CTBTO PREPARATORY COMMISSION | preparatory commission for the comprehensive nuclear-test-ban treaty organization

CTBTO Spectrum

CTBTO NEWSLETTER ISSUE 6 | JULY 2005

Who we are

The Comprehensive Nuclear-Test-Ban Treaty bans all nuclear weapon test explosions. It opened for signature in New York on 24 September 1996 and enjoys worldwide support.

The CTBTO Preparatory Commission was established to carry out the necessary arrangements for the implementation of the Treaty and to prepare for the first session of the Conference of the State Parties to the Treaty after its entry into force. It consists of all States Signatories and the Provisional Technical Secretariat.

Inside this issue

Establishment of an effective tsunami early warning system

By Masahiro Yamamoto, Director, Earthquake and Tsunami Observations Division, Japan Meteorological Agency

On 26 December 2004, a tsunami, triggered by a large earthquake off the coast of Sumatra, Indonesia, killed more than three hundred thousand people in the coastal areas of the Indian Ocean region. The fast-moving water of the tsunami devastated everything in its path, including homes, hotel complexes, trees, boats and cars.

The Sumatra earthquake was registered within minutes at waveform monitoring stations of the International Monitoring System (IMS) throughout the world, and was included in the first automatic event list released by the International Data Centre (IDC) to subscribing States Signatories about two hours after the data were recorded. The Reviewed Event Bulletins, which contain the review results by IDC analysts and are normally issued within ten days, included for 26 and 27 December 1054 aftershocks (figure 1).

Tsunami is a Japanese word meaning 'harbour wave'. Tsunamis are usually small in deep waters, but become large and cause damage when they approach coasts or harbours. A characteristic of tsunamis is that their destructive impact can occur far away from the area of origin. Therefore, real-time seismic and sea level data monitored in the region are an essential component of a system that issues timely tsunami warnings. Although the networks of many institutions registered the

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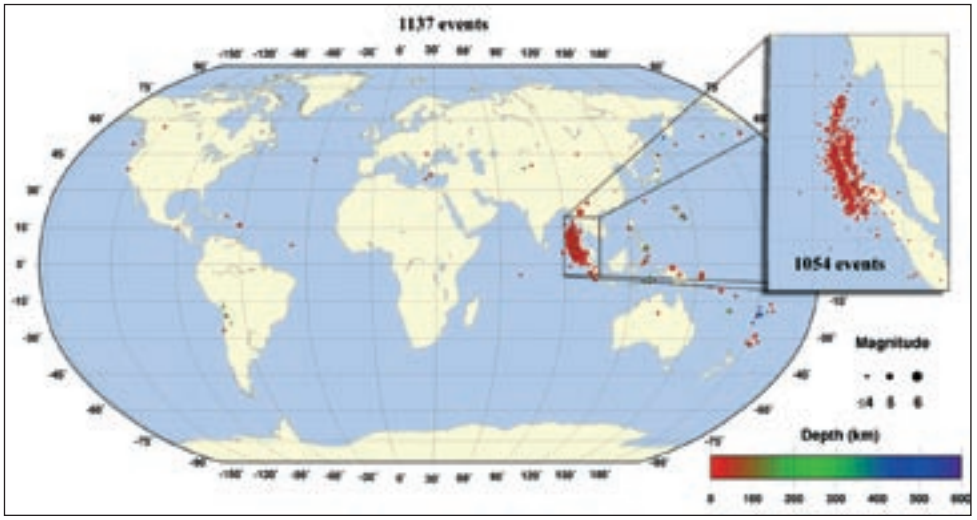


FIGURE 1:THE IDC REVIEWED EVENT BULLETINS OF 26 AND 27 DECEMBER 2004 INCLUDE 1137 EVENTS (MAIN MAP), OF WHICH 1054 EVENTS (INSET) WERE AFTERSHOCKS OF THE SUMATRA TSUNAMIGENIC EARTHQUAKE

Editorial

This is the last issue of the CTBTO Spectrum *that I am presenting to you. In July, I will hand over my present position as Executive Secretary of the CTBTO Preparatory Commission to Ambassador Tibor Tóth of Hungary, who will assume office on 1 August 2005.*

My connection with the Comprehensive Nuclear-Test-Ban Treaty (CTBT) dates back to the beginning of its negotiations at the Conference on Disarmament in Geneva in 1993. As the German Representative to the Conference, I chaired the Working Group on Verification. To conclude text negotiations on the Treaty in approximately three years was quite an achievement, even if the results were not to everybody's liking.

For a diplomat who is used to do a lot of paper work, it is quite extraordinary to be able to actually create an organization from scratch, from a blueprint that initially only existed on paper. I had this rare opportunity and realized it: On 17 March 1997, the Provisional Technical Secretariat (PTS) started to work at the Vienna International Centre with nine staff members from six different nationalities. We had our own offices, but the furniture was borrowed from UNIDO. In the meantime, the PTS has approximately 270 staff members from some 70 nations.

During these last eight years, we have worked in the technical and in the diplomatic field. In the technical field, we have been able to build around 65% of the International Monitoring System (IMS) network. Some of these stations were very difficult to build, due to technical, environmental and political reasons. We received help from the international scientific community, and wherever feasible, we provided the scientists with data. New scientific developments and improved communication technologies made it possible to receive high quality data from the IMS network in quantities not foreseeable during Treaty negotiations. Some of these data may also be used for potential civil and scientific applications. The most recent endeavour is to provide international organizations with IMS seismic data in order to help them build tsunami warning systems.

On the political side, the Treaty achieved nearly universal coverage, considering the number of signatures and the steadily growing number of ratifications, which confirms the growing commitment by a vast majority of States to stop nuclear test explosions as set out by the CTBT. Despite these positive developments, we are nowhere near entry into force because of the rather complicated entry into force clause of the Treaty.

The African region, which this issue of CTBTO Spectrum *focuses on as an overarching theme, is a particularly good example for the ever increasing numbers of signatures and ratifications: Of those States, who signed and ratified the Treaty in 2004, 75 and 66 percent respectively, were from the African region.*

With 53 Member States, Africa is by far the largest geographical region as defined by the Treaty and therefore an important player in global nuclear disarmament and non-proliferation. Nearly all African States have signed the Treaty, making up close to 30 percent of the Preparatory Commission's membership. The vision of African leaders to spare the continent the nuclear arms race is also expressed in the Treaty of Pelindaba, which will establish a Nuclear-Weapon-Free Zone once it enters into force.

Besides looking at the relations between Africa and the CTBT, this issue of CTBTO Spectrum *provides an overview of the Commission's work over the past six months, including an update on the latest session of the Preparatory Commission.*

On 26 December 2004, the whole world was in shock by the loss of lives and the devastation caused by the Indian Ocean tsunami. The cover article by Mr Masahiro Yamamoto provides the view of an earthquake prone country, Japan, on establishing an effective tsunami warning system with seismic data provided by the IMS.

Furthermore, an interview with Hon. Gérard Kamanda wa Kamanda, Minister of Scientific Research and Technology of the Democratic Republic of Congo, and two other African contributions by Ambassador Taous Feroukhi of Algeria, Chairperson of the Preparatory Commission, and Hon. Zabein Mhita, Deputy Minister of Science and Higher Education of Tanzania, reflect upon the role of the CTBT in Africa and provide new insights into the politics of nuclear non-proliferation and disarmament in Africa.

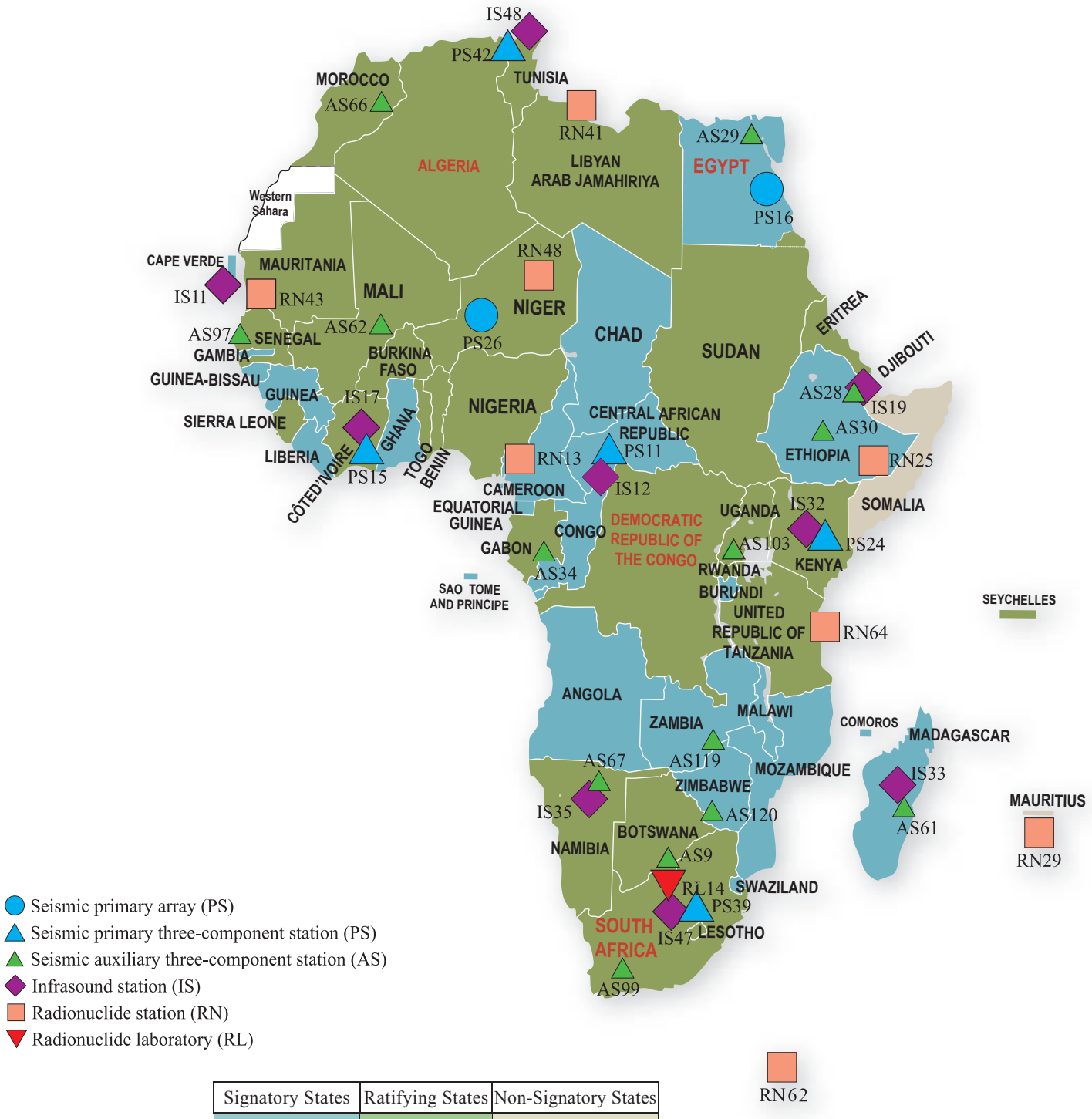
In concluding, I would like to express my appreciation to the PTS staff for creating a transparent and respected international organization. I find it very satisfactory to work with Member States, the United Nations and other international organizations for a common goal – to make this world a safer place.

I think the story of the Preparatory Commission and the PTS is a success story and I am proud to be part of it, but there is more to be done. I am confident that Ambassador Tibor Tóth will carry on the good work and will ultimately achieve entry into force of the CTBT.

Wolfgang Hoffmann
Executive Secretary
Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization

Africa

Status of signatures and ratifications
Annex 2 States
IMS facilities as defined in the Treaty



- Seismic primary array (PS)
- Seismic primary three-component station (PS)
- Seismic auxiliary three-component station (AS)
- Infrasound station (IS)
- Radionuclide station (RN)
- Radionuclide laboratory (RL)

	Signatory States	Ratifying States	Non-Signatory States
Total African States: 53	**51**	**28**	**2**
Annex 2 African States: 4	**4**	**3**	**0**

AS OF 15 JULY 2005

Africa and the Preparatory Commission for the CTBTO

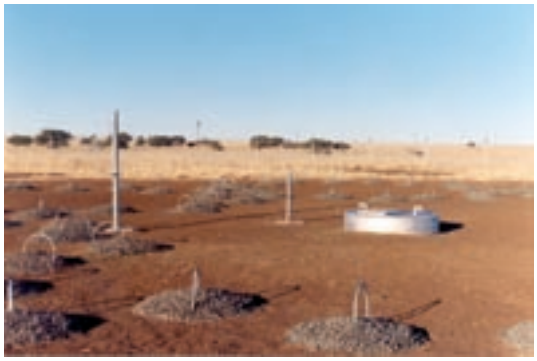
Despite the challenges facing the African continent, African States play a role in the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and the Preparatory Commission for the CTBTO that merits particular attention.

Since the CTBT opened for signature in 1996, nearly all African States have signalled their support for a universal prohibition of nuclear explosive tests by adhering to the Treaty. The number of African signatories and members of the Preparatory Commission has grown from 33 in 1996 to 51 today, and Africa now makes up close to 30 per cent of the membership of the Commission. That just two African States have yet to sign the CTBT and become members of the Commission is an encouraging indication of the extensive regional backing the Treaty enjoys. Indeed, of the international organizations whose mandate concerns the limitation of weapons of mass destruction, the Commission is now the organization with the greatest number of members among African States.

In Africa, the significance of the CTBT and the Preparatory Commission for the CTBTO lies in the opportunity they present to demonstrate the continued commitment of African States to international efforts to contain the proliferation of nuclear weapons and to maintain international peace and security. In fact, all African States have already subscribed to other international agreements prohibiting the possession of nuclear devices and restricting their testing, making the overwhelming support these States give to the preparatory arrangements for the CTBT all the more striking. These agreements include, amongst others, the Partial Test-Ban Treaty of 1963 and the Nuclear Non-Proliferation Treaty of 1968. In addition, once the African Nuclear-Weapons-Free Zone Treaty of 1996 enters into force, article 5 of that Treaty will complement the CTBT by comprehensively prohibiting "the testing of any nuclear explosive device".

NATIONAL SEMINAR ON THE CTBT IN ADDIS ABABA, ETHIOPIA, JUNE 2005

Of the six geographical regions foreseen in Article II, paragraph 28, of the CTBT, Africa is by far the largest. Annex 1 to the Treaty lists the 53 African States eligible for election to the ten seats allocated to Africa on the Executive Council of the future CTBTO. As a regional grouping, Africa already functions in the Preparatory Commission and regularly proposes candidates for elective office. The current Chairperson of the Commission is the Permanent Representative of Algeria, Ambassador Taous Feroukhi. Previously, the African region has nominated the Permanent Representatives of Algeria, Nigeria and South Africa to the same position.



ARRAY ELEMENT H1 OF IS47, BOSHOF, SOUTH AFRICA, READY FOR EQUIPMENT INSTALLATION

STATION OPERATOR WORKING ON WELLHEAD ELECTRONICS AT SEISMIC BOREHOLE, PS15, DIMBOKRO, COTE D'IVOIRE

2005 Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty

In total, 24 African States host 38 monitoring facilities under the CTBT, including seven primary seismic stations, 15 auxiliary seismic stations, seven radionuclide stations, nine infrasound stations and one radionuclide laboratory. These facilities are located not only on continental Africa, but on several island states and territories, including Cape Verde, Madagascar and Marion Island. Most African host States have entered into some form of legal arrangement with the Commission to govern the Organization's activities on their territories. Formal International Monitoring System Facility Agreements have been concluded with six African States, of which five have entered into force and one is being applied provisionally pending its entry into force.

The task of the Preparatory Commission in fostering international cooperation is one of particular importance for African States, especially where the activities concerned promote technical capacity, provide relevant training and lead to the useful exchange of information and experience in Treaty-related matters. The Commission has sponsored several regional and sub-regional workshops in Africa, namely in Cairo (1999), Dakar (2001), Nairobi (2002), Kampala (2003), Tunis (2004) and Pretoria (2004). In 2005, three national seminars have taken place in Africa, with the aim to raise awareness on the CTBT and to promote the Commission's work. In June 2005, the most recent one was held in Addis Ababa, Ethiopia, attended by high-level officers of the Ethiopian Government and the House of Representatives and representatives of the Provisional Technical Secretariat.

Africa will no doubt remain a focus of future international cooperation activities, providing a small gesture of reciprocation for the continent's abiding support for the nuclear test ban. ■

At the request of a majority of States which have ratified the Comprehensive Nuclear-Test-Ban Treaty (CTBT), a Conference on Facilitating the Entry into Force of the CTBT will be held in New York from 21 to 23 September 2005.

In its Article XIV, the Treaty provides for the holding of such a conference if it has not entered into force three years after its opening for signature on 24 September 1996, and at subsequent anniversaries until its entry into force. Since the 2003 Conference, Member States and the Provisional Technical Secretariat have continued to promote the entry into force of the Treaty. Nevertheless, more work needs to be done.

The requesting States believe that the timing of the Conference during the general debate of the General Assembly will help ensure high-level attendance and maximize the impact of the Conference.

The Conference will be opened by the United Nations Secretary-General. Hon. Alexander Downer, Minister of Foreign Affairs, Australia, is the President-Designate. The preparations in Vienna are led by Ambassador Deborah Stokes, Permanent Representative of Australia to the CTBTO Preparatory Commission. ■

"For 35 years, the Nuclear Nonproliferation Treaty, or NPT, has been a cornerstone of our global security. With near universal membership, the treaty has firmly entrenched a norm against nuclear proliferation and helped confound predictions that today there would be 25 or more countries with nuclear weapons…Let me be clear: Failure of a review conference to come to any agreement will not break the NPT-based regime. The vast majority of countries that are parties to the treaty recognize its enduring benefits…

When multilateral forums falter, leaders must lead. This September, more than 170 heads of state and government will convene in New York to adopt a wide-ranging agenda to advance development, security and human rights for all countries and all peoples. I challenge them to break the deadlock on the most pressing challenges in the field of nuclear nonproliferation and disarmament…

Leaders must also move beyond rhetoric in addressing the question of disarmament. Prompt negotiation of a fissile material cutoff treaty for all countries is indispensable. All countries also should affirm their commitment to a moratorium on testing, and to early entry into force of the Comprehensive Nuclear-Test-Ban Treaty. And I hope leaders will think seriously about what more can be done to reduce - irreversibly - the number and role of nuclear weapons in the world."

KOFI A. ANNAN, SECRETARY-GENERAL OF THE UNITED NATIONS, INTERNATIONAL HERALD TRIBUNE, 30 MAY 2005

Commission update

Report on the June 2005 session

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) held its Twenty-Fourth Session from 27 to 28 June 2005 in Vienna under the chairmanship of Ambassador Taous Feroukhi of Algeria. 82 Member States participated in the session. The League of Arab States attended as an observer.

The report of the Executive Secretary

Mr Wolfgang Hoffmann, Executive Secretary of the CTBTO Preparatory Commission, reported on the progress of the establishment of the International Monitoring System (IMS) and on administrative, legal and coordination matters. He informed the delegates that 131 out of the 337 IMS facilities have now been certified, an increase of 33 facilities since the last issue of CTBTO Spectrum. Moreover, legal arrangements between Member States and the Commission are now in place for 326 IMS monitoring facilities in 83 host States.

Mr Hoffmann reported on the further refinement of operation and maintenance (O&M) which has resulted in improved processes and procedures of the Operations Centre. This new cross-Divisional entity started its operations at the beginning of April, comprising staff members from the IMS and the International Data Centre (IDC) Divisions, and has proven successful during the first system wide performance test (SPT1).

Mr Hoffmann informed Member States that pursuant to the decision made on 4 March 2005 by the special session of the Preparatory Commission on the possible use of verification data in support of tsunami warning systems, the Provisional Technical Secretariat is currently forwarding data of selected seismic stations for test purposes to the Northwest Pacific Tsunami Advisory Centre in Japan, following their request (see cover article page 1 and 17).

The Executive Secretary also reported that as of 16 June 2005 the collection rates of assessed contributions for 2005 amounted to 79 % of the US$ portion and 73,6% of the € portion, and had reached 95,2% for 2004. The Provisional Technical Secretariat (PTS) will continue to monitor exchange rate developments closely.

The plenary debate

Discussions of the plenary debate focused on modalities for the appointment of chairpersons of the subsidiary bodies of the Commission and on the 2006 draft Programme and Budget proposals. With regard to the selection criteria of the chairpersons of the subsidiary bodies, wide support was expressed for terms of appointment of two to three years for Chairpersons of Working Group A and B. According to other views, the elaboration of detailed qualification criteria of Chairpersons should be avoided. Some delegations mentioned that the subsidiary bodies had functioned well and that restructuring was not necessary at this stage.

Delegations welcomed the final report on the review of the organizational structure of the PTS and expressed their appreciation to the review team. Views were conveyed that the recommendations on structural reform should be considered together with the reorganization of the work of the subsidiary bodies and that the PTS should include allocations for the participation of such experts in WGB in the budget proposals for 2006.

Several Member States expressed their appreciation for PTS training courses and international cooperation activities since they were enabling them to take greater advantage of the IMS data and the products and services of the IDC, and, in addition, develop human resources.

Member States welcomed the signing of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) by the Bahamas, the signature and ratification by Rwanda and the ratification by Saint Kitts and Nevis since the last session of the Commission. Strong views were expressed that all Member States should contribute to the efforts of the upcoming Conference on Facilitating the Entry into Force of the CTBT in September 2005.

Regarding the 2005 Programme and Budget proposals, several delegations underlined that the zero real growth principle should be followed and that the increases for the On-Site Inspection programme and for the security enhancements should be absorbed through re-allocation of existing resources. The view was also expressed that the budget should be programme driven and that the current proposals constituted a good basis for agreement at the next session of the Commission.

Conclusions

There was an agreement to convene a joint meeting of Working Groups A and B to discuss the recommendations of the final report of the review team in more detail.

Various views were expressed regarding the current budget proposals which will be taken into account by the PTS in preparing its final draft.

The Commission expressed its deep appreciation for Mr Hoffmann's work as the first Executive Secretary of the Commission and his significant contributions to nuclear non-proliferation and disarmament since the beginning of the CTBT negotiations. ■

Outreach activities

The Provisional Technical Secretariat (PTS) conducts a variety of activities focusing on enhancing the Treaty understanding of decision-makers and the general public. It generates political support, encourages international cooperation and builds national technical capacities through training.

External relations

The Mexican Government invited the Preparatory Commission for the CTBTO to participate in an international conference on Nuclear-Weapon-Free Zones (NWFZs) from 26-28 April 2005. The conference was held in Mexico City at the Tlatelolco Plaza, where the first NWFZ treaty covering Latin America and the Caribbean was concluded in 1967. Diplomats from 89 nations attended the conference. The CTBTO Preparatory Commission was represented by the Chairperson of the Commission, Ambassador Taous Feroukhi of Algeria.

The four NWFZs established by the treaties of Tlatelolco, Rarotonga, Bangkok and Pelindaba cover the entire southern hemisphere. According to the conference declaration, the development of the NWFZs strengthens "world and regional peace and security, reinforces the nuclear non-proliferation regime, and contributes to the achievement of nuclear disarmament". The conference participants called for the total elimination of all nuclear tests, stressing the significance of achieving universal adherence to the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

The Provisional Technical Secretariat organized on the margins of the conference a seminar to increase awareness of the CTBT, which was well attended by delegations and NGO representatives. ■

International cooperation

In 2005, several Member States have offered voluntary contribution funds in support of the Preparatory Commission's international cooperation and outreach activities.

The Kingdom of the Netherlands provided funds for national seminars on the Comprehensive Nuclear-Test-Ban Treaty (CTBT) which were intended to be used for the promotion of the Commission's work and to facilitate entry into force of the Treaty. So far, eight national seminars in Africa, the Caribbean and the Pacific have been held (Cameroon, Cape Verde, Ethiopia, Papua New Guinea, the Marshall Islands, the Solomon Islands, Guatemala and Antigua and Barbuda). All national seminars were well attended, with the discussions focusing on the political significance of the CTBT; potential benefits for Signatories States arising from joining the Treaty; obligations of States Signatories; legal information pertaining to national Treaty implementation and the potential civil and scientific application of CTBT verification technologies.

The Czech Republic provided funds for two information visit programmes: Five participants from five countries (Serbia and Montenegro, Former Yugoslav Republic of Macedonia, Kyrgyzstan, Tajikistan, Uzbekistan) increased their awareness of the technical aspects of the CTBT verification regime and of the Commission's work. ■

NATIONAL SEMINAR ON THE CTBT IN HONIARA, SOLOMON ISLANDS, MAY 2005

Training

The training activities organized by the Provisional Technical Secretariat (PTS) are, *inter alia*, designed to introduce Member States to the technical aspects of the CTBT verification regime.

Forty-seven station operators and National Data Centres (NDC) managers from 37 Member States participated in a joint IMS/IDC introductory training course, which was held from 18-22 April 2005 in Vienna, Austria.

JOINT IMS/IDC INTRODUCTORY TRAINING COURSE, VIENNA, AUSTRIA, APRIL 2005

When organizing training events, the PTS always tries to optimize time and resource allocation. Utilizing the presence of the station operators and NDC managers in Vienna, the PTS organized, in the week following the joint introductory training course, a special technical training programm for ten station operators from seven Member States (Argentina, China, Libya, Panama, Philippines, Tanzania and United Kingdom) in Seibersdorf, Austria.

In parallel, another group of participants of the joint introductory training course, consisting of eight NDC managers from seven Member States (Burkina Faso, Kenya, Sri Lanka, Tunisia, Uganda, Zambia and Zimbabwe), attended a hands-on training course in Helsinki, Finland, which was organized by the Finnish NDC as one of the voluntary contributions of the Finnish Government in support of the work of the Commission. ■

In the spotlight

Gérard Kamanda wa Kamanda, Minister of Scientific Research and Technology, Democratic Republic of the Congo (DRC)

Q: *The Treaty of Pelindaba establishing the African Nuclear-Weapon-Free Zone (NWFZ) has been signed by almost all African nations, which makes it in numerical terms the largest in the world. The members of the African NWFZ are therefore potentially important players in strengthening the global nuclear non-proliferation regime.*

How does the African NWFZ contribute to global nuclear arms control and disarmament?

A: The African countries and their leaders consider nuclear-weapon-free zones one of the most effective means to prevent horizontal and vertical proliferation of nuclear weapons. The final objective is to create a world entirely free of nuclear weapons.

Thus, the establishment of an African nuclear-weapon-free zone contributes to this goal of nuclear non-proliferation. It encourages co-operation in the field of peaceful uses of nuclear energy and promotes general and complete disarmament as an ultimate goal.

The majority of African countries signed the Treaty on the Non-proliferation of Nuclear Weapons (NPT). Fifty-one African States signed the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and 27 have ratified it as of 12 July 2005. The Treaty of Pelindaba was signed by 52 and ratified by 20 countries. The DRC Parliament ratified the Treaty of Pelindaba on 31 May 2005 and the President published the relevant law on 7 June 2005. This will bring the number of ratifications of the Treaty of Pelindaba to 21, once DRC has deposited its instruments of ratification with the Commission of the African Union (AU).

Q: *The vision of the African leaders to spare Africa the nuclear arms race was expressed as early as 1964 at the first Organization of African Unity (OAU) summit meeting. It took three decades to transform the vision into reality.*

How is South Africa's decision to dismantle its nuclear weapons programme connected to the establishment of the African NWFZ?

> "I think the case of South Africa which dismantled its nuclear capacity should encourage the other nuclear powers to end all nuclear explosive tests for all time."

A: Subsequent to the Declaration of Cairo in July 1964, the OAU planned to sign an international agreement, under the supervision of the United Nations, banning the manufacture, the acquisition and the control of nuclear weapons in Africa.

The political commitment by the African leaders to implement the Cairo Declaration is also expressed in the 1986 Declaration of the OAU on Safety, Disarmament and Development. Over time, I think, it led to the unilateral decision made by South Africa in 1990 to dismantle its nuclear weapons manufacturing capacity and to access the NPT. By doing so, South Africa showed solidarity with other non-nuclear African NPT States. To honour this important decision by South Africa, the African leaders named the treaty establishing the African NWFZ the Pelindaba Treaty, after the site of South Africa's former nuclear weapons complex.

Q: *Although the Treaty of Pelindaba is still awaiting entry into force (having achieved 20 of the 28 necessary ratifications), it is nonetheless a landmark agreement.*

What efforts could be envisaged to speed up the ratification of the treaty?

A: Two possible avenues for initiatives are at hand: The first relates to the African members of the International Atomic Energy Agency (IAEA) and the African Regional Co-operation Agreement for Research, Training and Development related to Nuclear Science and Technology (AFRA). After DRC had ratified the CTBT, it became particularly active in encouraging other AFRA members, who have not yet ratified the Pelindaba Treaty, to do so as soon as possible.

The second initiative should emanate from the African Union, since the Chairperson of the AU Commission is the depositary of the treaty.

Q: *The Treaty of Pelindaba goes beyond earlier NWFZ models in a number of ways. Among others it includes measures which will result in preventing illicit trading of nuclear materials. This is of particular importance given current concerns about the global threat of nuclear terrorism.*

Could you explain the scope of the Pelindaba Treaty once it enters into force?

A: The ultimate objective of the Pelindaba Treaty is to strengthen international peace, to further regional security in Africa and to reinforce the NPT regime.

The treaty will require African States to conclude comprehensive IAEA Safeguard Agreements. This provision is intended to reduce the possibility that nuclear material could be diverted or stolen from African facilities by terrorists. Equally important in the light of increased concerns about terrorism is that the Pelindaba Treaty requires African States to upgrade the physical protection of nuclear materials, facilities, and equipment to meet the standards of the IAEA, as outlined in the Convention on the Physical Protection of Nuclear Materials.

The treaty further foresees the establishment of the African Commission on Nuclear Energy in order to promote the peaceful applications of nuclear technology; measures contained in the Convention of Bamako, which prohibits the import and the cross-boundary movement of dangerous waste in Africa, including radioactive waste; and to strengthen regional cooperation in the context of the AFRA Agreement.

Q: *In numerical terms, Africa is the largest of the six Treaty-defined regions of the Preparatory Commission for the CTBTO.*

How do African States view the global norm against nuclear weapon test explosions as set out by the CTBT?

A: I think the case of South Africa which dismantled its nuclear capacity should encourage the other nuclear powers to end all nuclear explosive tests for all time. The international norm against nuclear weapon test explosions will consolidate the regime established by the NPT and thus contribute to the fulfilment of the ultimate objective of nuclear disarmament and guarantee peace and collective security.

The CTBT and the Treaty of Pelindaba contribute to this end. The Executive Secretary of the CTBTO Preparatory Commission and the Chairperson of the African Union should intensify their co-operation on this subject.

Q: *The Democratic Republic of the Congo is one of the 44 States listed in Annex 2 to the CTBT, whose ratification is required for its entry into force. DRC ratified the CTBT on 28 September 2004 as the 24th African nation and the third African Annex 2 State.*

What was the political process leading to this important decision in DRC?

A: DRC was the first uranium producing country in the world and the first one in Africa with a nuclear reactor. It provided uranium for the Manhattan Project, which made it possible for the United States of America to produce weapons of mass destruction, namely, the first two atomic bombs dropped on Hiroshima and Nagasaki in Japan during the Second World War.

The Democratic Republic of the Congo signed the CTBT on 4 October 1996 and pledged on several occasions to ratify it, without prejudging the decision by the National Assembly and before the Government was fully installed. Meetings were held between representatives of DRC and the Provisional Technical Secretariat (PTS) in New York in November 2001, in Kinshasa in February 2002 and in April 2003, as well as in Vienna during the General Conference of IAEA in September 2003. During the Vienna meeting, I promised in my capacity as Minister of Scientific Research and Technology to the Chief of External Relations of the PTS to submit the draft law concerning the CTBT ratification to the National Assembly.

Over the years the commitment of DRC to fight against nuclear proliferation has been underlined in numerous ways. These include its adherence to the NPT in August 1970 and to the IAEA Safeguards Agreements in November 1972, its adoption of a law on the protection against the dangers of ionizing radiation and on the physical protection of nuclear materials and installations, its signature of the Additional Protocol to the IAEA Safeguards Agreements in April 2003 and adherence to the Convention on the Physical Protection of Nuclear Materials during the 48th Session of the General Conference of IAEA in September 2004.

The above list is the best proof that DRC is committed to reinforcing the nuclear non-proliferation regime and to ensuring nuclear safety. ■

Biographical note

The Hon.Gérard Kamanda wa Kamanda is Minister of Scientific Research and Technology of the Democratic Republic of the Congo (DRC). He studied philosophy and law at the University of Lovanium, Léopoldville, DRC, and holds an honorary Ph.D. from the State University of Haïti. He also participated in a Public Law and Public Administration training programme at the John Hopkins University, United States.

Mr Kamanda has held numerous positions in his diplomatic and political career, including, inter alia*, Vice Secretary-General of the Organization of African Unity (1972-78), Permanent Representative of DRC to the United Nations in Geneva (1978) and in New York (1979-1983), President of the UN Security Council (1981), Minister of Foreign Affairs and International Cooperation (1983-85) and (1996-97), Minister of Justice (1985-87) and (1994-95) and Vice Prime Minister. He took up his present position in 2003.* ■

Perspectives

A view from Algiers

By Ambassador Taous Feroukhi of Algeria, Chairperson of the CTBTO Preparatory Commission

CTBTO Spectrum *has invited two African Member States to give their perspective on the Comprehensive Nuclear-Test-Ban Treaty (CTBT). These contributions reflect upon the role of the CTBT and on the processes and considerations that led the respective States to ratify the Treaty. At the same time, they provide the readers with their view on the role of the CTBT in regional and global nuclear non-proliferation and disarmament, particularly drawing attention to the build-up of the International Monitoring System of the verification regime in the African region, the benefits arising from joining the Treaty, and the potential civil and scientific applications of CTBT verification data in African countries.*

Algeria's foreign policy is founded on the principles governing international relations which are based on the promotion of peace and security, good neighbourly relations, social progress and respect of obligations emerging from the treaties and other international legal instruments it has adhered to.

Algeria considers the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which bans any nuclear weapon test explosion or any other nuclear explosion in any environment, as an instrument that significantly contributes to disarmament and nuclear non-proliferation. From this point of view, the build up of the verification regime as stipulated in the Treaty contributes to reinforcing the multilateral regime established by the Non-Proliferation Treaty (NPT), which is based on the link between security and development.

In fact, the implementation of the commitments agreed upon among all States Parties to the NPT is essential for freeing the world from nuclear weapons, preventing the acquisition of nuclear weapons by more States and promoting the peaceful use of nuclear energy, in order to accelerate socio-economic development.

In this regard, despite far-reaching measures aimed at reinforcing the international instruments of the multilateral nuclear non-proliferation regime, progress on nuclear disarmament remains limited. The complexity of this issue should not discourage us from continuing our efforts to reach the objective of freeing the world from nuclear weapons and working towards furthering economic and social progress through the use of nuclear technology.

Algeria, one of the States listed in Annex 2 of the CTBT, ratified the Treaty on 11 July 2003. This decision has been welcomed by all participants of the third Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty held in Vienna in September 2003 as an impetus to international efforts aimed at accelerating the early entry into force of the Treaty.

Algeria, which has always supported the objectives of the CTBT, encourages all States that have yet to do so, to adhere to the Treaty at the earliest date possible and to contribute to facilitating the establishment of a just and more balanced collective security system. ■

Biographical note

Ambassador Taous Feroukhi, Permanent Representative of Algeria to the United Nations and other International Organizations in Vienna, is serving as Chairperson of the Preparatory Commission for 2005. Ambassador Feroukhi studied literature and political science at the University of Algiers, Algeria, and at the University of Madrid, Spain. She joined the diplomatic service in 1976 and served from 1979-1981 as Secretary for Cultural and Educational Cooperation in Ottawa, Canada, and from 1981-1986 as First Secretary of the Embassy of Algeria in Madrid, Spain, and further as First Counselor and Deputy Ambassador at the Permanent Mission of Algeria to the United Nations in Geneva between 1990 and 1994.

In the Foreign Ministry in Algiers, Ms Feroukhi was responsible for Southern European countries (1986-1990). In 1994, she was appointed Deputy Director for the Programmes and Specialized Agencies of the United Nations, followed by the position of Counselor to the Secretary of State for Co-operation and Maghrebian Affairs until 1999.

Prior to her current appointment, which she took up in November 2001, she served in the Cabinet of the President of the Republic of Algeria. ■

A view from Dar-es-Salaam

By Hon. Zabein Mhita, Deputy Minister for Science, Technology and Higher Education of the United Republic of Tanzania

The signing and ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) by my Government marks a milestone in regional and international peace and security as well as in civil and scientific applications of the information provided by the International Monitoring System (IMS) on events that happen globally. The Treaty represents an important step of mankind towards creating a nuclear-free world and facilitates regional nuclear disarmament and the prevention of nuclear proliferation in the Africa region. Since 1996, the CTBTO Preparatory Commission has played an important regulatory role in the fight against the spread of nuclear weapons and the threats posed by their proliferation.

In recognition of the important role that the CTBTO plays in relation to global security, Tanzania took several steps to enable the ratification of the Comprehensive Nuclear-Test- Ban Treaty, all of them were very participatory. They included the preparation of a Cabinet paper, the holding of consultative meetings with stakeholders, the presentation of the Cabinet paper to various organs of the Government and finally to the Tanzanian Parliament for endorsement. Thereafter, instruments of ratification were prepared and signed by the President of Tanzania and subsequently deposited with the Secretary-General of the United Nations in 2004.

My Government welcomes and supports the Preparatory Commission's initiatives on the establishment of IMS facilities on the African continent. Once the build-up of the IMS verification regime is completed, IMS monitoring facilities will be located in 24 African countries. My Government recognizes with appreciation that these state-of-the art technologies, which will be owned and operated by the host countries, will have potential civil and scientific applications in African States, including Tanzania. These applications comprise, *inter alia*, critical information on nuclear accidents, earthquake forecasts, information on radioactivity levels and weather forecasting.

On behalf of the Government of Tanzania, I urge all other African States that are yet to sign and ratify the CTBT to expedite the process because global peace and security is a concern of all countries. I commend the Provisional Technical Secretariat (PTS) of the CTBTO for its technical and financial support rendered to my country, especially on the establishment of the radionuclide monitoring station RN64 in Dar-es-Salaam that will be operational soon. Similarly, the PTS has supported human resources capacity building programmes in various aspects. Two technical staff members of the Tanzania Atomic Energy Commission have been trained to operate the radionuclide monitoring station in Dar-es-Salaam. Lastly, the information study visit to the CTBTO in Vienna in the year 2004 was organized and financed by the PTS. The information visit, in which I participated, broadened the participants' knowledge on the CTBTO and deepened their understanding of the programmes implemented in other countries, programmes which are designed to make the world a more peaceful place to live. ■

> "On behalf of the Government of Tanzania, I urge all other African States that are yet to sign and ratify the CTBT to expedite the process because global peace and security is a concern of all countries."

Biographical note

Honorable Zabein Muhaji Mhita has held several positions in the educational field in Tanzania, including Tutor of the Dar-es-Salaam Teachers College, and Regional Academic Officer of the Dar-es-Salaam region. She holds an honorary degree in education.

In 1991, she was appointed Director for primary education in the Ministry of Education and Culture. Since 2000, Ms Mhita serves as a Member of Parliament and as Deputy Minister for Science, Technology and Higher Education. In this capacity she has attended a number of national, regional and international forums on science and technology. At present, she is the only female member of the Tanzanian Government. ■

Verification highlights

Extreme heat and friendly people: Experiences in establishing IMS stations in Africa

The main activity of the CTBTO Preparatory Commission is the establishment of a global verification regime, which is capable of detecting nuclear explosions underground, underwater and in the atmosphere. As defined in the Treaty, this regime consists of an International Monitoring System supported by an International Data Centre, consultation and clarification mechanisms, on-site inspections and confidence-building measures, all of which must be operational at the Treaty's entry into force.

A TYPICAL FULANI VILLAGE CLOSE TO PS26, TORODI, NIGER

Global IMS station status

The International Monitoring System (IMS) consists of 321 stations employing four different technologies (seismic, hydroacoustic, infrasound and radionuclide), located in 89 countries.

Currently, 205 of these stations are installed and are either certified as part of the IMS or substantially meet specifications. Of these 205 installed stations, approximately 170 are sending data to the International Data Centre in Vienna. An additional 70 stations are either already under construction or under contract negotiation, while another 84 stations and four radionuclide laboratories have contracts for operations and maintenance.

Even as the IMS network reaches completion, much work remains to be done. The Provisional Technical Secretariat (PTS) is moving from a development stage to a mature operational and maintenance stage. By the end of 2007, the PTS expects that over 90 per cent of the IMS network will be completed and sending data to Vienna. ■

Africa is the world's second largest continent. It has a diverse mixture of climatic zones with different ecologies stretching from the Mediterranean Sea in the North to the Cape of Good Hope in the South, from the Red Sea and the Indian Ocean in the East to the Atlantic Ocean in the West. The 38 International Monitoring System (IMS) facilities on the vast continent contribute to the global monitoring of Treaty compliance. The African region with its 53 States and an estimated population of 700 million is a major player in contributing to ensuring the entry into force and the universality of the Comprehensive Nuclear-Test-Ban Treaty.

Due to the extreme weather conditions and the remoteness of some of the IMS stations, site survey and installation works can be a challenging experience for the Provisional Technical Secretariat (PTS) staff. In April 2005, three PTS staff members and 15 contractors and sub-contractors returned from a three weeks mission in Torodi, Niger, where they completed the installation works for primary seismic station PS26, located 55 kilometres southwest from Niamey in the midst of Fulani farm land.

The Fulani are a semi-nomadic people engaging primarily in live stock breeding of cattle, sheep, goats and camels. Initially full-scale nomads, the Fulani in Niger have to rely increasingly

DRILLING OF BOREHOLES AT PS26, TORODI, NIGER, APRIL 2005

PS26 ARRAY ELEMENT ON THE LEFT WITH FULANI HUTS NEARBY

on farming for their livelihood due to the depletion of their herds by desertification. Some of them live in temporary settlements consisting of portable huts made of mud and grass, which they sometimes built as close as 50 metres to the IMS station.

A TEMPERATURE OF NEARLY 50° C WAS REACHED DURING INSTALLATION OF PS26 IN APRIL 2005

The PTS staff enjoyed the friendly interaction with the local population since their first site survey visit in 2001. The work of the PTS team was regularly accompanied by the hammering sound of the Fulani women pounding millet in wooden buckets. Children always gathered on top of the nearby hill to watch the progress of the installation work, waiting eagerly for the distribution of empty water bottles by the PTS staff at the end of the day. With more than 45° Celsius in the shade, the water consumption of the PTS team reached ten litres a day per person.

The 16-element array station at Torodi consists of three concentric rings with a diameter of six kilometres. The sensors are located in 50 metres-deep boreholes, sending their data by radio to a collecting point, from where the data are transmitted via satellite to the National Data Centre at the Institut des Radio-Isotopes in Niamey and further to the International Data Centre (IDC) in Vienna. At present, PS26 is the only seismic array station in Africa; plans for the site preparation of another array station at Luxor, Egypt, are proceeding.

Despite the extreme heat and other adverse conditions, such as collapsing bore holes due to layers of granite and mud, the installation team successfully completed the installation works for PS26 in the foreseen time frame. The station is already transmitting test data in near-real time to Vienna. Once the data is incorporated into the IDC data processing, it will result in a vast improvement of the seismic detection capability globally and in the southern hemisphere.

This mission shows that the PTS staff members sometimes have to deal with unexpected challenges when establishing IMS stations in Africa. However, the friendliness of the local population and their willingness to cooperate with the PTS installation teams have contributed significantly to the steady build-up of the IMS network on the African continent. ■

FULANI WOMAN WITH CHILDREN NEXT TO A PTS FIELD VEHICLE, TORODI, NIGER

Verification highlights

Elaborating the Draft On-Site Inspection Operational Manual

The Operational Manual for On-Site Inspections (OSI) is a Treaty-required document to guide the operation of on-site inspections, which form a component of the CTBT verification regime. Upon entry into force of the Treaty, it will require approval by the initial session of the Conference of the States Parties. Thereafter, the manual will be maintained and updated by the Technical Secretariat (TS), with any further changes to be approved by the Executive Council.

WORKING GROUP B MEETING DISCUSSING THE DRAFT OSI OPERATIONAL MANUAL, VIENNA INTERNATIONAL CENTRE, MAY 2005

The Treaty and the Protocol generically define the scope of the manual. It should cover, *inter alia*, procedures for discharging TS inspection responsibilities, specifications for the use of inspection equipment, procedures for overflights, and specifications for off-site analysis of inspection samples at designated laboratories. Of direct relevance to the manual are OSI procedures and provisions otherwise defined in Article IV, Part D of the Treaty and Part II of the Protocol.

The Preparatory Commission, supported by the Provisional Technical Secretariat (PTS), started work on the draft manual in 1997. The process encompasses three stages: Creation of the initial draft rolling text, first reading of the draft rolling text and the second round process.

The initial draft rolling text of the OSI Operational Manual

States Signatories developed at first an outline of the manual and started the drafting process of an initial draft rolling text. The drafting process of the document, which was designed to contain all potential requirements for both "peace time" and an operational phase of an inspection mission for all key players, proved to be a difficult one.

By 1999, it became clear that a better mechanism was needed to achieve faster progress. Working Group B mandated the OSI Programme Coordinator, Mr. Vitaliy Shchukin, to form a group of Friends of the Programme Coordinator, who, over a period of eighteen months, produced a 670-page document, the Initial Draft Rolling Text of the On-Site Inspection Operational Manual (IDRT). In May 2001, the document was adopted by Working Group B as the common basis for the elaboration of the draft manual by States Signatories.

First reading of the Initial Draft Rolling Text of the On-Site Inpection Operational Manual

In mid-2001, the next stage of the elaboration process of the manual started under the chairmanship of Ambassador Arend Meerburg of the Netherlands, the Working Group B Task Leader for the manual. During this process, comments, amendments and alternative proposals from national delegations were registered. Upon Ambassador Meerburg's retirement in mid-2004, Mr Malcolm Coxhead, Australia, led the Task Group to the end of the first reading of the entire document in February 2005. In May 2005, the Annotated Draft Rolling Text of the On-Site Inspection Operational Manual (ADRT) was issued.

Second round process

In light of the practical requirements of the projected large scale OSI field exercises, the second round process of the draft manual will focus on the continued elaboration of the manual using the Annotated Draft Rolling Text of the On-Site Inspection Operational Manual as its basis. It will further concentrate on the selection and refinement of manual elements for testing and evaluation during field exercises and on the preparation of subsidiary documents. ■

The System-Wide Performance Test SPT1: Where do we stand?

In 2003 the Preparatory Commission of the CTBTO decided to call for a system-wide performance test (SPT1) to measure the performance of the verification system and its component parts. It was determined that the earliest practical opportunity to begin the system-wide testing would be in mid-2004, since by that time about 40% of the stations in the International Monitoring System (IMS) would be able to provide data. By mid-2005, this percentage would exceed 50%, thus yielding a representative sample of the IMS network.

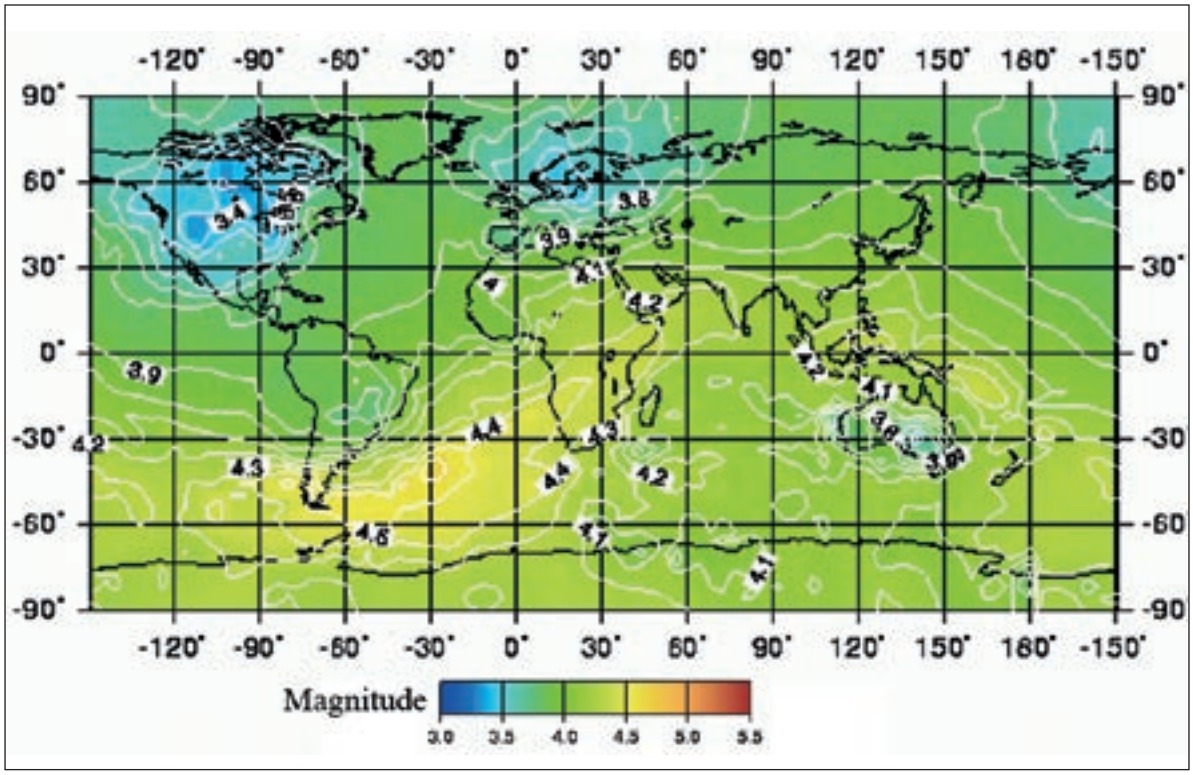
Further considerations and discussions established that SPT1 would be conducted in three progressive stages: A preparatory (developmental) phase of testing in May-June 2004, a performance testing phase in April-June 2005, and an evaluation and reporting phase in the second half of 2005.

The preparatory phase of SPT1 has been successfully completed in 2004. A total of 130 IMS stations and four certified radionuclide laboratories participated in the test. May 2004 was devoted to testing and assessing the procedures and performance metrics to be used during the 2005 performance testing phase. The Provisional Technical Secretariat (PTS) collected performance statistics and established a system-wide performance baseline under the current provisional mode of operation. In June 2004, procedures for the implementation of specific simulated 'failures' of selected system components were tested in order to examine the response of the overall system. The results were presented to Working Group B, at the Operations & Maintenance Workshop in Baden, Austria, in October 2004, and in the technical report summarizing the system baseline performance.

In April 2005, the performance testing phase of the SPT1 started with more than 150 stations in all four verification technologies and five certified radionuclide laboratories participating. During June 2005, 22 test case scenarios were implemented on a controlled basis to analyze the response of the system. This test phase provided the framework and the data for further evaluation and assessment of the verification system, while at the same time contributing to the development of the IMS and International Data Centre Operational Manuals.

The third phase of SPT1, which is scheduled for the second half of 2005, will focus on evaluation and reporting on the performance tests. National Data Centres (NDCs), IMS station operators and radionuclide laboratories are expected to play an active role in this phase, as outlined in the suggested guidelines for the NDC evaluation of SPT1. The NDC Evaluation Workshop, scheduled for the fall of 2005, in Rome, Italy, will provide an excellent platform to present initial results and to obtain feedback for further assessment during the evaluation phase.

The results and the experience gained during SPT1 will be used in technical and budgetary planning and in support of the future development of the verification system. ■



GLOBAL DETECTION CAPABILITY OF IMS PRIMARY SEISMIC NETWORK DURING PREPARATORY PHASE OF SPT1 IN MAY 2004

Potential civil and scientific applications

IMS hydroacoustic data offer a wide range of potential uses

The International Monitoring System uses seismic, hydroacoustic, infrasound and radionuclide technologies to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty. These technologies, together with the data and the products of the International Data Centre, have potential civil and scientific applications which may benefit States and the scientific community.

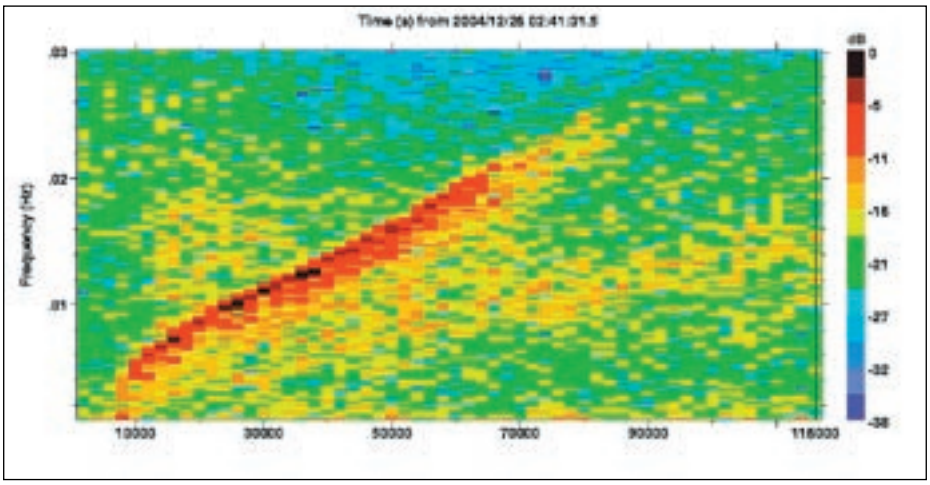


FIGURE 1: SPECTROGRAM OF THE 26 DECEMBER 2004 TSUNAMI RECORDED AT IMS HYDROPHONE STATION HA08 (DIEGO GARCIA, BRITISH INDIAN OCEAN TERRITORY) BETWEEN THREE AND 18 HOURS AFTER THE TSUNAMIGENIC EARTHQUAKE, SHOWING WITH UNPRECEDENTED CLARITY THE HIGHLY DISPERSED NATURE OF THE WAVE

When whales communicate with each other over distances of several hundreds of kilometers, they make use of the efficient propagation of sound through water. Taking advantage of the same effect, the International Monitoring System (IMS) hydroacoustic network covers the world's oceans with six hydrophone and five T-phase stations.

The IMS hydrophone stations are composed of triplets of hydrophones which are floated off the sea floor to the depth of the best sound propagation. T-phase stations, on the other hand, employ seismometers on small islands which detect acoustic waves in the ocean after they are converted to seismic energy at the islands' shores. Hydrophone stations have a considerably greater monitoring capability than T-phase stations. Although hydrophone stations were designed to detect nuclear explosions in the ocean, they are able to monitor several classes of ocean phenomena, including physical oceanographic processes, natural geophysical events and marine mammals, some of which emit hydroacoustic signals in the 1 to 100 Hz frequency range.

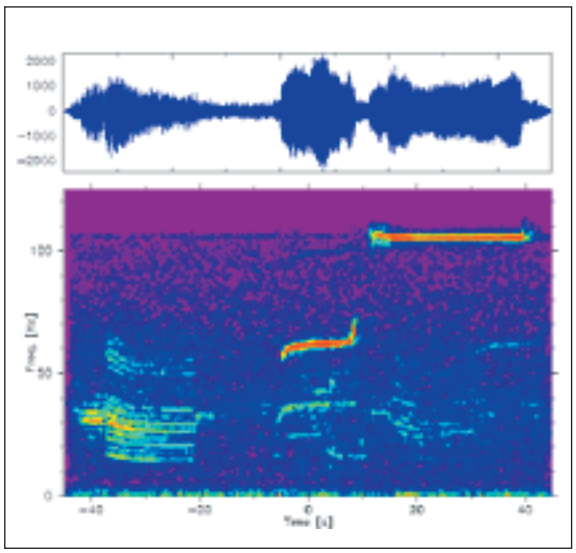


FIGURE 2: WAVE FORM (UPPER FRAME) AND SPECTROGRAM (LOWER FRAME) OF A WHALE CALL RECORDED ON 17 MAY 2005 AT HA08 (DIEGO GARCIA, BRITISH INDIAN OCEAN TERRITORY)

The IMS hydrophones are capable of serving as receivers for ocean acoustic thermometry. Acoustic thermometry is the periodic measurement of travel time of hydroacoustic waves which are affected by the distribution of the ocean temperature. Thus it can be used as a tool for monitoring the large scale temperature structure of the ocean. Potential benefits would include the monitoring of the average and long term temperature changes in the oceans, improved understanding of the oceans' processes and currents, and an increased capability to predict weather phenomena such as El Niño.

Natural geophysical events such as underwater seismicity and underwater volcanism can also be detected very effectively by hydrophone systems. Civil benefits could arise through integrating these detections into tsunami warning systems (figure 1). At the scientific level, the understanding of the seismicity of mid-ocean ridges and of underwater volcanism could be enhanced. Other signals observed by the IMS hydroacoustic stations appear to come from Antarctic iceberg calving, meteorite impacts on the oceans and submarine landslides. Further work, however, needs to be done to attribute these signals to particular oceanic events.

Similarly, the background noise of the ocean recorded at the IMS hydrophone stations represent data that may be of considerable environmental relevance, with implications on such matters as the contribution to ambient noise by human activities and marine mammal vocalizations. Two significant contributors to ocean ambient noise are shipping and whales, but it is not known quantitatively how one affects the other. Research using IMS recordings of ambient noise could lead to better understanding of these relationships.

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Establishment of an effective tsunami early warning system

continued from cover page

catastrophic earthquake in Indonesia, no adequate warning could be issued by the relevant authorities to the population at risk, due to the lack of an integrated and coherent early warning system in the region.

Japan has a long history of tsunami inflicted damage. In order to mitigate tsunami disasters, the Japan Meteorological Agency (JMA) established a tsunami warning service as early as 1952 and has been making continuous efforts to issue accurate and effective tsunami warnings. In 1960, the largest earthquake ever recorded (9.5 on the Richter scale) occurred off the coast of Chile. The tsunami generated by this severe earthquake reached the Japanese islands about 23 hours later, causing extraordinary damage in Japan and in other Pacific Ocean countries. As a consequence of this disaster, the International Coordination Group for the Tsunami Warning System in the Pacific was formed in 1965.

The main purpose of the system is to provide timely tsunami warnings to its participating States threatened by tsunamis. The Group reviews activities in order to implement further cooperation and coordination between the Member States. In 1993, the Group launched a feasibility study and discussed the establishment of a possible regional tsunami warning centre in the Northwest Pacific region. Since then JMA has concentrated its efforts on research and development to meet fully the requirements of the envisaged centre.

The Northwest Pacific Tsunami Advisory Centre of JMA has been providing tsunami advisories to the countries in the Northwest Pacific region since March 2005. The advisories offer user-friendly and regionally tailored information, including expected tsunami arrival time and expected tsunami height at each coast. It also assists recipient countries in improving their plan of action against the tsunami threat.

ANALYST AT JMA HEADQUARTERS, TOKYO, JAPAN

The United Nations World Conference on Disaster Reduction, held in Kobe, Japan, in January 2005, agreed that the Tsunami Watch Information for the Indian Ocean would be issued on an interim basis by JMA and the Pacific Tsunami Warning Centre (PTWC) in Hawaii, United States, until a tsunami early warning system in the Indian Ocean becomes fully operational. Each of the two organizations has already started issuing information to concerned countries, using common criteria on seismic event data and estimates of tsunamigenic potential taken from seismological observations.

As the current tsunami warning criteria are mainly based on seismic data, the acquisition of high quality seismological data in a timely manner is essential for the establishment of an accurate and early tsunami warning system. The existing seismological networks are not deployed uniformly and the data availability is not reliable because it is forwarded through the Internet. However, the International Monitoring System (IMS) seismological network of 50 primary and 120 auxiliary stations is deployed more evenly across the globe and is equipped with the most advanced broad-band seismometers, which record seismic waves over a wide range of frequencies. The advantage of using data from broad-band seismometers for tsunami warning is to estimate the overall size of a large earthquake and to be able to evaluate tsunamigenic earthquakes. Furthermore, the data are transmitted via a dedicated communication network, all IMS seismic stations are maintained by well-trained station operators and the data could potentially be provided with very high reliability. This complies with the requirements for a tsunami warning system, to issue a warning to concerned countries within minutes of a potentially tsunamigenic earthquake.

The Northwest Pacific Tsunami Advisory Centre of JMA is one of two UNESCO recognized tsunami warning centres. The CTBTO Preparatory Commission decided at its special session on 4 March 2005 to cooperate with UNESCO and the International Oceanographic Commission on a possible contribution to an effective tsunami warning system. Following this decision, the Provisional Technical Secretariat is forwarding continuous seismic data recorded at selected IMS stations to JMA for test purposes since 7 June 2005, thereby giving an example of potential civil and scientific applications of IMS verification data. ■

Biographical note

Mr Masahiro Yamamoto is the Director of the Earthquake and Tsunami Observation Division, Seismological and Volcanological Department of the Japan Meteorological Agency (JMA) since 2004. From 2002 to 2004 he served as Director of the Volcanological Division of JMA. He worked for the PTS from 1997 to 2002 and contributed to the construction of the IMS network.

Since the occurrence of the Sumatra earthquake and the subsequent tsunami on 26 December 2004, he has participated in numerous meetings, sharing the experiences and knowledge of JMA in building an effective tsunami warning system. ■

Latest technologies applied in infrasound

By Dr Henry E. Bass, Dr Milton Garces, Dr Michael Hedlin and Robert Woodward

The International Monitoring System (IMS) and the International Data Centre were designed to be fully capable of monitoring compliance with the Treaty. New research and improved communication technologies continuously refine the detection capabilities of the IMS. This column introduces some of the latest developments in verification science.

The International Monitoring System (IMS) infrasound network of 60 stations uses sensors (microbarometers) which are able to detect micropressure variations in the atmosphere. These variations are generated by the propagation of very low-frequency acoustic waves produced by natural and man-made events. The detection of infrasonic signals is limited by background noise in the recorded data which is primarily caused by local winds. A better understanding of the noise characteristics at infrasound stations is crucial for the improvement of the processing capabilities of infrasound data.

Research at the United States Universities of Mississippi, California San Diego and Hawaii is focusing on a detailed analysis of the relationship between wind and pressure noise as a function of frequency, wind characteristics (e.g. speed, turbulence, spectral slope, etc.) and environmental conditions. It utilizes data from meteorological sensors which are co-located with one of the microbarometers used at IMS infrasound stations. The observed wind-pressure relationships (as a function of time) may lead to improved signal processing algorithms which dynamically adapt to changing wind conditions.

In this context two new wind noise filtering systems are being tested. Both systems rely on the different spatial distribution scales of signals and noise: Wind noise is incoherent beyond distances of tens of meters, while infrasonic signals can be coherent over distances in excess of 100 meters The two systems aim to increase the amplitudes of coherent signal and decrease the amplitudes of incoherent noise by summing or integrating the pressure field across distances beyond the coherence limit of noise. The first filtering system uses fiber optic cables to integrate the pressure field along a line. The second system comprises a grid of sensors, each independently sampling the infrasonic pressure field. Noise reduction is achieved by integrating the recordings adaptively from all sensors to cancel out noise optimally.

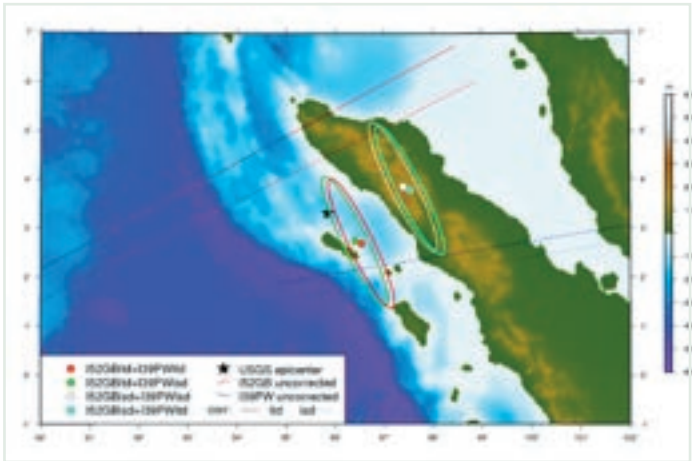

FIGURE 1 SHOWS THAT WITH THE HELP OF INFRASOUND DATA TWO LOCATIONS FOR THE SOURCE WHICH GENERATED THE BIG TSUNAMI OF 26 DECEMBER 2004 COULD BE IDENTIFIED: ONE IS NEAR THE EPICENTER/TSUNAMI SOURCE AND THE OTHER ONE NEAR THE HIGHEST MOUNTAINS IN ACEH, WHICH POSSIBLY GENERATED WITH THEIR SHAKING INFRASONIC WAVES. THE SOURCE LOCATIONS ARE RETRIEVED BY USING DIFFERENT INFRASOUND ARRIVALS FROM THE SOURCE TO IMS INFRASOUND STATIONS IN PALAU (IS39) AND DIEGO GARCIA (IS52)

Infrasonic signals loose their impulsive character as they propagate for thousands of kilometers. A typical infrasonic signal from a distant source appears to emerge gradually from the background sound field, and can sometimes be buried in the ambient noise. However, as infrasound waves propagate across an array, they produce distinctive patterns in space and time that can be recognized with specialized digital signal processing algorithms. The Progressive Multi-

continued on next page

Biographical note

Dr Henry E. Bass, Dr Milton Garces, Dr Michael Hedlin and Robert Woodward are experts in atmospheric and physical acoustics, molecular energy transfer in gases, seismology and nuclear monitoring.

Dr Bass, who coordinated the article with the other researchers, is the leader of the Multi-University US CTBT Infrasound Team. He is professor of physics and serves since 1992 as the Director of the National Centre for Physical Acoustics at the University of Mississippi.

Dr Garces is the Scientific Director at the Infrasound Laboratory of the University of Hawaii at Manoa and operates IMS infrasound stations IS59, IS52 and IS39.

Dr Hedlin is research geophysicist and senior lecturer at the Laboratory for Atmospheric Acoustics at the University of California, San Diego and operates infrasound stations IS56 and IS57.

Bob Woodward works as the Systems Integration Manager of the Science Applications International Cooperation which was a lead contractor in the creation of the full-scale prototype of the International Data Centre. ■

Secretariat snapshots

Asbestos removal at the VIC

The Vienna International Centre (VIC) based organizations have been in discussion with the Austrian authorities on the removal of asbestos from the offices at the Vienna International Centre since 1998. The actual asbestos removal work began in November 2004 and is scheduled to last until 2008.

The central purpose of the project is to ensure the safety and health of the people working at the VIC. Staff councils are kept informed of the progress achieved through their attendance at the regular working group meetings held between the VIC representatives and the responsible host authorities.

At the beginning of May 2005, Provisional Technical Secretariat (PTS) staff began moving to the temporary building "L". Floor by floor, staff will follow with as little disruption to their work as possible. The majority of PTS staff will have moved back to their original office floors by 7 January 2006, with the exception of the On-Site Inspection Division, which is scheduled to move in the summer of 2007. The staff members will be evacuated for a period of 15 to 19 weeks, before returning to their old location.

PTS staff will notice some changes when they return to their offices. New windows with much better heating and cooling insulation will have been installed. In addition, these windows will have a shatter resistant layer that is intended to protect staff from flying glass in case of external events such as explosions or storms. New floor coverings, blue carpets in the corridors and cork tiles in the offices, considered to be more hygienic than carpets, will have been fitted. ■

Latest technologies applied in infrasound

continued from previous page

Channel Correlation (PMCC)[1] feature extraction algorithm has proven to be particularly well suited to the analysis of data from IMS infrasound arrays.

Infrasonic source location is complicated by atmospheric variability. New generation atmospheric models integrate high-resolution meteorological models in the troposphere and stratosphere with climatological models of the mesosphere and lower thermosphere.

Although great strides have been made in the development of full wave propagation models, infrasonic source location is generally performed by simulating the propagation of waves with the propagation of rays through stratified media, providing speed and flexibility at the expense of rigor. The tau-p model[2] , originally developed for the determination of seismic travel-times, has been applied to the problem of atmospheric sound propagation in the presence of winds. It is under testing in several countries and could provide much improved travel times and azimuths.

Infrasound data has been used to detect and locate an increasingly larger variety of sources. A significant example is the location of the event associated with the big tsunami of 26 December 2004 (see figure 1, page 18). ■

[1]The PMCC algorithm first identifies the arrival of coherent signals across an array by using the consistency of the lag-closure relationship between sets of three sensors. If an arrival is persistent, PMCC then groups coherent packets into families, which are defined by trends in the signal frequency, velocity and azimuth.

[2]The intercept time, tau, is a piecewise continuous, monotonic function of the ray parameter (p), and permits the efficient calculation of the travel time, range, and azimuth deviation for a ray.

Security enhancements at the VIC

Since its opening in 1979, adequate security measures have been in place at the VIC to protect the nearly 5000 international civil servants and associated staff working there. Due to the increasing global threat of terrorism, these measures are less viable now and need to be upgraded. The security enhancement project includes measures to protect the building from forced, particularly vehicular, entry; improvement of communications; increased human security levels as well as more stringent entry controls.

All measures are carried out in cooperation with the host Government authorities. Member States have been asked to approve increased budgets to cover the security enhancements. The Preparatory Commission approved a first phase of security enhancement in November 2004. The second phase is currently under discussion and is receiving a positive response. ■

Treaty Status

Signatures	175
Ratifications	122
Annex 2 Ratifications	33

AS OF 15 JULY 2005

IMS hydroacoustic data offer a wide range...

continued from page 16

The highly sensitive hydrophones also pick up signals which originate from marine animals. Whales in particular have a very wide range of vocalizations, including some at low frequencies that can be readily detected by IMS stations. The nature of the sounds, their duration, pattern, and frequency content, can be used to identify the whale species (figure 2, page 16). On this basis, it is possible to obtain information on the position and migration patterns of individual whale species. This information could be used to research whale populations and their seasonal migration patterns.

The scarcity of hydroacoustic monitoring facilities and the high quality of the IMS data make it particularly valuable for scientific research. It remains a political decision by the Member States if this data and the International Data Centre's near real-time processing capabilities will be used to supply information related to national disasters and to enhance research in the above mentioned fields. The tragic events of 26 December 2004 which cost the lives of more than three hundred thousand people gave new impetus to the discussion on the potential usage of verification data for civil and scientific purposes (see cover article, page 1 and 17). ■

Calendar of Meetings 2005

Preparatory Commission:

24th Session	27 – 30 June 2005
25th Session	14 – 18 November 2005

Working Group A:

27th Session	6 – 10 June 2005
28th Session	3 – 7 October 2005

Working Group B:

24th Session	14 Feb. – 4 March 2005
25th Session I	23 May – 3 June 2005
25th Session II	29 August – 9 Sept. 2005

Advisory Group:

24th Session I	18 – 23 April 2005
24th Session II	17 – 20 May 2005
25th Session	12 – 16 September 2005

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