the issuance of a request for proposals at the end of 2005, proposals were received in March 2006. Thereafter, the PTS began the technical and financial evaluation process, which was concluded with clarification visits in August.

The PTS requested selected bidders to begin the design phase of the next GCI, moving the whole process forward by three months and providing more time for the subsequent phases. The preliminary design phase was completed in December 2006. The next GCI will be a hybrid system using both terrestrial and satellite connections (as before) based on an Internet Protocol (IP) network with end to end quality of service.

Above left: VSAT installations at hydroacoustic station HA11, Wake Island, USA.

Above: Satellite radome for auxiliary seismic station AS114, South Pole, Antarctica (USA).

Centre: Radio frequency transmitter.

Bottom: Exercise on the roof of the Vienna International Centre to set up the VSAT that was later used during the OSI directed exercise (DE06) in Croatia.

International Data Centre

International Data Centre

Introduction

The International Data Centre (IDC) receives, collects, processes, analyses, reports on and archives data from IMS facilities, including the results of analysis conducted at certified radionuclide laboratories. The procedures and standard event screening criteria which it uses to carry out these functions, particularly the generation of standard reporting products and the performance of a standard range of services for States Signatories, are set out in the draft IDC Operational Manual. The IDC is progressively enhancing its technical capabilities.

The data collected by the IMS are processed immediately when they reach the IDC, and the first automated products are released within two hours of the arrival of raw data. The products comprise lists of seismological and acoustic events and of radionuclides that have been detected in the IDC. Analysts subsequently review these lists in order to prepare quality-controlled bulletins. The IDC has been providing IMS data and IDC products to States Signatories through secure signatory accounts on a test basis since February 2000. The IDC gives extensive support to users designated by States Signatories, including a standard software package, training courses and technical assistance.

HIGHLIGHTS OF ACTIVITIES IN 2006

A new, state of the art Operations Centre serving the entire PTS has been built and was expected to open in January 2007.

The number of IMS stations in IDC operations reached 190 (59%) at the end of 2006.

Significant progress was made in transferring existing IDC applications software for monitoring purposes to an open source platform. A set of 103 automatic waveform processing programs, collectively called iBase, was modified so that the software can be compiled on either Solaris or Linux from the same source code.

The occurrence of an event in the Democratic People's Republic of Korea at the beginning of October 2006 provided an opportunity to test the responsiveness of IDC operations. The exercise emphasized the importance of the synergy among Treaty verification technologies. The important contribution of noble gas data during this exercise highlighted the need to accelerate the installation of the respective IMS radionuclide monitoring stations.

The processing provided by the computer infrastructure was almost free of outages for all services. The new computer centre operated without problems and contributed greatly to the availability of all services.

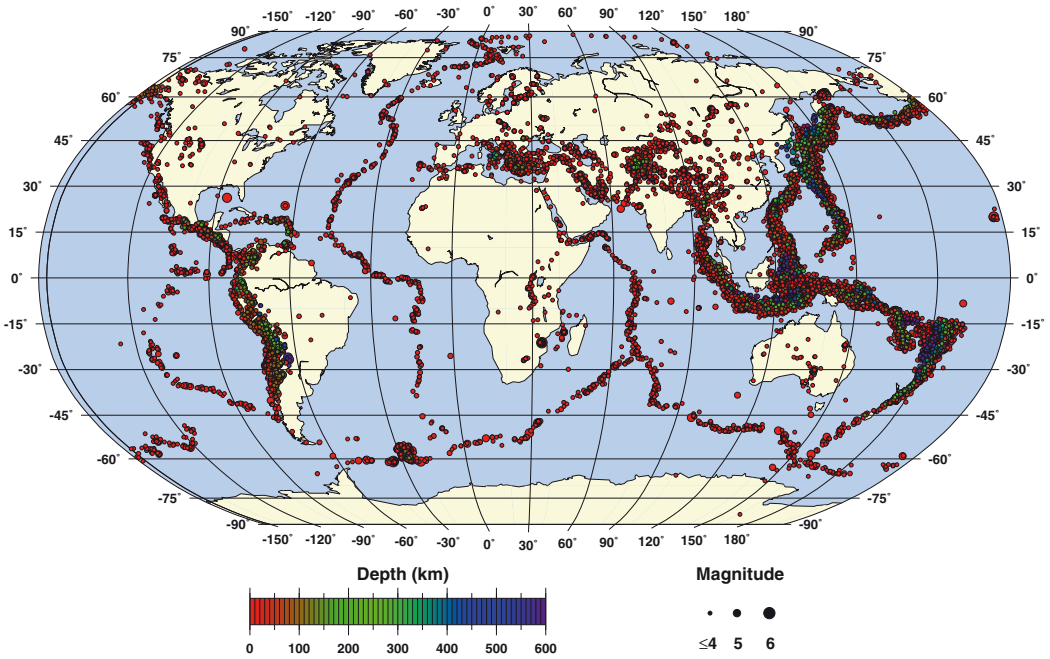
DATA PROCESSING AND ANALYSIS

Waveform Data

During the year, 16 new or upgraded waveform monitoring stations were added to IDC provisional operations and thus began contributing to IDC standard products. Data from a total of 126 stations were processed continuously and contributed to Reviewed Event Bulletins (REBs).

Standard IDC products were issued for each day. On average, 122 and 76 events per day were included in the automatic Standard Event List 3 (SEL3) and the REB respectively, compared with 138 and 77 respectively during 2005. Following an event on 9 October in the Democratic People's Republic

27 574 Events from the IDC 2006 Reviewed Event Bulletin



of Korea, the REB for that day was expedited and issued within the time line envisaged after entry into force of the Treaty (see also Special Feature 2).

The identification of software deficiencies, proposed enhancements and the testing and evaluation of software upgrades continued. The PTS continued to support the build-up of the IMS by testing and evaluating data from new stations.

The PTS continued to forward data to recognized tsunami warning organizations under the Commission decision of March 2005. In accordance with the further Commission decision of November 2006, the PTS placed the forwarding of data for this purpose under a more routine regime (see also Special Feature 3).

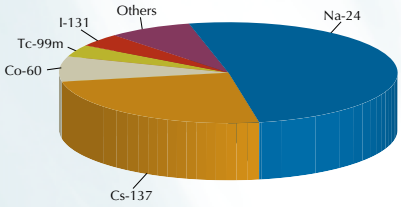
Radionuclide Data

In 2006, six radionuclide particulate stations were added to IDC provisional operations; this increased the total number of stations to 43, out of 80 foreseen in the network.

During the year, 10 368 full-sample spectra were automatically analysed, interactively reviewed and categorized. Of these, 7393 were Level 1 spectra. Two spectra were categorized as Level 5, and these were sent for reanalysis to certified laboratories in accordance with standing procedures. In addition, six samples which were not Level 5 were sent for reanalysis to laboratories under the provisions of the draft operational manuals, following the event of 9 October in the Democratic People's Republic of Korea.

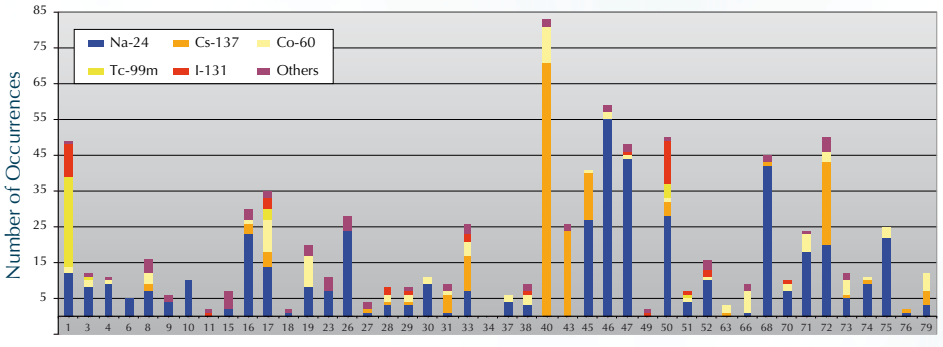
The automated atmospheric transport modelling (ATM) system delivered 'fields of regard' for every Reviewed Radionuclide Report issued. Analysed global meteorological data arrived from the European Centre for Medium-Range Weather Forecasts with high reliability.

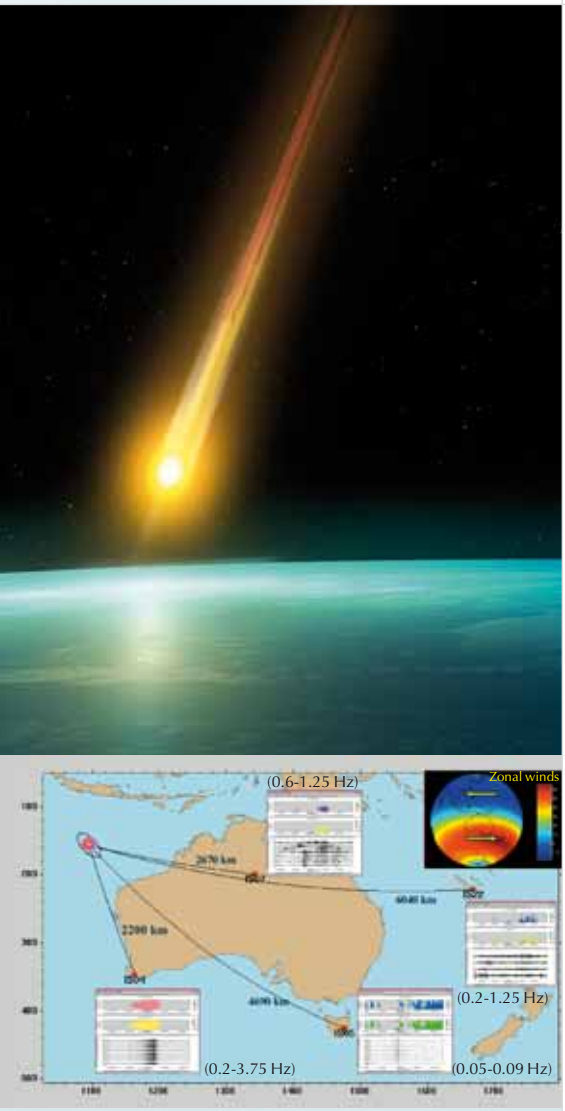
IDC waveform analysts review all events that are formed by automatic processing in Standard Event List 3 and identify missed events.



Overall Distribution of Nuclide Occurrences in 2006

Occurrences of Anthropogenic Nuclides by Station in 2006





On 2 September 2006, strong signals from an atmospheric event (probably a meteor explosion) were observed downwind at IMS infrasound arrays in Australia and New Caledonia. The frequency ranges of the signals detected at the stations are shown in parentheses. The event was formed and located by automatic processing in Standard Event List 3 in the Wharton Basin, north-west of Australia.

SOFTWARE DEVELOPMENT

Waveform Development

Priority was given to preparing for the reintroduction of infrasound processing into IDC operations. Efforts continued to focus on the development and testing of the initial version of the interactive infrasound review tool. A database of ground truth and reference infrasound events for validating and testing purposes was established in cooperation with a group of specialists. New association criteria to enhance the network processing were tested with infrasound data. This significantly reduced the number of false events, which should be reviewed interactively. Work was also done to extend processing to lower frequencies (from 0.1 Hz to 0.02 Hz). This was made possible by the Linux hardware used in the development environment.

New source code for hydroacoustic arrival feature extraction (previously only available in binary form) was developed and installed in IDC operations. The hydroacoustic azimuth and slowness estimator was upgraded, partly to facilitate the automatic identification of seismic phases on hydrophone triplets, and its testing was begun.

The topo 8.2 bathymetry grid recommended by the expert group for hydroacoustic screening was installed in IDC operations. The minimum number of stations with surface wave measurements considered by event screening was recommended by the expert group for event screening to be increased from one to two. Work has been proceeding for one external contract concerning the refinement of the IDC event screening criterion for the magnitude ratio (mb:Ms).

The performance of the automated system for seismic processing was further analysed with the goal of enhancing the quality of the Standard Event Lists. Development work to improve signal and noise separation continued. Detection performance was improved for the large IMS array station NOA (Norway) by tuning relevant parameters.

The development of three dimensional velocity models for eastern and southern Africa was concluded and source specific station corrections were calculated for relevant IMS stations. New potential data on ground truth events (i.e. events whose location and time of origin are known) for validation of the regional models were identified and analysed.

In the area of network processing, a scheme for computing moment magnitudes from long period P waves of large events was adapted for IDC purposes. A prediction module has been included in the global association subsystem to investigate the benefit of adding detections to existing event

hypotheses on the basis of matching arrival times only. In both cases, preliminary tests showed promising results. The waveform event location code was improved by correcting the implementation of the underlying algorithms.

Radionuclide Development

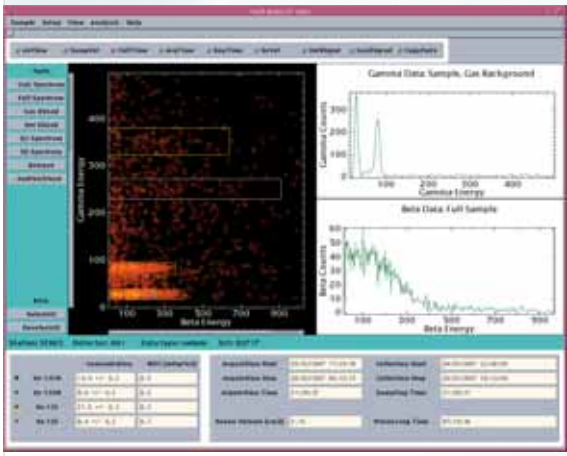
Work started on the development of an automatic counterpart to the Simulation Assisted Interactive Nuclide Review Tool (SAINT), based on the existing prototype. Many of the functionalities that are currently in the interactive tool and used to correct the old Genie based automatic software will be moved to the new automatic tool and thereby further reduce the time needed for review.

The software developed in 2005 for analysing noble gas data from the United States (ARSA) and Swedish (SAUNA) systems was in regular use for the International Noble Gas Experiment. A contract was initiated for the development of software for the ARIX radioxenon analyser from the Russian Federation. For the French SPALAX radioxenon analyser a function to analyse data was developed and demonstrated in-house as a part of SAINT (Xe-SAINT).

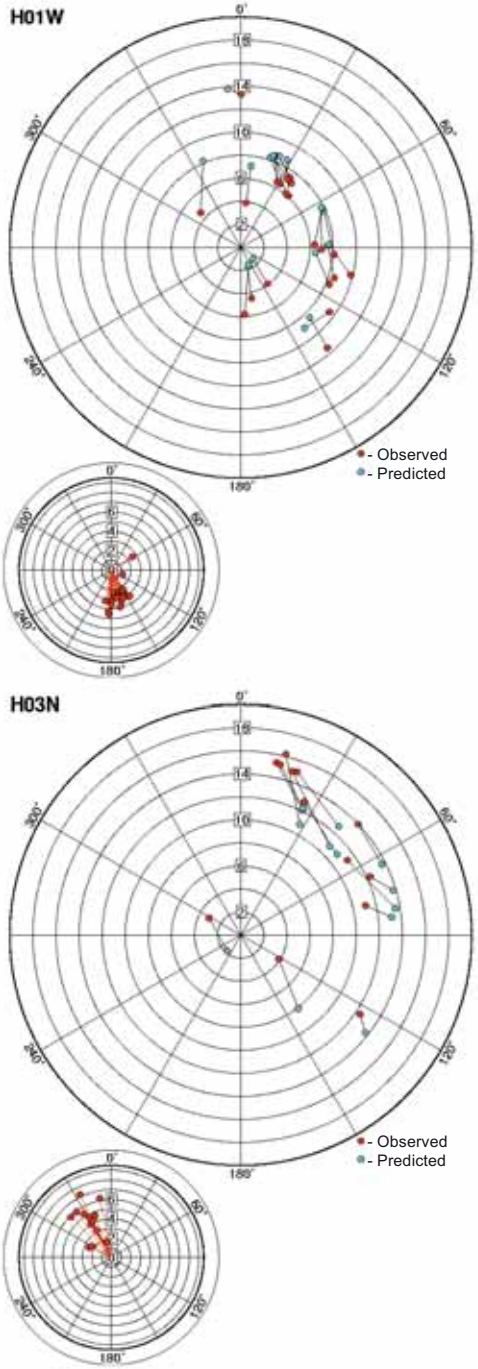
The client software for the Web based graphics engine WEB-GRAPE to permit graphical source attribution analysis was completed with functionalities for easy access to the basic ATM results residing as source–receptor sensitivity fields on the IDC secure web site. A beta version of WEB-GRAPE was given to a number of States Signatories that requested it.

On the basis of a request from the Special Session of the Commission held after the event in the Democratic People's Republic of Korea of 9 October 2006, enhanced ATM was performed with regard to this event. Work was done to analyse noble gas observations which appeared to be related to the event. All of these results were placed on the IDC secure web site and were presented at a special technical briefing for States Signatories in November in Vienna.

The migration of the first generation ATM software system to the new 64 bit Linux ATM server was completed. The performance gain compared with the old ATM server is by two orders of magnitude, which allows the extension of the backtracking capability from 6 to 14 days and the introduction of uncertainty analysis with regard to the daily computed ATM products. As a first step for the latter, the standard transport model, FLEXPART version 5.1, has been operated since October 2006 in two configurations with regard to the input wind fields utilized, allowing for model intercomparison.



Screenshot of the graphical user interface being developed in the PTS for reviewing beta-gamma coincidence noble gas spectra. This tool is intended for different kinds of users, including noble gas analysts, NDCs and station operators.



Results from automatic identification of seismic arrivals on IMS hydrophone triplets. The large polar diagrams show the misfit between observed and predicted values of back-azimuth and slowness. The small polar diagrams show only the misfit vectors, which are small (H10N, see opposite) or highly systematic. Empirical corrections may compensate for a large fraction of such misfits and will be established once sufficiently well distributed data become available. Back-azimuth and slowness estimates from hydrophone triplets may eventually approach the accuracy of those from seismic arrays.

Software Integration

Software integration work continued in the areas of software development, maintenance and configuration management. Over twenty upgrade patches of the IDC applications software were put into the operational system in 2006. A number of changes were made to improve the automatic processing capability of the software.

An effort was made to restructure the IDC software source code collection and to prepare for the migration of this code to the operational system by building and delivering Solaris and then Linux versions of the code from the single source code tree. This set of code, called iBase, consists of the 103 automatic waveform processing programs in use at the IDC. This major step towards open source migration of IDC applications was implemented in IDC operations in November.

Work was under way to port the remaining software, including IDC interactive processing and auxiliary software applications, to Linux, as set out in the open source 'road map'.

The software developed by the PTS to receive and send data in CD-1.0 and CD-1.1 (continuous data) formats was improved and new versions have been moved to IDC operations. Improvements include greater speed, reduced resource usage and increased ease of use. Updated user documentation to reflect these new features was included in the release. A new testing contract was initiated for the purpose of maintaining high reliability and reducing the risk of future problems.

An improved version of the Geotool software was installed on the IDC test bed and in IDC operations.

Software problems with surface wave processing were resolved, allowing several new stations to contribute surface wave magnitudes to the bulletins. This will provide additional data for event screening.

SERVICES AND REVIEW ACTIVITIES

To ensure the continued quality of IDC products, follow-up assessments were carried out by comparing the REB with bulletins from the International Seismological Centre (ISC) for the year 2003 and the National Earthquake Information Center (NEIC) of the United States Geological Survey for the year 2004. Even though the number of events included in the REB has been steadily rising owing to the increasing number of low magnitude events being

detected by the growing PTS network, the agreement of all common solutions (in IDC and NEIC bulletins) was found to be equivalent to that of previous years. An important quality assurance activity is the evaluation of the automatic event bulletins. An assessment for 2005 demonstrated the added value of the interactive review, highlighting the recognized limitations to be expected from automatic IDC products.

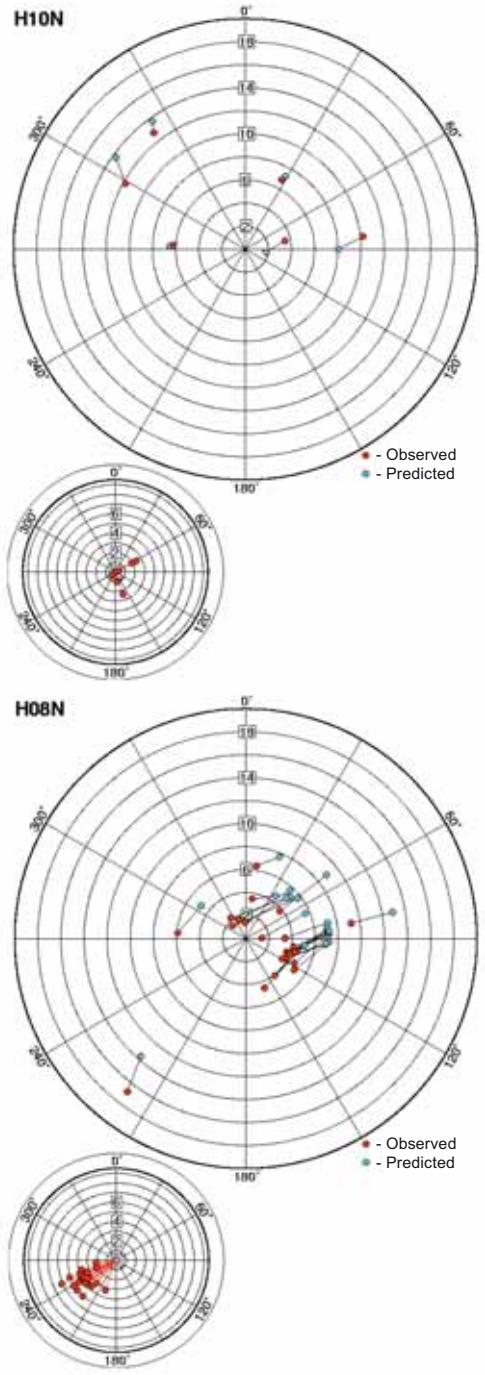
Within the evaluation framework of the first system-wide performance test (SPT1), the Swedish NDC compiled a set of seismic ground truth events in Scandinavia. This data set referred to underwater explosions near Stockholm and mining explosions in central Sweden. It provided the opportunity to assess the performance of location calibration data in IDC operations. Locations obtained for the currently installed set of corrections, in comparison with the ground truth events, suggest that the average mislocation for the events is not significantly reduced and that the estimated error ellipses do not reflect the real uncertainty attached to the location solutions.

SPT1 has also shed light on other potential issues with respect to IDC analysis and processing software. In this connection, station deficiencies in seismoacoustic event screening as well as in station magnitude estimates were investigated in support of further development of the IDC applications software.

Support for National Data Centres

By the end of 2006, 94 secure signatory accounts (one for each requesting State Signatory) had been established and a total of 808 users from these States Signatories had been authorized to access IMS data and IDC products and receive technical support. More than 800 requests from authorized users regarding technical information were received and resolved during the year.

The 'NDC in a box' software had been distributed to 97 States Signatories by the end of the year. This software package, developed by the IDC for use at NDCs, gives NDCs the capability to receive, process and analyse IMS data. A new version of the software package was released and made available to States Signatories through the IDC secure web site. The new version includes CD Tools for the handling of continuous data and updates of the other software components. A limited amount of hardware was donated to NDCs by the PTS as old computers were being decommissioned.



Control room of the Operations Centre.

OPERATION OF MONITORING FACILITIES

In 2006, the PTS concluded contracts for 14 new facilities for testing and evaluation and post-certification activities, making a total of 106 IMS facilities operating under such service agreements. During the year, the Operations Centre took on the task of monitoring data forwarding from the IDC to authorized users. The Operations Centre was staffed during business hours by personnel from the IMS and IDC Divisions. Despite the additional workload created by the increased number of stations in IDC operations, the Operations Centre was able to reduce the number of staff on duty each day from three to two. This was accomplished through the streamlining of procedures and improvement of the tools available.

Operation of Networks and Systems

The PTS has been preparing for an upgrade of the server infrastructure. The network preparation in the computer centre for the geographical information system (GIS) of the On-Site Inspection (OSI) Division was completed and this system was installed. New Linux servers were also installed.

Operational Tools

The Web portal for the GCI unified reporting interface was upgraded to improve performance and incorporate new reporting features that were then made available to States Signatories and station operators. The network management system was integrated with the PTS trouble ticket system as part of the evolution towards integrated operations of the IMS.

Internet Communication

The performance of the Internet links was consistent during 2006, with an availability of greater than 99.9%. The two links share the normal Internet traffic as well as the traffic carried by the virtual private networks for the GCI. During 2006, the capacity of one of the Internet links was increased from 4 to 10 megabits per second. The other link was scheduled for a similar upgrade in the first quarter of 2007. The links ably supported several trials in video streaming of various meetings of the Commission, including the tenth anniversary symposium (see Special Feature 1).

MANAGEMENT AND COORDINATION

Information Security

In 2006, the PTS Information Security Working Group was commissioned. Its objectives are to assemble the information security expertise from the PTS to draft information security policies and guidelines, to streamline the cross-Divisional acceptance of such policies and guidelines by actively involving information security representatives from all Divisions early in the drafting process, and to establish a security forum capable of discussing security matters and advising the PTS senior management.

Throughout the year, the PTS information security personnel provided engineering support to data and system owners to improve the security of their information systems. In particular, considerable efforts were invested in the project for the next GCI to ensure that the necessary security controls are adequate to protect the integrity, confidentiality and availability of data, and to ensure the security and integrity of all the independent networks connected via the GCI.

Two series of penetration tests were conducted in 2006 with the aim of identifying potential weaknesses in the security measures implemented to protect CTBT information assets. Corrective actions were taken to rectify the deficiencies noted from the test reports.

Workshop

The PTS maintained a high level of technical coordination with States Signatories. NDCs were invited to the Network and Data Operations Workshop, held in Vienna from 20 to 24 November 2006, to share their views regarding the further development of the provisional operation of the monitoring system and the cost effectiveness and efficiency of the end to end data flow. The workshop provided an opportunity to participants to bring directly to the attention of the PTS the problems that they were facing at their NDCs or at their stations. Around fifty NDC staff and station operators actively participated. The workshop was an example of PTS support of efforts of States Signatories in building or improving tsunami warning centres.

Participants of Network and Data Operations Workshop, Vienna, November 2006.

Cooperation with World Meteorological Organization

The PTS was invited to participate at a session of the WMO Nuclear Emergency Response Activities Coordination Group in Vienna in May 2006. At

this meeting, the PTS proposed to create a joint CTBTO–WMO response system in ATM by 2007. Such a system would allow the PTS, in the case of a Treaty-relevant radionuclide detection, to request, in near real time, ATM products from WMO centres to supplement its own computations. This would constitute the first near-real-time backtracking response system worldwide. The group noted the successful collaboration between the PTS and the WMO during the last decade, and recommended to formally include the CTBTO–WMO response system in the WMO Global Data Processing and Forecasting System (GDPFS).

The PTS furthermore participated at the Extraordinary Session of the WMO Commission for Basic Systems (CBS) in Seoul from 9 to 16 November 2006. There, the PTS gave a plenary presentation on the CTBTO–WMO cooperation. The CBS agreed to establish the new arrangements regarding the CTBTO–WMO backtracking response system. It recommended that these arrangements be formally included in the manual on the GDPFS. The matter was forwarded to the WMO Executive Council for final approval.

RESTRUCTURING OF IDC DIVISION

As a result of restructuring in the PTS in 2006, the activities of the former Computer Infrastructure and Network Services Sections were split between maintenance (and moved to the IMS Division) and operations (and transferred to a new Section of the IDC Division). The Waveform Monitoring Section was reorganized as the Monitoring and Data Analysis Section to integrate the radionuclide aspects of data analysis. The operational aspects were moved to the newly created Network and Data Systems Operations Section, which comprises the Monitoring Facilities Operations Unit and the Network and Systems Operations Unit. The Monitoring Facilities Operations Unit supervises and coordinates the operations and the first level support of the IMS facilities, which includes the management of the Operations Centre. The Network and Systems Operations Unit is responsible for all operational aspects of IDC applications software and the GCI and related computer hardware, as well as for the release of reviewed standard IDC products. The new Software Applications Section integrates all aspects related to radionuclide technologies as well as data fusion.

On-Site Inspection

On-Site Inspection

Introduction

The Treaty verification regime monitors the world for evidence of a nuclear explosion. If such an event were to occur, concerns about possible non-compliance with the Treaty may be addressed through a consultation and clarification process. Notwithstanding, States can request an on-site inspection (OSI), which is the final verification measure under the Treaty and can be invoked only after the Treaty has entered into force.

The purpose of an OSI is to clarify whether a nuclear weapon test or any other nuclear explosion has been carried out in violation of the Treaty and to gather facts, as far as possible, which might assist in identifying any possible violator.

HIGHLIGHTS OF ACTIVITIES IN 2006

Under the guidance of the Commission, during 2006 the PTS continued with preparation for the Integrated Field Exercise (IFE) in 2008, reporting at the Working Group B sessions about developments and progress made as well as holding expert advisory group meetings, to discuss various issues related to planning, preparation and conduct of this exercise. The meetings produced important inputs to the IFE process, in particular the OSI Test Manual prepared by Working Group B and approved by the Commission, and other relevant guidance and advice to the PTS.

The PTS set up a task force to launch the preparation of the IFE. Progress included the choice of a location for the exercise on the former nuclear test site near Semipalatinsk, Kazakhstan, and the elaboration of a scenario.

Near the city of Slunj, Croatia, the PTS conducted a directed exercise (DE06) that focused on the set-up of a base of operations for an OSI. The PTS took advantage of the lessons learned during this exercise in defining the design and scenario of the IFE and in establishing technical specifications for core and auxiliary equipment, for which procurement procedures were initiated. An essential tool for the preparation of any field activity, the GIS became operational and supported many activities throughout 2006, ranging from field exercises to training.

Noble gas (xenon) equipment was selected and then tested and evaluated in various field activities in Seibersdorf, Austria. A high resolution gamma spectrometer, including prototype software to implement recommended measurement restrictions, was purchased. Three systems (ground penetrating radar, electromagnetic pulse monitoring and magnetic field mapping) for possible high resolution ground geophysical surveys were integrated into the OSI equipment pool. Interpretational routines for ground geophysical data treatment were evaluated and specific software for processing near-field passive seismic data for the Seismic Aftershock Monitoring System (SAMS) was being developed.

2006 directed exercise, Croatia: views of the base of operations during overflight activities.

PREPARATION FOR INTEGRATED FIELD EXERCISE

As part of the preparation for the IFE, a meeting with representatives of the host country, Kazakhstan, took place in June 2006 in Astana, and an agreement was reached on setting up points of contact for both the Government of Kazakhstan and the Commission. In July, during an on-site visit to the former nuclear test site near Semipalatinsk, a suitable location matching the requirements for the possible types of scenario envisaged for the IFE was identified.

In September 2006, a task force comprising nine thematic groups was set up to assist the IFE project manager and immediately concentrated efforts on documentation, the scenario, logistics, equipment and financing. Involving experts from the States Signatories, consultants and PTS staff, the task force achieved progress in identifying key parameters for the design of the IFE. Further areas, including evaluation and medical and safety issues, were considered later by the task force.

Two meetings of the expert advisory group were held in May and December 2006 to discuss issues relevant to IFE preparation. The results of the meetings were considered as useful and important. Offers by States Signatories of equipment (hardware and software) as contributions in kind were evaluated for the exercise.

OSI OPERATIONAL MANUAL AND TEST MANUAL

During its sessions in 2006, Working Group B dedicated about five weeks of meetings to the elaboration of the draft OSI Operational Manual. In addition to the ongoing second round of the elaboration process, based on the annotated draft rolling text, work was done on an OSI Test Manual that Working Group B agreed to compile at its Twenty-Fifth Session to guide the IFE. Both undertakings were conducted under the chairmanship of the Task Leader for the draft OSI Operational Manual.

For the development of the OSI Test Manual, the PTS organized two OSI workshops (8–12 May and 24–28 July). The basis for this manual was the matured draft model texts produced by both the friends of the Task Leader and the PTS during the second round of elaboration of the draft OSI Operational Manual. In the process of compiling the Test Manual, the PTS contributed a wide range of comments based on practical lessons learned from its past OSI activities and provided the necessary support.

2006 directed exercise, Croatia:
planning of activities at the base of operations.

2006 directed exercise, Croatia: testing of procedures and equipment for soil sampling.

At Part II of its Twenty-Seventh Session, Working Group B considered the draft Test Manual resulting from the OSI workshops and agreed on the version that should be used by the PTS for testing during the IFE as well as for PTS activities and related training leading up to the IFE, as appropriate. The Test Manual includes text relevant to most sections of the annotated draft rolling text which were identified by Working Group B as priorities for testing at the IFE, it being understood that further material could be added to it. The general scope of the Test Manual was set to accommodate the overall scope of field activities designed for the IFE.

METHODOLOGY EXERCISES

The PTS completed the cycle of directed exercises for the preparation of the IFE with DE06, which focused on field logistics, in particular the setting up of a base of operations. This exercise took place in Vienna on 10 and 11 July 2006 for the advanced preparation of field deployment and near the city of Slunj, Croatia, from 12 to 22 July 2006 for the field activities within a military training facility. With the assistance of experts and equipment from supporting States Signatories, the participants deployed a mobile base of operations comprising tents and all necessary amenities, including, for the first time, a two way satellite based communication (VSAT) antenna for field communication testing purposes.

In addition, to improve the preparation for the IFE, the exercise included in its scope the testing of standard operating procedures in relation to techniques such as radionuclide analysis, magnetic field mapping and seismic measurement. DE06 also provided an opportunity to refine the definition of field medical support. Lessons learned have been implemented for the procurement of new core and auxiliary equipment as well as for the preparation of the IFE.

INFRASTRUCTURE

As planned, the GIS, a system for managing data with a spatial reference, was 95% complete at the end of 2006, substantial progress having been made through cooperation with the United Nations Cartographic Section.

Major improvements to the GIS took place in 2006. A GIS storage array, with a raw capacity of 20 terabytes, was installed and made operational at the computer centre with a direct secure link to the GIS laboratory. The GIS was successfully tested in DE06, introductory training courses and equipment field testing exercises, and was used to support the preparation of the IFE scenario. As a result the PTS has gained the technical ability to prepare basic maps, including elevation data, for any location in the world within a few hours.

Subsurface gas sampling for xenon during the testing of noble gas equipment at Seibersdorf, Austria. Plastic foil is used to seal the ground around the sampling hole to prevent contamination by the atmosphere. The foreground shows a sampling bag with a capacity of one cubic metre.

EQUIPMENT

Standard operating procedures for aerial and ground based geophysics were written and then tested in DE06. Procurement for a magnetometer, ground penetrating radar and an electrical conductivity measurement system was completed. The rest of the equipment necessary for the IFE has been assured to the PTS by States Signatories as contributions in kind.

Standard operating procedures were written and tested for SAMS. A new SAMS software development project for the analysis of the acquired seismic data was initiated in 2006. Technical evaluation for the procurement of two sets of SAMS equipment for testing and training purposes was completed and procurement was expected to follow in early 2007. Maintenance of all the existing SAMS equipment was conducted. SAMS equipment necessary for the IFE has been assured to the PTS by States Signatories as contributions in kind.

Comprehensive technical testing and evaluation of mobile xenon measurement systems were performed in Seibersdorf, Austria, concluding a three phase programme which began in 2003 to make prototype systems available for activities of the Commission. An experts' meeting to review the initial results of the development and testing and to discuss the future of the programme on mobile noble gas measurement was held immediately following the conclusion of the testing programme.

Prototype software for field analysis of beta–gamma coincidence xenon data was developed. Additional software for analysis of beta gated gamma data was under development.

Support for the development of on- and off-site measurement capability for argon-37 continued. An intercomparison measurement test was performed in which identical argon-37 samples were measured by a prototype mobile system and by a high sensitivity laboratory.

Noble gas equipment for both xenon and argon-37 measurements was offered to the PTS as contributions in kind for the IFE, and the PTS undertook one visit to an offering institution to evaluate the equipment offered and discuss terms of provision of equipment.

The procurement of the high resolution gamma spectrometer for field and laboratory use for testing and training purposes, including the factory acceptance test of the system, was completed. A beta version of the blinded gamma acquisition and analysis software for measurement restriction was under testing and evaluation. The software is based on off the shelf Genie-2000 gamma acquisition and analysis software.

2006 directed exercise, Croatia:
magnetometer for towing underneath helicopter.

Above: Filling a dewar with liquid argon for cooling the ARIX-3F system.

Above right: SAUNA laboratory unit for analysis of xenon samples taken in the field. The system was developed for OSI and tested in Seibersdorf, Austria, in July–September 2006.

Below: Portable xenon sampling unit of the ARIX-3F system, which was developed for OSI and tested in Seibersdorf, Austria, in July–September 2006.

Through clarification visits, at least three vehicle-borne and aerial gamma monitoring tools necessary for the IFE were assured to the PTS as contributions in kind by States Signatories. A set of environmental sampling equipment for sampling subsoil gases, soil and water (deep and shallow) was procured. Initial testing of the subsoil gas sampling equipment was performed as part of the noble gas testing and evaluation in Seibersdorf.

Verification Related Training Activities

Verification Related Training Activities

Introduction

The Preparatory Commission offers States training courses and workshops in IMS, IDC and OSI technologies, thereby assisting in the upgrading of national scientific capabilities in related areas.

Participants of joint IMS–IDC introductory training programme, Vienna, May 2006.

IMS AND IDC TRAINING ACTIVITIES

In 2006, three training courses were jointly organized by the IMS and IDC Divisions: one joint IMS–IDC introductory training programme (Vienna in May) and two joint IMS–IDC regional technical training programmes (Cairo in June and Mexico City in July–August). The two regional courses included a special programme for station operators and NDC staff. A total of 33 station operators and 43 NDC managers from 48 States Signatories participated in these courses.

Three IMS technical training programmes were held in 2006, two of them for radionuclide station operators (Seibersdorf, Austria, in May and Oak Ridge, Tennessee, USA, in June) and one for seismic station operators (Trafelberg, Austria, in November). Altogether 22 station operators from 17 States Signatories participated in the activities.

Eleven NDC technical staff members from eight States Signatories participated in an IDC regional training course in Zagreb, Croatia, in September. An IDC advanced training course was held for NDC technical staff in Vienna in December with the main purpose of familiarizing the 16 participants with the advanced features of the NDC in a box software package.

OSI TRAINING ACTIVITIES

The PTS continued with the development of the Long Range Plan for the training and exercise programme for future inspectors.

In 2006, the first cycle of experimental conduct of the elements of this programme finished with the seventh OSI Experimental Advanced Course, which was hosted by Croatia and held in Slunj in July 2006, with 13 participants from 10 States Signatories. Its aim was to develop a curriculum for the advanced course for the logistics/administration sub-team based on the Long Range Plan.

The OSI Introductory Course IC10 was conducted with 24 participants from 21 States Signatories in May 2006 in Vienna as a special outreach activity for staff of Permanent Missions of States Signatories with the aim to familiarize experts from States Signatories with the OSI regime and its development. IC11 was conducted with 32 participants from 15 States Signatories of the

Participants of IDC advanced training course for NDC technical staff, Vienna, December 2006.

Eastern Europe geographical region in October 2006 in Baku, Azerbaijan, as a special outreach activity for States Signatories in this region.

E-LEARNING

The pilot phase of a project to provide 'e-learning' opportunities to the States Signatories was completed. The purpose of the project is to broaden the participation in the PTS training programme to ensure the development and operation of the verification system elements. During the pilot phase, an e-learning strategy was developed, e-learning technologies were investigated and suppliers were identified. Terms of reference were developed and a supplier will be chosen to prepare the infrastructure and to start developing training material.

The development of e-learning modules for OSI training was enhanced during 2006 with the aim of using some modules for the training of the participants in the IFE. Four subjects were under development: introduction to OSI, OSI overflight, OSI seismic simulation and OSI Test Manual familiarization.

Above: OSI Introductory Course IC11, Azerbaijan: collecting radionuclide samples.

Below: Seventh Experimental Advanced Course, Croatia: planning the logistics for an OSI.

Evaluation

Evaluation

Introduction

Evaluation activities of the PTS consist of defining a set of specific acceptance tests to validate each phase of the implementation plans for the IMS, GCI, IDC and OSI regime and ensuring that continuous, reportable quality measures are implemented in order that the PTS can provide its customers with the necessary confidence in its functioning and its products.

HIGHLIGHTS OF ACTIVITIES IN 2006

On 26 August 2006, the Executive Secretary endorsed a quality policy for the PTS which includes the commitment to continually improve the effectiveness of the Quality Management System (QMS) and which provides a framework for establishing and reviewing quality objectives. Significant progress was also achieved in developing the Quality Manual.

The evaluation of SPT1, including the independent evaluation by external experts, was concluded. All the evaluations agreed on the need for the PTS to reinforce a process based framework, to develop key performance indicators further, to abide by quality management standards by adopting intercomparison exercises as a means to test the 'proficiency' of the PTS, and to conduct further testing at the subsystem level. The PTS acknowledged the need to take into account the evaluation objectives at the design stage of future system tests and exercises in order to better coordinate the various evaluation inputs.

The 2006 NDC Evaluation Workshop considered the small scale focused exercises for 2006 to 2008 proposed by the PTS to be appropriate from a system development perspective and proposed a number of additional tests incorporating a user perspective.

A system to facilitate tracking of the implementation of recommendations from NDC evaluation workshops was started and further developed on the basis of a recommendation of the 2006 Quality Management Workshop. This system also provides a repository for evaluation recommendations.

With regard to OSI activities, the evaluation of DE06 concluded that its objectives were met and that it made a significant contribution to the development of logistical aspects of the OSI regime that were of particular relevance for the IFE. The evaluation recommended that a more structured approach be used by the PTS to prepare the pre-inspection planning and point of entry activities by developing standard operating procedures, formats and checklists.

EXTERNAL EVALUATION OF FIRST SYSTEM-WIDE PERFORMANCE TEST

During June and July 2006, the reports on the external evaluation of SPT1, covering waveform and radionuclide technologies, were completed. These reports were made available to States Signatories on the IDC secure web site and presentations on the evaluation were given to Part II of the Twenty-Seventh Session of Working Group B. The general conclusion of the reports is that SPT1 has provided a useful benchmark for future performance tests, and was successful in testing many elements of the verification system and in identifying weaknesses and areas of the system that need attention and improvement.

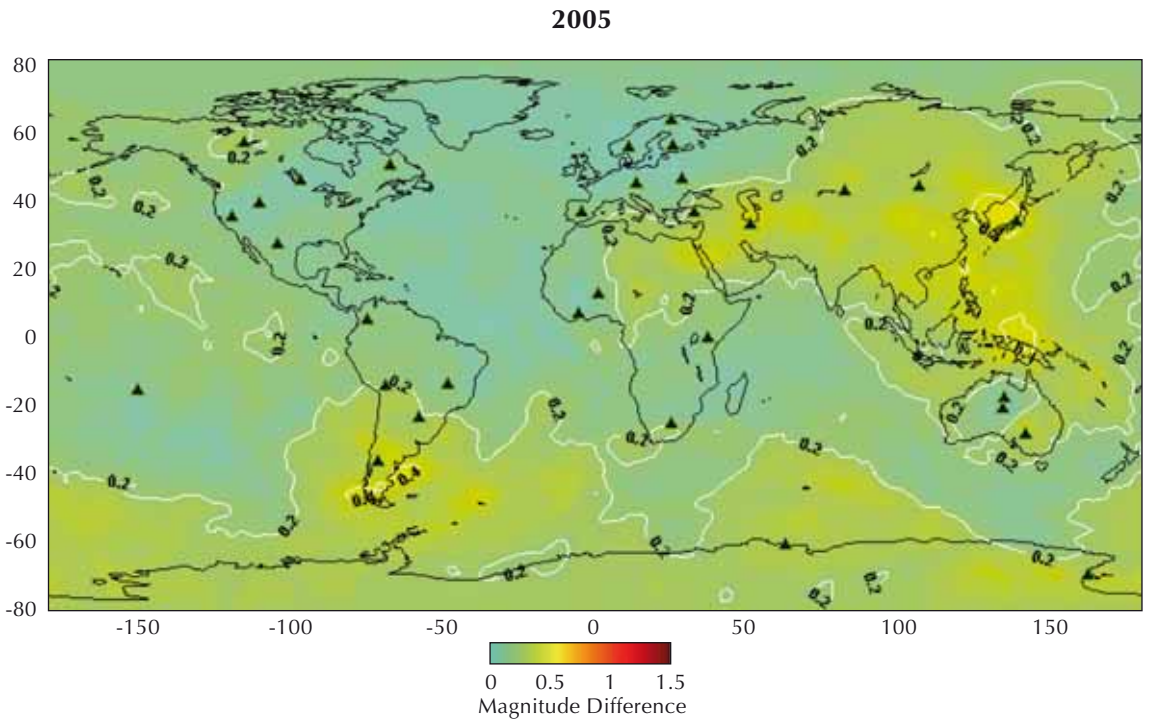
Opening of 2006 NDC Evaluation Workshop, Kiev, October 2006.

Some major conclusions and recommendations were as follows. (a) The Operations Centre established in support of SPT1 was an important step in improving the performance of the verification system. (b) In order to assess the cost–performance relationship, the PTS should develop accounting procedures that relate expenditures to system functions and performance. (c) Attempts should be made to develop and document metrics for the overall performance of the entire system. This implies the need to develop a 'map' linking the key performance issues with these metrics.

An independent evaluation by a radionuclide expert produced a number of comments and recommendations to the PTS and NDCs. These are summarized as follows. (a) The intercomparison exercise was an invaluable tool to indicate and benchmark the current performance capability of the whole radionuclide network. (b) Future intercomparison exercises, whether partial or system-wide, must be designed, conducted and evaluated in accordance with international best practice as espoused in the norms for evaluation in the United Nations system and in extant standards of the International Organization for Standardization and the International Electrotechnical Commission. (c) The system of communication between the PTS, NDCs and IMS radionuclide laboratories needs to be improved to ensure transparency on a real time basis with regard to ongoing developments. (d) Mechanisms must be sought to maximize the 'capture' of existing experience and expertise in the overall community and to ensure the transfer of this skill base by means of a successor training programme.

ASSESSMENT OF OSI ACTIVITIES

The objectives of DE06 were to develop and test procedures to establish and operate the base of operations for an inspection team in the field and to examine whether the lessons from the 2002 field exercise and later OSI activities



The maps show simulations of the estimated detection capability of certified primary seismic monitoring stations at the end of 2005 and 2006 relative to that of the complete IMS primary seismic network under ideal conditions (full station availability and low background noise).

Relative detection capability is shown as a difference in body wave magnitudes. An event is considered detected when its signal exceeds the noise level by a factor of 3 at three or more stations.

At the end of 2005, when only 32 stations had been certified, magnitude differences above 0.4 were apparent in three areas: around the Sea of Japan, north of Papua New Guinea and in southern Argentina. The same areas showed differences below 0.4 at the end of 2006, when there were 36 certified stations. Overall, at the end of 2006, magnitude differences in several parts of the globe fell to below 0.2.

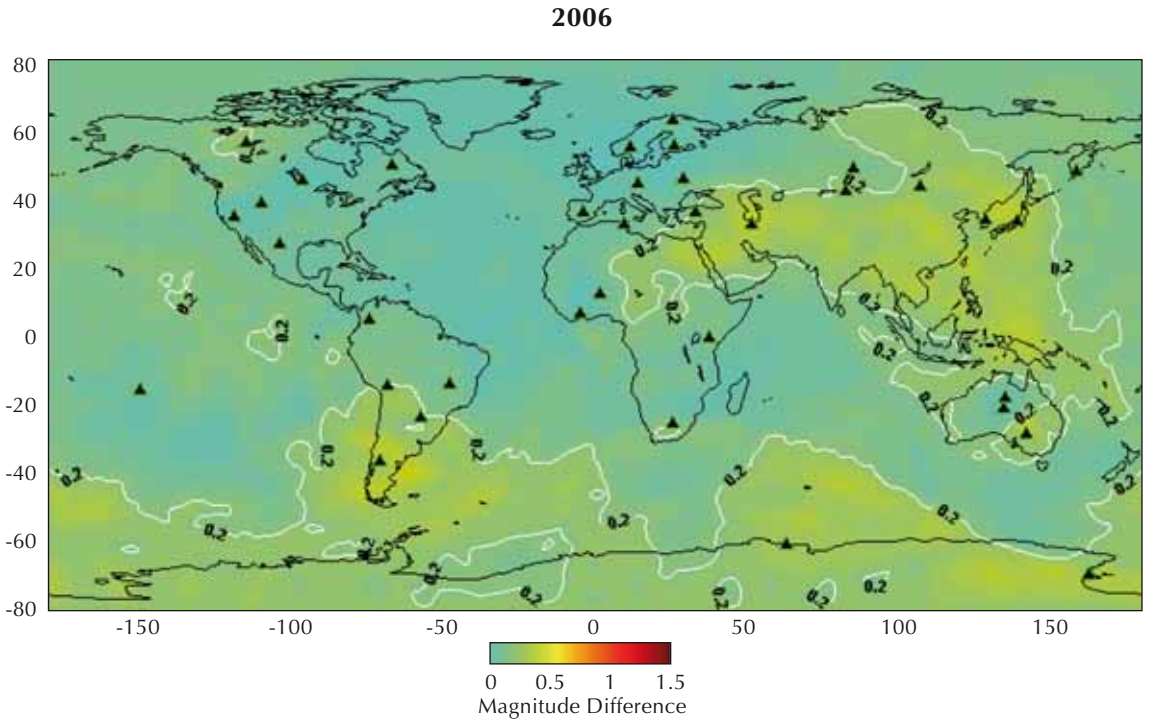
had been adequately incorporated into the OSI regime. The evaluation of DE06 found that the objectives were met and that it contributed to the development of fundamental logistical aspects of the OSI element of the CTBT verification regime, which are of particular relevance to the IFE. It was judged that several important lessons learned will need to be addressed in preparation for the conduct of the IFE. In particular, and in order to strengthen the inspection team, the evaluation team recommended that a more structured approach be used by the PTS to prepare, inter alia, standard operating procedures regarding the pre-inspection planning and point of entry activities as well as formats and checklists.

QUALITY ASSURANCE

The 2006 Quality Management Workshop endorsed the recommendations of the 2005 workshop and recommended that the revised quality policy and the document describing the revised QMS, namely the revised Quality Manual, be issued immediately. The 2006 workshop clearly expressed the need to move forward rapidly and, if necessary, to revise the QMS as experience is gained in its implementation. This would be an indication that the QMS was a utilized and 'living' system. As a result, the PTS quality policy was approved on 26 August 2006 by the Executive Secretary and the final draft of the revised Quality Manual was distributed for review within the PTS.

2006 NDC EVALUATION WORKSHOP: CUSTOMER FEEDBACK

The 2006 NDC Evaluation Workshop was hosted and actively supported by the National Space Agency of Ukraine. Over 55 participants representing 25 States Signatories, NDCs and the PTS gathered in Kiev from 17 to 21 October, primarily to develop testing and evaluation proposals as requested by Working Group B at Part II of its Twenty-Seventh Session.



The workshop considered the proposals by the PTS for components of future focused exercises and tests, and developed further proposals from an NDC perspective for consideration and possible approval at the Twenty-Eighth Session of Working Group B.

In addition, the workshop identified communication and information sharing between the PTS and the NDCs as two fundamental issues. It proposed that the PTS develop the concept of an 'integrated information portal' to provide all relevant information to NDCs in relation to the IMS as well as to provide them with an automatic connection to the external database.

The workshop recommended that the status of implementation of recommendations from previous evaluation workshops be reported and be a basis for discussion at the next NDC Evaluation Workshop.

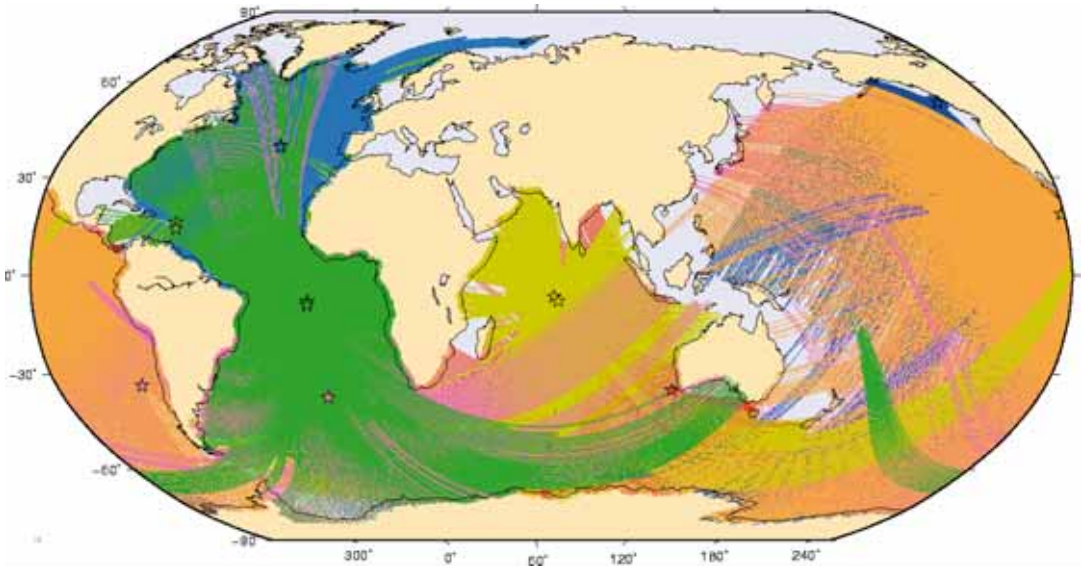
TRACKING OF IMPLEMENTATION OF RECOMMENDATIONS

A system to facilitate tracking the implementation of recommendations from NDC evaluation workshops was started and further developed on the basis of a recommendation of the 2006 Quality Management Workshop. This system also provides a repository for evaluation recommendations and all recommendations from the 1999 Evaluation Workshop have been entered into the system.

COOPERATION WITH UNITED NATIONS EVALUATION GROUP

The PTS continued to support the activities of the United Nations Evaluation Group regarding the exchange of the results based management and evaluation practices adopted by the United Nations agencies in the annual meeting in March 2006.

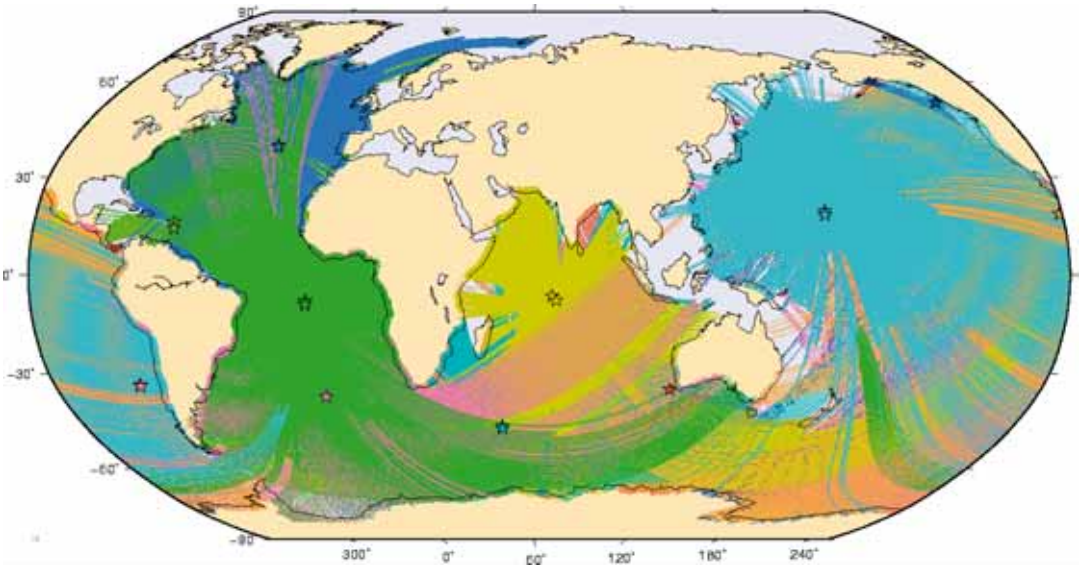
2006 Hydroacoustic Coverage



The maps show the oceanic areas which are 'visible' to hydroacoustic monitoring stations of the IMS (because there is no topographical blockage). A star shows the location of a monitoring sensor and different colours represent different stations. Each coloured area represents the oceanic region that is 'seen' by the station of that colour. Many parts of the oceans can be monitored by more than one hydroacoustic station, causing an overlap of colours and the disappearance of some colours in the overlapping areas.

The upper map shows the coverage by operational stations at the end of 2006. The lower map presents the expected coverage of the complete network of hydroacoustic stations and clearly shows a higher overlap in coverage by the stations.

Expected Coverage of Complete Hydroacoustic Network



Tenth Anniversary of the CTBT: Exploring New Synergies Between the Scientific and CTBT Communities

To mark the tenth anniversary of the adoption of the Comprehensive Nuclear-Test-Ban Treaty and its opening for signature in September 1996, the scientific symposium, CTBT: Synergies with Science, 1996–2006 and Beyond, was held from 31 August to 1 September 2006 at the Hofburg Congress Centre in Vienna with the generous support of Austria. It attracted more than three hundred participants, including key figures in the field of nuclear non-proliferation and disarmament and scientists from internationally renowned universities and institutions, as well as representatives of States Signatories.

"To cooperate with science is not a luxury that we can have or not, but a necessity for the long term sustainability of this organization." These words by Mr Ola Dahlman, former Chairperson of Working Group B and moderator of the symposium, summarize best the two day exchange of ideas aimed at strengthening the interaction between the global scientific community and the CTBTO Preparatory Commission.

The close cooperation between the CTBT community and the scientific world dates back to the negotiations of the CTBT at the Conference on Disarmament some twenty years ago, when scientists helped to design the most comprehensive verification system ever to be built in order to verify compliance with the Treaty. Since then, many significant scientific developments have taken place that are of relevance to the CTBT verification system. Some of them were discussed at the symposium: precision seismology to improve the accuracy of event location, improved understanding of earthquake sources, new computational tools to understand wave propagation, new and improved methods and procedures for the analysis of large data volumes, and new analytical methods and procedures to increase the understanding of infrasound observations.

Today, with nearly three quarters of the IMS completed, there is a great scientific interest in the data from this global monitoring network. During the symposium and in the discussions afterwards, several scientists highlighted the great value of CTBT data and their many long term uses in scientific research which could lead, inter alia, to improved methods of data acquisition and analysis. Other scientists emphasized that cooperation should not

be a one way street: international scientific cooperation has helped to provide state of the art models for the interpretation of CTBT monitoring results; now governments need to make verification data available for scientific purposes.

It became clear from the discussions that the scientific community and the Commission could both benefit from common research projects and data sharing. CTBT data could be used in studies of the earth's structure as well as in research on earthquakes, underwater explosion location and climate change monitoring. They could also be of value in efforts to improve early warning systems for tsunamis, volcanic and major chemical explosions, and tropical cyclones.

Hopes were expressed that the important synergies that already existed between the CTBT and scientific communities would be further developed.

In his report on this event to the Twenty-Seventh Session of the Commission held in November 2006, the Executive Secretary, Mr Tibor Tóth, stated: "I believe that through these activities we successfully made use of the tenth anniversary in launching efforts to strengthen links between the political and scientific constituencies, and I hope that they will be followed up with concrete actions. The symposium clearly demonstrated a wide range of potential improvements to the verification technologies and their civil and scientific applications which could provide States Signatories with additional benefits from participation in the Treaty verification regime."

The Event of 9 October 2006: A Test Case for the CTBT Verification Regime

The announcement by the Democratic People's Republic of Korea on 9 October 2006 that it had conducted a nuclear test was met with a practically unanimous global expression of concern. The United Nations Security Council condemned the act as a clear threat to international peace and security. The Chairperson and the Executive Secretary of the Preparatory Commission expressed grave concern at the declared test and characterized the event as an action against the letter and the spirit of the CTBT.

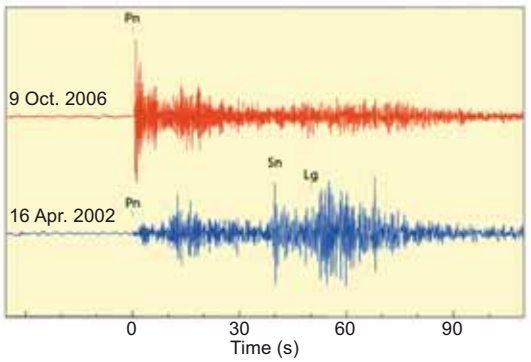
The Commission held a Special Session to discuss the announcement on 13 October 2006. At the session, a large number of States Signatories made statements expressing their deep concern and regret. The PTS provided two technical briefings on the event related to the announcement for States Signatories on 9 and 13 October. States Signatories expressed their appreciation to the PTS for the timely provision of reliable IMS data and IDC products.

This event can be regarded as an unplanned test of the reliability of the CTBT verification system. The event provided a special opportunity to demonstrate the technical capabilities of the PTS, to test its procedures and to highlight the added value that the system can bring to States Signatories in a situation of such political importance. Under the Treaty, IMS data and IDC products are provided to States Parties to enable them to draw their own conclusions. It is the States Parties' prerogative to assess the nature of an event.

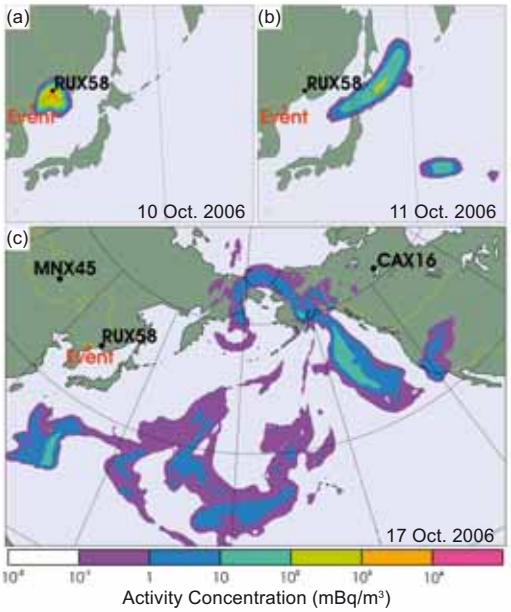
The event was well recorded throughout the world by the IMS. The signals originating from the event were detected at more than ten primary seismic monitoring stations. Less than two hours later, States Signatories received the first automated data product, Standard Event List 1 (SEL1), containing preliminary information on the time, location and magnitude of the event. The IDC in Vienna expedited analysis of the seismic recordings and applied time lines for data processing and dissemination as envisaged by the Treaty. As a result, the PTS was able to distribute its primary data product, the Reviewed Event Bulletin (REB), to States Signatories on 11 October 2006.

The REB for a given day contains all those events which have been detected at IMS seismic, hydroacoustic and infrasound stations and which meet specific quality criteria. All the data and parameters for every event in the REB have been reviewed by waveform analysts in the IDC, and seismic events may include data from IMS auxiliary seismic as well as primary seismic stations. For the IDC waveform analysts the event in the Democratic People's Republic of Korea was just one of over a hundred events in the REB for 9 October.

Locations and confidence ellipses for the event of 9 October 2006 in the Democratic People's Republic of Korea. The blue ellipse associated with the location resulting from automatic data processing (and provided in Standard Event List 1) had an area of 2389 square kilometres. In contrast, the red ellipse for the location resulting from the subsequent review by IDC analysts (and given in the Reviewed Event Bulletin) had an area of 880 square kilometres, which is less than the maximum area of 1000 square kilometres allowed for an OSI under the Treaty.



Waveforms for a nuclear explosion and an earthquake recorded at the IMS primary seismic array PS31 at Wonju, Republic of Korea. The upper trace shows the waveform recorded at PS31 for the announced nuclear explosion in the Democratic People's Republic of Korea of 9 October 2006 (mb = 4.08). The lower waveform trace is for a shallow earthquake that occurred on 16 April 2002 (mb = 3.93) and whose epicentre was within 80 km of the explosion. An explosion generally has a very impulsive, large onset of compressional waves (Pn) and produces little shear energy (Sn and Lg) and smaller surface waves in comparison with an earthquake of similar size, giving rise to the regional screening criterion.



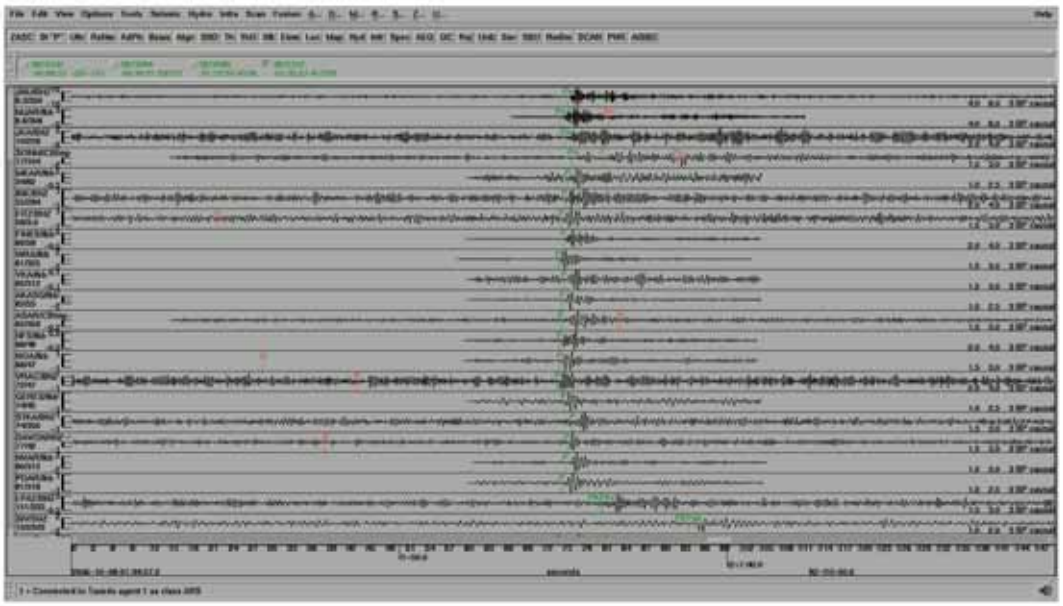
Temporal evolution of the ground level concentrations of xenon-133 as calculated by the PTS ATM software for an assumed immediate venting of radioxenon at the time and coordinates of the event of 9 October 2006 (shown by the red dot). The plume is shown at 03:00 Coordinated Universal Time (a) one, (b) two and (c) eight days after the event. The three radionuclide stations shown are participating in the International Noble Gas Experiment, but RUX58 was not operating at the time of the 9 October event.

The REB confirmed the validity of the event issued in SEL1, and its location and time. Moreover, the inclusion of signal detections at one additional primary seismic station and a range of well distributed auxiliary seismic stations, together with the improvements associated with analyst review, resulted in a reduced uncertainty in the location for a possible inspection area of well below 1000 square kilometres – the maximum allowed for an on-site inspection under the Treaty.

In addition to the observations made in the REB based on the findings by the seismic, hydroacoustic and infrasound technologies, the radionuclide technology, measuring radionuclide particles or noble gases in the air, may be able to allow unambiguous identification of a nuclear explosion. At the time of the announced nuclear explosion, 10 of the planned 40 radionuclide noble gas monitoring stations of the IMS were already equipped but were running in experimental mode only. A part of the experiment is the analysis of these data. Information related to observations made at the IMS radionuclide noble gas station at Yellowknife, Canada, as part of the International Noble Gas Experiment was made available to authorized users on the IDC secure web site on 30 October and 1 November, and this was followed by updated information on 6 November. A technical briefing on this information was given to States Signatories on 10 November.

In summary, the IMS data and IDC products provided very reliable parameters characterizing the event, including its location, and to an accuracy that would be required for initiating an on-site inspection after entry into force of the Treaty. This was done with only about 60% of the IMS stations in use. Thus the event demonstrated that the PTS is capable of receiving and reviewing data for an event of special interest in accordance with the time lines envisaged under the Treaty, and of providing States Signatories with relevant data products.

It should be noted that such a demonstration under the current provisional mode of operation of the verification system is only valid for an exceptional circumstance. In this particular case, diversion of resources from other work was necessary in order to expedite the early issuance of the REB for 9 October. The event in the Democratic People's Republic of Korea also highlighted the need for a rapid build-up of the CTBT verification system, in particular of the radionuclide monitoring stations.



Seismic signals of the event of 9 October 2006 recorded at IMS stations.

Contribution of the Preparatory Commission to Tsunami Early Warning Systems

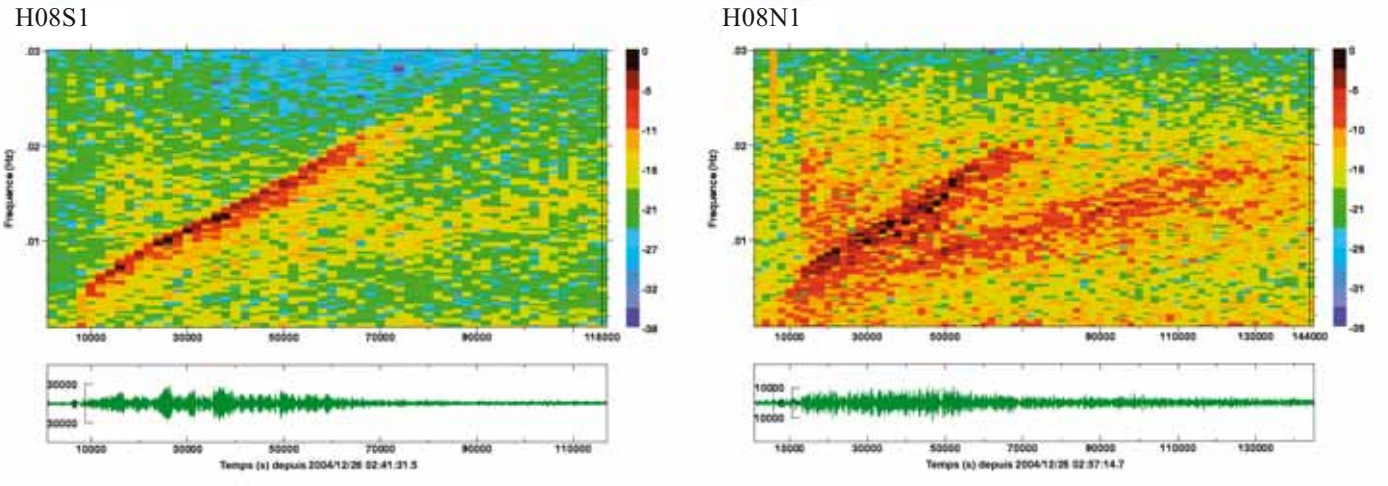
Houses in Aceh, Indonesia, destroyed by the tsunami of December 2004.

The tragedy caused by the tsunami in the Indian Ocean in December 2004 triggered discussions on whether the CTBTO Preparatory Commission could contribute to the prevention or mitigation of such disasters. In March 2005, the Commission tasked the PTS to test the provision of data for the purpose of tsunami warning.

A number of tsunami warning institutions began receiving IMS data in near real time on a test basis. During this test phase, which lasted over a year, tsunami warning centres confirmed the usefulness of IMS data. In comparison with data from other existing monitoring networks, IMS data were found to arrive at these tsunami warning centres with less delay and higher reliability. This provides potentially vital additional warning time in which to activate alerts in the event of a possible tsunami threat.

Consequently, the Twenty-Seventh Session of the Commission, in November 2006, endorsed a recommendation of Working Group B to provide real time and continuous data to relevant tsunami warning organizations. Four tsunami warning centres now receive data from about thirty IMS stations. These centres are located in Japan, the USA (Hawaii), Australia and Malaysia.

While the purpose of the global verification regime is to verify compliance with the CTBT, the use of IMS data to mitigate the catastrophic consequences of tsunamis is an example of the wide range of potential civil and scientific applications for which these data could be used.



Spectrogram of the tsunami signal recorded on 26 December 2004 on the first element of each of the IMS hydrophone triplets H08S and H08N at Diego Garcia in the Chagos Archipelago (Indian Ocean). The primary dispersion curve is clearly visible in both plots. The right hand plot also shows more prominently the secondary curve indicating the arrival of the reflected wave. The coloured right hand scale indicates the energy of the signal in decibels relative to the peak amplitude (0 dB). The horizontal axis shows time measured in seconds.

Policy Making Organs

Policy Making Organs

Introduction

The Preparatory Commission for the CTBTO was established for the purpose of carrying out the necessary preparations for the effective implementation of the CTBT and for preparing for the first session of the Conference of the States Parties to the Treaty after its entry into force. The Preparatory Commission consists of two organs: a plenary body composed of all the States Signatories and the Provisional Technical Secretariat (PTS).

The plenary body has three subsidiary bodies. Working Group A deals with budgetary and administrative matters, such as the annual budget, financial and staff regulations and rules, and legal issues. Working Group B deals with verification issues. Both Working Groups make proposals and recommendations for consideration and adoption by the Commission. Lastly, an Advisory Group advises the Commission and its Working Groups on financial, budgetary and associated administrative matters. The Advisory Group consists of experts from States Signatories who are of recognized standing and experience in financial matters.

HIGHLIGHTS OF ACTIVITIES IN 2006

The Preparatory Commission held a Special Session on 13 October 2006 and the PTS provided three technical briefings for States Signatories, on 9 October, 13 October and 10 November, concerning the announcement of the Democratic People's Republic of Korea that it conducted an underground nuclear test on 9 October 2006.

At Part II of its Twenty-Seventh Session in November 2006, the Commission adopted principles and operating rules for the provision of data to tsunami warning organizations, as outlined in the report of Working Group B to the Commission. At the same session, the Commission approved a pilot project to facilitate the participation of experts from developing countries in official technical meetings of the Commission.

POLICY MAKING ORGANS

In 2006, the Preparatory Commission was chaired by Ambassador Volodymyr Yelchenko, Permanent Representative of Ukraine. Working Group A was chaired by Ambassador Abdulkadir Bin Rimdap of Nigeria. The Advisory Group was chaired by Mr André Gué (France). As the term of appointment of Mr Ola Dahlman as Chairperson of Working Group B was due to end on 17 March 2006, at Part I of its Twenty-Sixth Session the Commission appointed Mr Hein Haak (Netherlands) as Chairperson of Working Group B with effect from 18 March 2006 for a three year term.

The Commission held two regular sessions in 2006, each in two parts. The subsidiary bodies of the Commission, Working Group A, Working Group B and the Advisory Group, each held two sessions in 2006. To facilitate the timely consideration of matters related to the Programme and Budget, the Twenty-Seventh Session of Working Group B and the Twenty-Sixth Session of the Advisory Group were each divided into two parts with an interval of several weeks between them.

On 13 October 2006, the Commission held a Special Session to discuss the announcement of the Democratic People's Republic of Korea that it conducted an underground nuclear test on 9 October 2006. At this session, a large number of States Signatories made statements expressing their deep concern and regret. In support of the session, the PTS provided three technical briefings for States Signatories on 9 October, 13 October and 10 November. States

Signatories expressed their appreciation to the PTS for the timely provision of reliable data and products and for the professionalism demonstrated in this respect (see also Special Feature 2).

With regard to the schedule of meetings of the Policy Making Organs for 2007, the Commission decided in November 2006 to reduce each of the sessions of Working Group A by two days and its own session in November 2007 by one day, and to leave intact the Working Group B sessions as proposed by Working Group B at its Twenty-Seventh Session. The Commission also requested Working Group B to re-examine in 2007 the duration and organization of its meetings, including the possibility of no longer holding parallel meetings, in order to prepare a proposal on how to organize its sessions from 2008 onwards.

Working Group A made recommendations, subsequently adopted by the Commission, on administrative and financial issues, including adjustments to the Financial Rules of the Commission. Following discussion in Working Group A, at Part II of its Twenty-Seventh Session the Commission approved a pilot project to facilitate the participation of experts from developing countries in official technical meetings of the Commission.

Working Group B made recommendations, subsequently adopted by the Commission, on a range of verification related issues. Special attention was devoted to the contract procurement process for the next generation of the GCI, planning and preparations for the IFE in 2008, including the development of a Test Manual, evaluation of SPT1 and a possible contribution of the Commission to a tsunami warning system. Following its decision in March 2005, in November 2006 the Commission adopted principles and operating rules for the provision of data to tsunami warning organizations, as recommended by Working Group B at its Twenty-Seventh Session (see also Special Feature 3).

Joint meetings of Working Group A and Working Group B were held on 23 February and 4 September 2006 to discuss restructuring of the PTS, the 2007 Programme and Budget proposals of the PTS, the Medium Term Plan for 2008–2012, the recommendations of the Advisory Group concerning sole source procurement and e-learning. Chairpersons' summaries of the proceedings of these joint meetings were issued.

The Advisory Group considered and provided advice on financial, budgetary and administrative issues.

Administration, Coordination and Support

Administration, Coordination and Support

Introduction

The PTS provides support to the Policy Making Organs and effective and efficient management of the activities of the PTS through the provision of administrative services and legal advice and services, coordinates relations with the international community, promotes deeper understanding of the objectives and principles of the Treaty as well as of the objectives and activities of the Commission, and fosters international cooperation in the exchange of verification related technologies.

HIGHLIGHTS OF ACTIVITIES IN 2006

The year 2006 saw an increase of 11 in the number of ratifiers of the Treaty. This number is almost twice that achieved in 2005.

Four facility agreements concerning the IMS entered into force and three additional facility agreements were concluded.

The year was marked by the tenth anniversary of the adoption of the CTBT and its opening for signature on 24 September 1996. Activities and events related to the tenth anniversary were publicized by the PTS. One such event, organized by the PTS, was a two day scientific symposium entitled CTBT: Synergies with Science, 1996–2006 and Beyond (see also Special Feature 1).

The PTS, with the support of a voluntary contribution by the Government of the Netherlands, organized two national seminars aimed at increasing awareness about Treaty requirements in the African region: in Lusaka, Zambia, and in Lilongwe, Malawi.

OUTREACH AND INTERNATIONAL COOPERATION

SIGNATURES AND RATIFICATIONS

Ten States (Andorra, Antigua and Barbuda, Armenia, Bosnia and Herzegovina, Cameroon, Cape Verde, Ethiopia, Suriname, Viet Nam and Zambia) ratified and one State (Montenegro) succeeded to the Treaty. The number of ratifications is almost twice that achieved in 2005. As of 31 December 2006, the Treaty had 177 signatures and 137 ratifications, including ratifications by 34 of the 44 States listed in Annex 2 to the Treaty, whose ratification is required for the Treaty to enter into force. The overall status of signatures and ratifications of the Treaty is shown in Table 2.

Table 2. Signatures and Ratifications by Year

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	**Total**
Signatures	138	11	2	4	5	5	1	4	4	2	1	**177**
Ratifications	1	7	18	25	18	20	8	11	12	6	11	**137**

RELATIONS WITH STATES

With the emphasis on States hosting IMS facilities and States that have not yet signed and/or ratified the Treaty, in particular those listed in Annex 2 to the Treaty, the PTS maintained dialogue through bilateral visits in capitals and interactions with Permanent Missions in Vienna, Berlin, Geneva and New York. Contacts were also made in the framework of relevant multilateral fora at the international, regional and subregional levels. Within the context of strengthening interaction with States, the Executive Secretary visited Japan, Malaysia, the Republic of Korea, the Russian Federation, Tunisia, Turkmenistan and Ukraine. In Vienna, the Executive Secretary continued to foster dialogue with States through their Permanent Missions. The Executive Secretary received several high level visitors from Cameroon, Colombia, Costa Rica, Croatia, the Dominican Republic, Romania, South Africa and the Sudan.

The Commission was notified by 16 States of their designations of National Authorities, or national focal points, in accordance with Article III, paragraph 4, of the Treaty. As of 31 December 2006, 128 States had notified the Commission of their designation of National Authorities or national focal points.

RELATIONS WITH INTERNATIONAL ORGANIZATIONS

In order to advance relations with relevant international organizations and to reach out to States that have not yet signed or ratified the Treaty, the Executive Secretary participated in the African Union (AU) Summit in Khartoum, Sudan (21–26 January 2006). He met on the margins of the summit with high level representatives of Burkina Faso, Egypt, Ethiopia, Gabon, Ghana, Guinea-Bissau, Nigeria and South Africa, and with the Chairperson of the AU Commission, the Executive Secretary of the Economic Community of West African States (ECOWAS) and the Secretary-General of the League of Arab States.

The Executive Secretary participated in the Ministerial Meeting of the Coordination Bureau of the Non-Aligned Movement in Putrajaya, Malaysia (26–30 May 2006), and had bilateral meetings with high level representatives of Guatemala, Indonesia, Malaysia, Thailand and Timor-Leste. The Executive Secretary participated in the 14th Summit of the Non-Aligned Movement in Havana, Cuba (11–16 September 2006), where he met with high level officials from Cuba, Dominica, Guatemala, Lesotho, Mozambique, the Philippines and Trinidad and Tobago.

The Executive Secretary participated in the ministerial meeting of the Friends of the CTBT co-hosted by Australia, Canada, Finland, Japan and the Netherlands

Relationship and Cooperation Agreements with Other International Organizations (31 December 2006)

International Organization and Agreement	Date of Signature	Date of Entry into Force
Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL) Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean	18 September 2002	18 September 2002
Association of Caribbean States Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the Association of Caribbean States	7 March 2005	7 March 2005
European Centre for Medium-Range Weather Forecasts Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the European Centre for Medium-Range Weather Forecasts	[a]	24 June 2003
United Nations Agreement to Regulate the Relationship between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the United Nations	26 May 2000	15 June 2000
United Nations Development Programme Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the United Nations Development Programme on the Provision of Support Services	7 December 2000	7 December 2000
World Meteorological Organization Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the World Meteorological Organization	[a]	23 May 2003

[a] A protocol recording the date of entry into force was signed after that date.

in New York (20 September 2006). During his stay in New York, the Executive Secretary also met with the Minister of Foreign Affairs of Timor-Leste.

The Executive Secretary participated in the sixty-first session of the United Nations General Assembly (9 October 2006), during which he made a statement under agenda item 108(s), "Cooperation between the United Nations and the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization". On the margins of the session, the Executive Secretary met with the President of the United Nations General Assembly and the United Nations Under-Secretary-General for Disarmament Affairs, and PTS staff held discussions with the directors of the regional centres of the United Nations Department for Disarmament Affairs.

The Executive Secretary participated in the 11th Summit of the Organisation internationale de la Francophonie (OIF) in Bucharest, Romania (26–29 September 2006), and held meetings with high level representatives of Mali, Morocco and Romania and the Director-General of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

In Vienna, the Executive Secretary continued to receive high level representatives of international organizations, including the President of the United Nations General Assembly, the Executive Secretary of ECOWAS, the Secretary-General of the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL), the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the Director-General of the OPEC Fund for International Development and the Special Representative of the Secretary-General of the OIF.

In order to strengthen cooperation and interaction between the PTS and relevant international organizations and institutions, PTS staff participated in different international events, including the 11th Ordinary Meeting of the Ministerial Council of the Association of Caribbean States (Port-of-Spain, Trinidad and Tobago, 5 April 2006), the AU Summit (Banjul, Gambia, 29 June – 2 July 2006), the 10th PIIC Beijing Seminar on International Security (Xiamen, Fujian Province, China, 25–28 September 2006), the United Nations Regional Seminar on Implementing United Nations Security Council Resolution 1540 in Latin America and the Caribbean (Lima, Peru, 27–28 November 2006), the 11th Session of the Conference of the States Parties to the Chemical Weapons Convention (The Hague, Netherlands, 5–8 December 2006) and the Fifth United Nations–Republic of Korea Joint Conference on Disarmament and Non-Proliferation Issues (Jeju Island, Republic of Korea, 13–15 December 2006).

The international organizations with which the Commission has concluded relationship and cooperation agreements are listed opposite.

WORKSHOPS AND OTHER CAPACITY BUILDING ACTIVITIES

The PTS promoted and facilitated cooperation among States from various regions, encouraging them to strengthen their national implementation measures to meet Treaty requirements. The PTS also raised awareness about the benefits that verification technologies offer for civil and scientific purposes. States Signatories provided voluntary contributions for activities promoting the Treaty as well as for the e-learning project. The PTS compiled and issued a booklet on all international cooperation activities carried out from 1997 to 2005.

The PTS held two national seminars in the African region with the support of a voluntary contribution by the Government of the Netherlands. One seminar was held in Lusaka, Zambia (21 February 2006), and the other seminar took place in Lilongwe, Malawi (23 February 2006). Each of these events was attended by around thirty participants from different government ministries as well as from legal, health, research, scientific, technical and environmental institutions. The seminars emphasized the political significance and national requirements following the ratification of the Treaty as well as the support available from the PTS to build capacity for operating stations.

Above: Participants of international cooperation workshop, Kuala Lumpur, May–June 2006.

Below: Participants of experts' meeting on civil and scientific applications of CTBT verification technologies, Budapest, September 2006.

At the invitation of the Malaysian Government, a workshop was held in Kuala Lumpur (31 May – 2 June 2006) on the national implementation of the Treaty for States from South-East Asia. The workshop was attended by about thirty participants from States in South-East Asia and representatives of the IOC of UNESCO. It built on previous workshops held in the region and provided an overview of progress achieved by the PTS. In addition, participants discussed the potential for upgrading technological capabilities of States Signatories, especially in areas relating to the IMS, the IDC and OSI, as well as cooperation among States Signatories and the benefits of verification technologies for civil and scientific purposes such as natural disaster alert and mitigation of hazards posed by natural disasters.

With financial support provided by the Government of Hungary, an experts' meeting was held in Budapest (2–3 September 2006). The meeting was attended by over forty experts from 28 countries. Developing the findings of experts' discussions held in London (2002), Sopron (2003) and Berlin (2004), the meeting reviewed and explored new potential benefits of the application of verification technologies for civil and scientific uses. The sessions therefore also dealt with PTS support for tsunami warning centres, seismoacoustic and radionuclide monitoring technologies, capacity building of staff of NDCs and the cooperation between the PTS and national institutions. A session on e-learning stressed the needs of end users and discussed possible

training modules to be included in the e-learning project. On the other hand, it was underlined that, while supporting capacity building, e-learning could not replace conventional training programmes.

Through the financial support of the Government of Canada and at the invitation of the Government of Mexico, a Regional Workshop on Promotion of Ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) for States in the Greater Caribbean was conducted in Mexico City (11–13 October 2006). The workshop was a follow-up to the Regional Workshop on CTBTO International Cooperation for States from Latin America and the Caribbean (Guatemala City, September 2005) and the fourth Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty ('Article XIV conference', New York, September 2005). The workshop was attended by about forty participants from 34 States, including 4 non-signatory States and 3 non-ratifying States. Its aim was to enhance the understanding of the Treaty and facilitate the earliest possible establishment of the verification regime. Participants discussed civil and scientific applications of the verification technologies in the area of natural disaster alert and mitigation. Legal and technical obstacles to signature, ratification and implementation of the Treaty by States were also discussed. Participants reviewed regional and subregional cooperation and agreed on developing cooperation further with a focus on the region of the Association of Caribbean States.

At the invitation of the Government of Nigeria, the PTS held a Workshop on CTBTO International Cooperation for National Implementation of the CTBT for the Economic Community of West African States, in Abuja (30 November – 1 December 2006). The workshop, held in collaboration with the Government of Nigeria and the ECOWAS secretariat, was attended by representatives of eight member States of ECOWAS. The aim of the workshop was to enhance the understanding of the Treaty and to promote its universality. Presentations were made by experts on different aspects of the verification regime, including the IMS, civil and scientific benefits of the verification technologies and opportunities for technical cooperation with the PTS. States were encouraged to facilitate technical cooperation with each other and establish a subregional data centre for collating, processing and archiving data from all NDCs and operating stations in the subregion. Participants mentioned the need for assistance by the PTS in achieving these goals through, inter alia, the provision of training and access to online support services such as e-learning.

DISSEMINATION OF INFORMATION

In 2006, the PTS organized various events to mark the tenth anniversary of the adoption of the CTBT and its opening for signature in September 1996.

Among these events was a scientific symposium entitled CTBT: Synergies with Science, 1996–2006 and Beyond, which was held in Vienna from 31 August to 1 September (see also Special Feature 1). An accompanying exhibition, "Verifying the Comprehensive Nuclear Test Ban", included display panels in addition to exhibits from the technical Divisions of the PTS. In cooperation with the Austrian Federal Ministry for Foreign Affairs, the PTS produced a booklet about the symposium entitled *CTBT: Synergies with Science, 1996–2006 and Beyond: An Overview.* The booklet includes statements made at the symposium and contains a DVD with recordings of all speeches and presentations. In continuation of the events marking the tenth anniversary of the CTBT, a modified version of the exhibition was presented in New York at United Nations Headquarters on the margins of the sixty-first session of the General Assembly in October 2006.

The PTS public web site continued to be updated, providing information for both the general public and specialized audiences. About 13 000 copies of public information material were distributed to States Signatories, non-governmental organizations (NGOs), academia and the media.

The PTS contributed to the special CTBT issue of *Disarmament Forum,* the quarterly journal of the United Nations Institute for Disarmament Research. The PTS also produced the eighth issue of *CTBTO Spectrum,* entitled "IMS: The pioneering years".

The PTS produced a DVD of the CTBTO documentary film entitled *For a Safer and More Secure World* and distributed it to States Signatories, scientists, media representatives and NGOs. The film was also shown at the opening of the scientific symposium.

The PTS held two press conferences and participated in the regular joint press reception organized by the United Nations Information Service in Vienna. The PTS also provided regular briefings on the CTBT and the work of the Commission to the Diplomatic Academy of Vienna, Disarmament Fellows, delegations, military officials, student groups, journalists and members of parliaments. In July, the PTS organized the visit of local and national media representatives to the OSI directed exercise (DE06) in Croatia.

In 2006, media interest in the Treaty and the work of the Commission and the PTS increased considerably, especially following the announcement of a nuclear test by the Democratic People's Republic of Korea. During this period, the PTS responded to a large number of enquiries from the media and facilitated interviews of the Executive Secretary and relevant PTS staff by various news agencies. The PTS issued 20 press releases during the year.

ADMINISTRATION

FINANCE

The Programme and Budget for 2006 amounted to US$50 894 000 and €44 437 900. At the 2005 Programme and Budget average exchange rate of 0.8270 euro to 1 US dollar, the total US dollar equivalent of the Programme and Budget for 2006 was $104 352 600, representing a nominal growth of 2.08% or, taking into account price changes, a real growth of 0.27%. On the basis of the 2006 average exchange rate of 0.7974 euro to 1 US dollar, the total US dollar equivalent of the Programme and Budget for 2006 was $106 622 493. Of the total Budget, 79% was allocated to verification related activities, including an allocation of $17 954 890 to the Capital Investment Fund (CIF), established for the build-up of the IMS. A breakdown of the 2006 Programme and Budget by Major Programme is shown in Table 3.

Table 3. 2006 Programme and Budget by Major Programme

Major Programme	US$(millions)[a]
MP1: International Monitoring System	44.5
MP2: International Data Centre	19.9
MP3: Communications	12.3
MP4: On-Site Inspection	5.8
MP5: Evaluation	1.3
MP6: Policy Making Organs	3.2
MP7: Administration, Coordination and Support	19.6
Total	**106.6**

[a] An average exchange rate of 0.7974 euro to 1 US dollar was used to convert the euro components of the 2006 Programme and Budget.

The expenditures for the Programme and Budget in 2006 amounted to $95 282 268, of which $22 197 840 was from the CIF. For the General Fund, the unused budget amounted to $15 583 175, which means that 82.4% of the total approved Budget for the year was implemented. For the CIF, approximately 87.3% of the allotment was executed by the end of 2006.

In 2006, disbursements in the amount of $188175 and obligations in the amount of $286 845 in indirect taxes were recorded by the PTS. The total cumulative amount of indirect taxes disbursed as of 31 December 2006 was $1696 047.

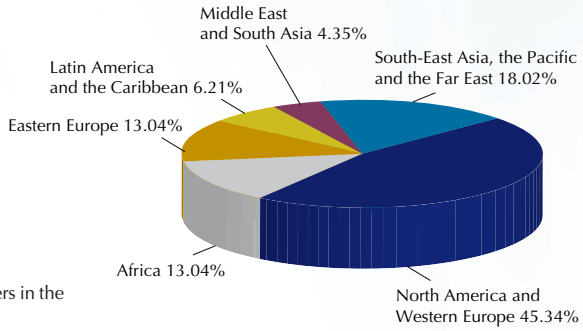


Figure 1. Staff members in the Professional category by geographical region (as set out in Annex 1 to the Treaty).

PROCUREMENT

The PTS completed more than 450 procurement processes in 2006, a similar number to that in 2005. The total number of contracts for testing and evaluation (T&E) and post-certification activities (PCAs) concluded by the end of the year was 12, covering 15 IMS stations, including 1 station at which noble gas equipment was tested, and 1 radionuclide laboratory. The PTS conducted negotiations on various stages of work for a further 50 IMS facilities, including work at 3 radionuclide laboratories and testing at 7 radionuclide stations in the noble gas network. With T&E and PCA projects dominating the work of the Procurement Section and with the tendency for the IMS stations still requiring installation to be in relatively difficult locations, the time and human resources needed for each procurement project have increased on average while the number of staff members in the Section has remained constant.

Financial Rule 11.5.06, Exceptions to Competitive Procedures, stipulates that the Commission should be informed about all contracts over $150 000 which were awarded after one of the exceptions listed in this Rule had been invoked. In 2006, 10 sole source procurements in this category (the same number as in 2005) were concluded with a total value of approximately $4.8 million.

HUMAN RESOURCES

The PTS secured the human resources for its operations by recruiting and maintaining highly competent and diligent staff for all programmes. Recruitment was based on securing the highest standards of professional expertise, experience, efficiency, competence and integrity. Due regard was paid to the principle of equal employment opportunity, to the importance of recruiting staff on as wide a geographical basis as possible, and to other criteria stipulated in the relevant provisions of the Treaty as well as the Staff Regulations.

As of 31 December 2006, the PTS had 254 staff members from 66 countries, compared with 270 staff members at the end of 2005. Figure 1 provides information on the distribution of staff members in the Professional category by geographical region. Table 4 shows the distribution of regular staff members by field of work.

The PTS continued its efforts to increase the representation of women in the Professional category, which rose to 29.19% at the end of 2006 from 26.85% at the end of 2005. In comparison with 2005, the number of female staff members at the P2 and P5 levels remained the same, while at the P4 level there was an increase of 14.28%. On the other hand, the number of female staff at the P3 level decreased by 11.12%. The recruitment efforts continued against the

Table 4. Regular Staff Members by Field of Work (31 December 2006)

Field of Work	Professional	General Service	Total
Evaluation Section	4	1	5
International Monitoring System Division	35	24	59
International Data Centre Division	67	14	81
On-Site Inspection Division	17	6	23
Total, verification related	*123 (76.40%)*	*45 (48.39%)*	*168 (66.14%)*
Office of the Executive Secretary	4	3	7
Internal Audit	1	1	2
Division of Administration	17	27	44
Legal and External Relations Division	16	17	33
Total, non-verification-related	*38 (23.60%)*	*48 (51.61%)*	*86 (33.86%)*
Total	**161**	**93**	**254**

background of low numbers of female applicants for the majority of vacancies for scientific posts. Discussions were held with some States Signatories regarding the modalities of encouraging female candidates to apply for vacant positions in the PTS.

In 2006, the PTS appointed 25 regular staff members. In addition, the PTS processed contracts for 65 consultants, 25 interns and 6 linguists; 175 contracts were processed for short term staff.

The PTS continued to provide opportunities for staff to develop their 'soft' skills in courses tailored for the mutual benefit of the PTS in carrying out its work programmes and of staff members in their job performance and career development. During the year, 134 staff members participated in internal and external training covering a wide range of topics, such as conflict management, performance management, international diplomacy, gender sensitivity and diversity, and management and supervision, as well as information technology.

On the issue of service limitation for Professional and internationally recruited General Service staff members, the PTS has introduced a system for implementing the policy within the framework of the Treaty, the Regulations and Rules and Administrative Directives, in particular Administrative Directive No. 20 (Rev.2). The implementation of the system is well under way and decisions were made regarding 32 staff members during the year.

The PTS concluded a human resources strategy paper which not only focuses on the implementation of the service limitation but also provides for improved recruitment strategies, succession planning, knowledge management and transfer of expertise. Due regard was being paid to the importance of recruiting staff on as wide a geographical basis as possible and to increasing the representation of staff from under-represented and developing countries as well as to improving the gender balance.

As a result of the implementation of the service limitation policy, the workload of the Personnel Section has increased greatly. Whereas 38 vacancy notices were issued in 2005, in 2006 a total of 77 vacancy notices were issued, 48 of which were related to limitation of the service period. Accordingly, the number of applications that had to be reviewed rose to 3667, an increase of 55% from 2358 in 2005. This increase has had a ripple effect of increasing the work in various administrative functions, such as assessing and shortlisting applicants, arranging and conducting interviews as well as Personnel Advisory Panels, briefing selected candidates and preparing offers of appointment.

The implementation of the service limitation policy led to a high staff turnover in 2006, whereby 35 staff separated from the PTS while 20 new staff members joined the organization. In this regard, there was an increase in the administrative work of the Personnel Section associated with entitlements of new and separating staff members. In accordance with the human resources strategy, separating staff were also provided with support in seeking new employment, writing letters of application and preparing for interviews.

Supplementary Information

States Whose Ratification is Required for the Treaty to Enter into Force (31 December 2006)

State	Date of Signature	Date of Ratification
Algeria	15 Oct. 1996	11 Jul. 2003
Argentina	24 Sep. 1996	4 Dec. 1998
Australia	24 Sep. 1996	9 Jul. 1998
Austria	24 Sep. 1996	13 Mar. 1998
Bangladesh	24 Oct. 1996	8 Mar. 2000
Belgium	24 Sep. 1996	29 Jun. 1999
Brazil	24 Sep. 1996	24 Jul. 1998
Bulgaria	24 Sep. 1996	29 Sep. 1999
Canada	24 Sep. 1996	18 Dec. 1998
Chile	24 Sep. 1996	12 Jul. 2000
China	24 Sep. 1996	
Colombia	24 Sep. 1996	
Democratic People's Republic of Korea		
Democratic Republic of the Congo	4 Oct. 1996	28 Sep. 2004
Egypt	14 Oct. 1996	
Finland	24 Sep. 1996	15 Jan. 1999
France	24 Sep. 1996	6 Apr. 1998
Germany	24 Sep. 1996	20 Aug. 1998
Hungary	25 Sep. 1996	13 Jul. 1999
India		
Indonesia	24 Sep. 1996	
Iran (Islamic Republic of)	24 Sep. 1996	
Israel	25 Sep. 1996	
Italy	24 Sep. 1996	1 Feb. 1999
Japan	24 Sep. 1996	8 Jul. 1997
Mexico	24 Sep. 1996	5 Oct. 1999
Netherlands	24 Sep. 1996	23 Mar. 1999
Norway	24 Sep. 1996	15 Jul. 1999
Pakistan		
Peru	25 Sep. 1996	12 Nov. 1997
Poland	24 Sep. 1996	25 May 1999
Republic of Korea	24 Sep. 1996	24 Sep. 1999
Romania	24 Sep. 1996	5 Oct. 1999
Russian Federation	24 Sep. 1996	30 Jun. 2000
Slovakia	30 Sep. 1996	3 Mar. 1998
South Africa	24 Sep. 1996	30 Mar. 1999
Spain	24 Sep. 1996	31 Jul. 1998
Sweden	24 Sep. 1996	2 Dec. 1998
Switzerland	24 Sep. 1996	1 Oct. 1999
Turkey	24 Sep. 1996	16 Feb. 2000
Ukraine	27 Sep. 1996	23 Feb. 2001
United Kingdom	24 Sep. 1996	6 Apr. 1998
United States of America	24 Sep. 1996	
Viet Nam	24 Sep. 1996	10 Mar. 2006

Status of Signature and Ratification of the Treaty
(31 December 2006)

States whose ratification is required for the Treaty to enter into force

States Signatories that have ratified

States Signatories yet to ratify

Non-signatory States

Status of Signature and Ratification of the Treaty (31 December 2006)

177 Signed

137 Ratified

18 Not signed

State	Date of Signature	Date of Ratification
Afghanistan	24 Sep. 2003	24 Sep. 2003
Albania	27 Sep. 1996	23 Apr. 2003
Algeria	15 Oct. 1996	11 Jul. 2003
Andorra	24 Sep. 1996	12 Jul. 2006
Angola	27 Sep. 1996	
Antigua and Barbuda	16 Apr. 1997	11 Jan. 2006
Argentina	24 Sep. 1996	4 Dec. 1998
Armenia	1 Oct. 1996	12 Jul. 2006
Australia	24 Sep. 1996	9 Jul. 1998
Austria	24 Sep. 1996	13 Mar. 1998
Azerbaijan	28 Jul. 1997	2 Feb. 1999
Bahamas	4 Feb. 2005	
Bahrain	24 Sep. 1996	12 Apr. 2004
Bangladesh	24 Oct. 1996	8 Mar. 2000
Barbados		
Belarus	24 Sep. 1996	13 Sep. 2000
Belgium	24 Sep. 1996	29 Jun. 1999
Belize	14 Nov. 2001	26 Mar. 2004
Benin	27 Sep. 1996	6 Mar. 2001
Bhutan		
Bolivia	24 Sep. 1996	4 Oct. 1999
Bosnia and Herzegovina	24 Sep. 1996	26 Oct. 2006
Botswana	16 Sep. 2002	28 Oct. 2002
Brazil	24 Sep. 1996	24 Jul. 1998
Brunei Darussalam	22 Jan. 1997	
Bulgaria	24 Sep. 1996	29 Sep. 1999
Burkina Faso	27 Sep. 1996	17 Apr. 2002
Burundi	24 Sep. 1996	
Cambodia	26 Sep. 1996	10 Nov. 2000
Cameroon	16 Nov. 2001	6 Feb. 2006
Canada	24 Sep. 1996	18 Dec. 1998
Cape Verde	1 Oct. 1996	1 Mar. 2006
Central African Republic	19 Dec. 2001	
Chad	8 Oct. 1996	
Chile	24 Sep. 1996	12 Jul. 2000
China	24 Sep. 1996	
Colombia	24 Sep. 1996	
Comoros	12 Dec. 1996	
Congo	11 Feb. 1997	
Cook Islands	5 Dec. 1997	6 Sep. 2005
Costa Rica	24 Sep. 1996	25 Sep. 2001
Côte d'Ivoire	25 Sep. 1996	11 Mar. 2003
Croatia	24 Sep. 1996	2 Mar. 2001
Cuba		
Cyprus	24 Sep. 1996	18 Jul. 2003
Czech Republic	12 Nov. 1996	11 Sep. 1997

State	Date of Signature	Date of Ratification
Democratic People's Republic of Korea		
Democratic Republic of the Congo	4 Oct. 1996	28 Sep. 2004
Denmark	24 Sep. 1996	21 Dec. 1998
Djibouti	21 Oct. 1996	15 Jul. 2005
Dominica		
Dominican Republic	3 Oct. 1996	
Ecuador	24 Sep. 1996	12 Nov. 2001
Egypt	14 Oct. 1996	
El Salvador	24 Sep. 1996	11 Sep. 1998
Equatorial Guinea	9 Oct. 1996	
Eritrea	11 Nov. 2003	11 Nov. 2003
Estonia	20 Nov. 1996	13 Aug. 1999
Ethiopia	25 Sep. 1996	8 Aug. 2006
Fiji	24 Sep. 1996	10 Oct. 1996
Finland	24 Sep. 1996	15 Jan. 1999
France	24 Sep. 1996	6 Apr. 1998
Gabon	7 Oct. 1996	20 Sep. 2000
Gambia	9 Apr. 2003	
Georgia	24 Sep. 1996	27 Sep. 2002
Germany	24 Sep. 1996	20 Aug. 1998
Ghana	3 Oct. 1996	
Greece	24 Sep. 1996	21 Apr. 1999
Grenada	10 Oct. 1996	19 Aug. 1998
Guatemala	20 Sep. 1999	
Guinea	3 Oct. 1996	
Guinea-Bissau	11 Apr. 1997	
Guyana	7 Sep. 2000	7 Mar. 2001
Haiti	24 Sep. 1996	1 Dec. 2005
Holy See	24 Sep. 1996	18 Jul. 2001
Honduras	25 Sep. 1996	30 Oct. 2003
Hungary	25 Sep. 1996	13 Jul. 1999
Iceland	24 Sep. 1996	26 Jun. 2000
India		
Indonesia	24 Sep. 1996	
Iran (Islamic Republic of)	24 Sep. 1996	
Iraq		
Ireland	24 Sep. 1996	15 Jul. 1999
Israel	25 Sep. 1996	
Italy	24 Sep. 1996	1 Feb. 1999
Jamaica	11 Nov. 1996	13 Nov. 2001
Japan	24 Sep. 1996	8 Jul. 1997
Jordan	26 Sep. 1996	25 Aug. 1998
Kazakhstan	30 Sep. 1996	14 May 2002
Kenya	14 Nov. 1996	30 Nov. 2000
Kiribati	7 Sep. 2000	7 Sep. 2000
Kuwait	24 Sep. 1996	6 May 2003
Kyrgyzstan	8 Oct. 1996	2 Oct. 2003
Lao People's Democratic Republic	30 Jul. 1997	5 Oct. 2000
Latvia	24 Sep. 1996	20 Nov. 2001
Lebanon	16 Sep. 2005	
Lesotho	30 Sep. 1996	14 Sep. 1999

State	Date of Signature	Date of Ratification
Liberia	1 Oct. 1996	
Libyan Arab Jamahiriya	13 Nov. 2001	6 Jan. 2004
Liechtenstein	27 Sep. 1996	21 Sep. 2004
Lithuania	7 Oct. 1996	7 Feb. 2000
Luxembourg	24 Sep. 1996	26 May 1999
Madagascar	9 Oct. 1996	15 Sep. 2005
Malawi	9 Oct. 1996	
Malaysia	23 Jul. 1998	
Maldives	1 Oct. 1997	7 Sep. 2000
Mali	18 Feb. 1997	4 Aug. 1999
Malta	24 Sep. 1996	23 Jul. 2001
Marshall Islands	24 Sep. 1996	
Mauritania	24 Sep. 1996	30 Apr. 2003
Mauritius		
Mexico	24 Sep. 1996	5 Oct. 1999
Micronesia (Federated States of)	24 Sep. 1996	25 Jul. 1997
Moldova	24 Sep. 1997	
Monaco	1 Oct. 1996	18 Dec. 1998
Mongolia	1 Oct. 1996	8 Aug. 1997
Montenegro	23 Oct. 2006	23 Oct. 2006
Morocco	24 Sep. 1996	17 Apr. 2000
Mozambique	26 Sep. 1996	
Myanmar	25 Nov. 1996	
Namibia	24 Sep. 1996	29 Jun. 2001
Nauru	8 Sep. 2000	12 Nov. 2001
Nepal	8 Oct. 1996	
Netherlands	24 Sep. 1996	23 Mar. 1999
New Zealand	27 Sep. 1996	19 Mar. 1999
Nicaragua	24 Sep. 1996	5 Dec. 2000
Niger	3 Oct. 1996	9 Sep. 2002
Nigeria	8 Sep. 2000	27 Sep. 2001
Niue		
Norway	24 Sep. 1996	15 Jul. 1999
Oman	23 Sep. 1999	13 Jun. 2003
Pakistan		
Palau	12 Aug. 2003	
Panama	24 Sep. 1996	23 Mar. 1999
Papua New Guinea	25 Sep. 1996	
Paraguay	25 Sep. 1996	4 Oct. 2001
Peru	25 Sep. 1996	12 Nov. 1997
Philippines	24 Sep. 1996	23 Feb. 2001
Poland	24 Sep. 1996	25 May 1999
Portugal	24 Sep. 1996	26 Jun. 2000
Qatar	24 Sep. 1996	3 Mar. 1997
Republic of Korea	24 Sep. 1996	24 Sep. 1999
Romania	24 Sep. 1996	5 Oct. 1999
Russian Federation	24 Sep. 1996	30 Jun. 2000
Rwanda	30 Nov. 2004	30 Nov. 2004
Saint Kitts and Nevis	23 Mar. 2004	27 Apr. 2005
Saint Lucia	4 Oct. 1996	5 Apr. 2001
Saint Vincent and the Grenadines		

State	Date of Signature	Date of Ratification
Samoa	9 Oct. 1996	27 Sep. 2002
San Marino	7 Oct. 1996	12 Mar. 2002
Sao Tome and Principe	26 Sep. 1996	
Saudi Arabia		
Senegal	26 Sep. 1996	9 Jun. 1999
Serbia	8 Jun. 2001	19 May 2004
Seychelles	24 Sep. 1996	13 Apr. 2004
Sierra Leone	8 Sep. 2000	17 Sep. 2001
Singapore	14 Jan. 1999	10 Nov. 2001
Slovakia	30 Sep. 1996	3 Mar. 1998
Slovenia	24 Sep. 1996	31 Aug. 1999
Solomon Islands	3 Oct. 1996	
Somalia		
South Africa	24 Sep. 1996	30 Mar. 1999
Spain	24 Sep. 1996	31 Jul. 1998
Sri Lanka	24 Oct. 1996	
Sudan	10 Jun. 2004	10 Jun. 2004
Suriname	14 Jan. 1997	7 Feb. 2006
Swaziland	24 Sep. 1996	
Sweden	24 Sep. 1996	2 Dec. 1998
Switzerland	24 Sep. 1996	1 Oct. 1999
Syrian Arab Republic		
Tajikistan	7 Oct. 1996	10 Jun. 1998
Thailand	12 Nov. 1996	
The former Yugoslav Republic of Macedonia	29 Oct. 1998	14 Mar. 2000
Timor-Leste		
Togo	2 Oct. 1996	2 Jul. 2004
Tonga		
Trinidad and Tobago		
Tunisia	16 Oct. 1996	23 Sep. 2004
Turkey	24 Sep. 1996	16 Feb. 2000
Turkmenistan	24 Sep. 1996	20 Feb. 1998
Tuvalu		
Uganda	7 Nov. 1996	14 Mar. 2001
Ukraine	27 Sep. 1996	23 Feb. 2001
United Arab Emirates	25 Sep. 1996	18 Sep. 2000
United Kingdom	24 Sep. 1996	6 Apr. 1998
United Republic of Tanzania	30 Sep. 2004	30 Sep. 2004
United States of America	24 Sep. 1996	
Uruguay	24 Sep. 1996	21 Sep. 2001
Uzbekistan	3 Oct. 1996	29 May 1997
Vanuatu	24 Sep. 1996	16 Sep. 2005
Venezuela (Bolivarian Republic of)	3 Oct. 1996	13 May 2002
Viet Nam	24 Sep. 1996	10 Mar. 2006
Yemen	30 Sep. 1996	
Zambia	3 Dec. 1996	23 Feb. 2006
Zimbabwe	13 Oct. 1999	

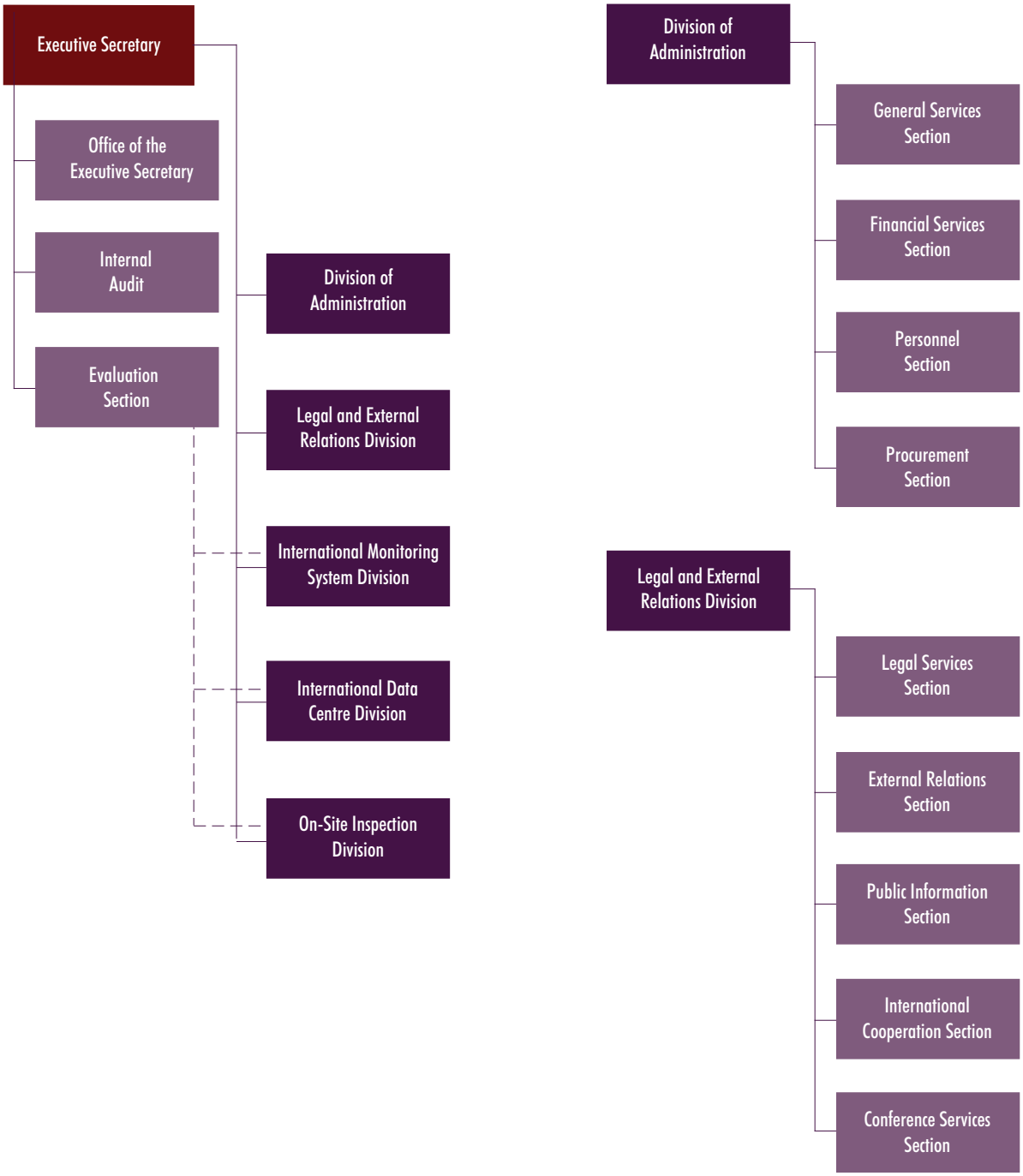
Facilities of the CTBT International Monitoring System

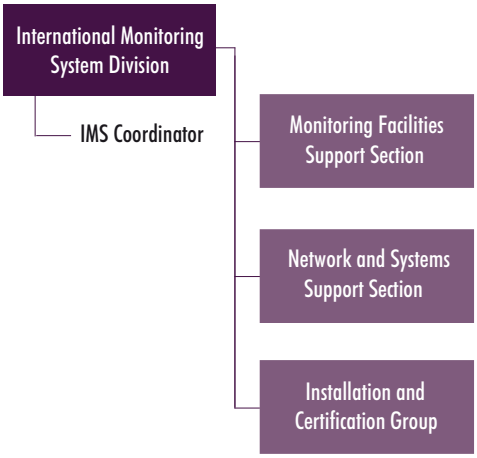
State	Primary Seismic Stations	Auxiliary Seismic Stations	Radionuclide Stations	Radionuclide Laboratories	Hydroacoustic Stations	Infrasound Stations	Total
Argentina	1	2	3	1		2	9
Armenia		1					1
Australia	4	3	7	1	1	5	21
Austria				1			1
Bangladesh		1					1
Bolivia	1	1				1	3
Botswana		1					1
Brazil	1	2	2	1		1	7
Cameroon			1				1
Canada	3	6	4	1	1	1	16
Cape Verde						1	1
Central African Republic	1					1	2
Chile		2	2		1	2	7
China	2	4	3	1		2	12
Colombia	1						1
Cook Islands		1	1				2
Costa Rica		1					1
Côte d'Ivoire	1					1	2
Czech Republic		1					1
Denmark		1				1	2
Djibouti		1				1	2
Ecuador			1			1	2
Egypt	1	1					2
Ethiopia		1	1				2
Fiji		1	1				2
Finland	1			1			2
France	1	2	6	1	2	5	17
Gabon		1					1
Germany	1		1			2	4
Germany and South Africa[a]		1					1
Greece		1					1
Guatemala		1					1
Iceland		1	1				2
To be determined	1	1	1			1	4
Indonesia		6					6
Iran (Islamic Republic of)	1	2	1			1	5
Israel		2		1			3
Italy		1		1			2
Japan	1	5	2	1		1	10
Jordan		1					1
Kazakhstan	1	3				1	5
Kenya	1					1	2
Kiribati			1				1
Kuwait			1				1
Kyrgyzstan		1					1
Libyan Arab Jamahiriya			1				1

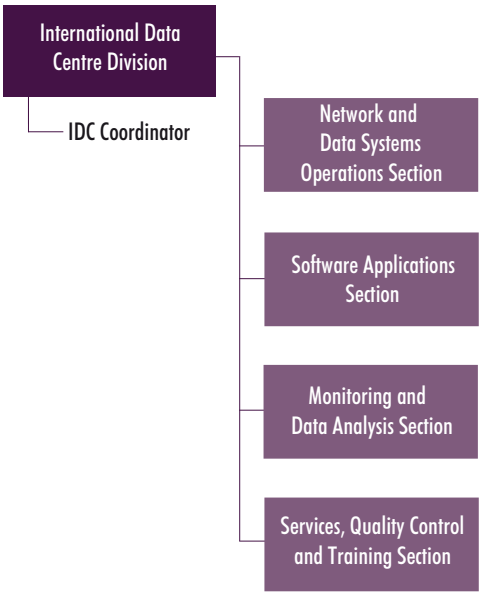
[a] Germany and South Africa are jointly responsible for an auxiliary seismic station in Antarctica.

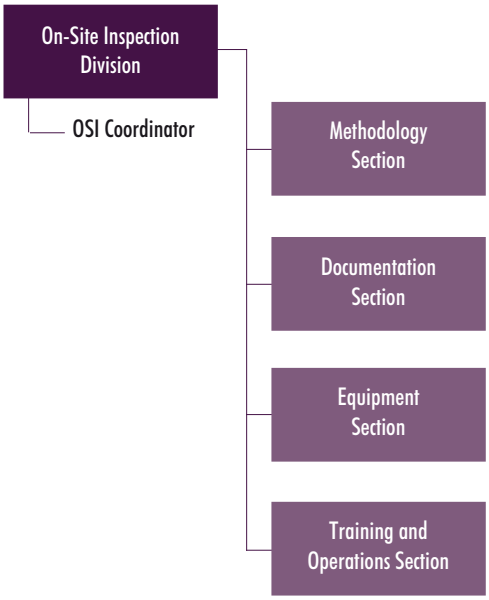
State	Primary Seismic Stations	Auxiliary Seismic Stations	Radionuclide Stations	Radionuclide Laboratories	Hydroacoustic Stations	Infrasound Stations	Total
Madagascar		1				1	2
Malaysia			1				1
Mali		1					1
Mauritania			1				1
Mexico		3	1		1		5
Mongolia	1		1			1	3
Morocco		1					1
Namibia		1				1	2
Nepal		1					1
New Zealand		3	2	1		1	7
Niger	1		1				2
Norway	2	2	1			1	6
Oman		1					1
Pakistan	1					1	2
Palau						1	1
Panama			1				1
Papua New Guinea		2	1			1	4
Paraguay	1					1	2
Peru		2					2
Philippines		2	1				3
Portugal			1		1	1	3
Republic of Korea	1						1
Romania		1					1
Russian Federation	6	13	8	1		4	32
Samoa		1					1
Saudi Arabia	1	1					2
Senegal		1					1
Solomon Islands		1					1
South Africa	1	1	1	1		1	5
Spain	1						1
Sri Lanka		1					1
Sweden		1	1				2
Switzerland		1					1
Thailand	1		1				2
Tunisia	1					1	2
Turkey	1						1
Turkmenistan	1						1
Uganda		1					1
Ukraine	1						1
United Kingdom		1	4	1	2	4	12
United Republic of Tanzania			1				1
United States of America	5	12	11	1	2	8	39
Venezuela (Bolivarian Republic of)		2					2
Zambia		1					1
Zimbabwe		1					1
Total	**50**	**120**	**80**	**16**	**11**	**60**	**337**

Organizational Structure of the Provisional Technical Secretariat (31 December 2006)




International Monitoring System Division
IMS Coordinator
Monitoring Facilities Support Section
Network and Systems Support Section
Installation and Certification Group


International Data Centre Division
IDC Coordinator
Network and Data Systems Operations Section
Software Applications Section
Monitoring and Data Analysis Section
Services, Quality Control and Training Section


On-Site Inspection Division
OSI Coordinator
Methodology Section
Documentation Section
Equipment Section
Training and Operations Section

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Throughout the document, countries are referred to by the names that were in official use in the period for which the text was compiled.

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