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

CTBTO Spectrum

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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

The role of the Special Representative in the Article XIV Conference process

By Ambassador Jaap Ramaker

From 21 to 23 September this year, 117 Signatories and Ratifying States of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), many of them at the Ministerial level, participated in the fourth Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty (Article XIV Conference) at the United Nations Headquarters in New York. Scheduled one week after the Millennium Summit, the Conference represented another opportunity for Governments to focus on one of the most burning issues of our time: nuclear non-proliferation and disarmament.

OPENING SESSION OF THE CONFERENCE ON FACILITATING THE ENTRY INTO FORCE OF THE CTBT, UNITED NATIONS, NEW YORK, 21-23 SEPTEMBER 2005

When opening the Conference, the United Nations Secretary-General Kofi Annan, in his function as Depositary of the Treaty, said: "We meet at a time of heightened global anxiety about weapons of mass destruction – particularly nuclear weapons. It is our collective duty to promote and strengthen the various multilateral instruments which reduce the threat these weapons pose to us all."

The CTBT, often referred to as a cornerstone in the global nuclear non-proliferation architecture, is an important international instrument in this field. The mere fact that Governments get together every two years and discuss ways and means of how to accelerate the ratification process of the CTBT, has a merit of its own since it focuses Governments on this central issue. As a result of this focus, the number of signatures and ratifications rises in the period before and after each Conference. For example, this year one State signed and four ratified the Treaty between July and November.

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Editorial

This is the first issue of CTBTO Spectrum *that I am presenting to you as Executive Secretary of the CTBTO Preparatory Commission.*

My new responsibility fills me with pride because I firmly believe that preparing the grounds for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) to enter into force is a unique undertaking. This is due to several factors:

- *First, the CTBT itself is unique in its scope. By banning all nuclear weapon test explosions, the CTBT reduces significantly the risk of proliferation of nuclear weapons and hampers the development of new weapons.*

- *Second, the mandate of the Preparatory Commission differs from similar undertakings insofar as the CTBTO global verification regime has to be fully functional at the time of entry into force of the Treaty. One could say – the newly born baby is expected from day one not just to walk, but to run at high speed.*

- *Third, the CTBT has a unique arrangement among verification regimes. Member States, regardless of their size, wealth or technological status, receive state of the art verification technology and global verification data and products. This democratic approach is enhanced by capacity building measures to empower and integrate further Signatories and Ratifiers.*

I am taking over an organization with a remarkable performance in the technical field and in the diplomatic area. Currently, about two thirds of the International Monitoring System (IMS) network is built and nearly 150 IMS facilities are certified. More than 700 end users in 89 countries are participating in the provisional operation and testing of the system. The dynamics of building the verification system are very rapid. Just over the past two years, 115 IMS stations were installed which means that the number of IMS stations already in place practically doubled. In addition, the daily volume of data exchange nearly tripled from five gigabytes per day to 14 gigabytes per day in the same period.

The recently held Conference on Facilitating the Entry into Force of the CTBT (Article XIV Conference) confirmed the commitment of the international community to the Treaty and the work of the Commission. With 176 signatures and 126 ratifications, the Treaty has reached nearly universal status. Still, more work needs to be done and I am committed to motivate everyone concerned to bring this unique undertaking to a successful conclusion.

This issue of CTBTO Spectrum *takes a close look at the Article XIV process and the results of the 2005 Article XIV Conference. Two eminent supporters of the Treaty provided contributions in this context: An interview with Alexander Downer, Minister of Foreign Affairs of Australia and President of the 2005 Article XIV Conference, recaptures,* inter alia*, his own personal efforts and the special historic role of Australia regarding the CTBT. The cover story by Ambassador Jaap Ramaker provides new insights into his role in promoting the entry into force of the Treaty as the Special Representative of the Ratifier States.*

The Eastern European region, the main focus of this issue, is a particularly good example of the continuing and robust support for the Treaty, with all 22 Member States having signed and 19 having ratified it.

Besides looking at the various interactions between the Eastern European region and the CTBT, including a feature story about the latest IMS station establishment in Kamchatka, Russian Federation, this issue also gives an overview of the Commission's work over the past six months, including an update on the latest session of the Preparatory Commission. It also reports on the latest developments for atmospheric transport modelling in the field of verification science.

Furthermore, an article by Dieter Schiessl, Director of the World Meteorological Organisation, gives an example of how the scientific community and external cooperation partners can already benefit from data deriving from CTBT verification technologies. Another article in this field provides an overview of tests currently conducted to explore the usefulness of IMS data and International Data Centre products for tsunami alert systems.

Tibor Tóth
Executive Secretary
Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization

Eastern Europe

IMS facilities as defined in the Treaty

Status of signatures and ratifications

	Signatory States	Ratifying States	Non-Signatory States
Total Eastern European States: 22	**22**	**19**	**0**
Annex 2 Eastern European States: 7	**7**	**7**	**0**

- 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)

Notes & quotes

Eastern Europe and the CTBT

In terms of membership, Eastern Europe with 22 members is the smallest of the six geographical regions established for the purposes of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). Yet it is by no means the least visible. The region is united in its robust and continuing support for the comprehensive ban on nuclear test explosions.

The most visible sign of this support is the readiness with which Eastern European States have adhered to the CTBT. Indeed, their track record in this respect is exemplary. All 22 have signed the Treaty and are accordingly members of the Preparatory Commission, while 19 have ratified it. Most importantly, each one of the seven Annex 2 States from the region, whose ratification is required for the CTBT to enter into force has already ratified the Treaty. As the sole nuclear weapon State in the region, the Russian Federation signed the CTBT on 24 September 1996 and ratified it on 30 June 2000.

Over the years, three Permanent Representatives of Eastern European States to the Preparatory Commission have been elected as Chairpersons of the Commission: Ambassador Daniela Rozgonova, Slovak Republic, from May to December 1997; Ambassador Pavel Vacek, Czech Republic, from January to June 2000; and Ambassador Liviu Aurelian Bota, Romania, from July to December 2002. In addition, Eastern Europe regularly nominates Vice-Chairpersons of the Commission and has designated several members of the Advisory Group, which advises the Commission on financial, budgetary and associated administrative issues as well as a representative of the Commission on the Management Board of the Provident Fund of the organization.

Since 1997, Eastern European States have hosted 13 technical meetings and training activities of the Commission. The activities focused on fostering international cooperation with respect to the CTBT, on On-Site Inspection (OSI) issues, on training for the staff of National Data Centres, and on possible civil and scientific benefits of the Treaty's verification technologies. Notably, the first OSI field experiment was conducted in Slovakia in 2001.

The commitment of the Eastern European geographical region to the CTBT and the Preparatory Commission was given recognition in 2004, when Ambassador Tibor Tóth, the Permanent Representative of Hungary in Geneva and longstanding chairman of Working Group A, was elected the second Executive Secretary of the Commission, with effect from 1 August 2005. ■

INSPECTION OF A BOREHOLE BY THE STATION OPERATOR OF PS45, UKRAINE

Eastern European facility agreements

States hosting monitoring facilities under the CTBT conclude international agreements or arrangements known as facility agreements with the Preparatory Commission. Facility agreements regulate matters such as the establishment, upgrading, testing, certification, and the operation and maintenance of monitoring facilities as well as the privileges and immunities of the organization and its staff.

COLONEL-GENERAL ANATOLY I. MAZURKOVICH, RUSSIAN FEDERATION (LEFT), AND MR WOLFGANG HOFFMANN, FORMER EXECUTIVE SECRETARY, SIGNING FACILITY AGREEMENT

The CTBT envisages that 36 international monitoring facilities will be located in five Eastern European States, namely Armenia, the Czech Republic, Romania, the Russian Federation and Ukraine. Thirty-two of these facilities are hosted by the Russian Federation, including Eastern Europe's only radionuclide laboratory, RL13 in Moscow.

Following several rounds of negotiations held in Vienna and Moscow, the Government of the Russian Federation and the Preparatory Commission concluded a bilateral facility agreement in Vienna on 22 March 2005. The agreement is being applied provisionally until the Government of the Russian Federation has completed the necessary domestic formalities for its entry into force. The agreement is especially significant since it regulates the Commission's activities in respect to almost ten per cent of the overall monitoring network. Facility agreements have also been concluded with the Czech Republic (2002), Romania (2003) and Ukraine (1999). ■

NDC Evaluation Workshop

The 2005 National Data Centre (NDC) Evaluation Workshop, held from 17 to 21 October in Rome, Italy, focused on obtaining evaluation feedback from NDCs on the System-wide Performance Test (SPT1). Organized by the PTS and hosted by the Instituto Nazionale di Geofisica e Vulcanologia in Rome, the workshop attracted over 80 participants from 26 Member States. More than 30 participants gave presentations and provided reports on their evaluation of the SPT1.

The participants acknowledged that the SPT1 has been very successful both in providing baseline information on the current status of the verification system and in illuminating various areas that require further development. Given the importance of the SPT1, the degree to which NDCs have become engaged and the good cooperation now in place between NDCs and the Provisional Technical Secretariat (PTS) for evaluation activities, it was recommended that Working Group B should consider future integrated tests to assist the development of selected components of the verification system. Furthermore, the participants expressed their appreciation of the Operations Centre, which was established for the conduct of SPT1, as a significant improvement in PTS coordination and recommended that the Operations Centre should be further developed.

The participants of the workshop benefited from the exchange of experience between NDCs and the PTS, the well-prepared presentations and the open working atmosphere. According to a survey, over 80 percent of the participants rated the workshop between excellent and good. ■

PARTICIPANTS AT THE NDC EVALUATION WORKSHOP, ROME, ITALY, 17 - 21 OCTOBER 2005

"Today, in my ninety-seventh year, … I am still as deeply confirmed in my belief that nuclear weapons are fundamentally immoral, and that we must do everything in our power to stop their proliferation. It is not only the enormous scale of their powers of destruction (to the point of destroying the whole of civilization), but, even if limited, their action is indiscriminate, affecting civilians as well as military, innocents and aggressors alike, killing people alive now and generations as yet unborn.

All this makes nuclear weapons unacceptable instruments for maintaining peace in the world. But this has been exactly our policy during, and since the end of, the Cold War. Nuclear weapons have been kept as a deterrent, to prevent war by the threat of retaliation. And we have to ask ourselves: Are we going to base our world on a culture of peace or on a culture of violence?

If we rest the security of the world on a balance of terror, not only is it extremely dangerous, but in the long run it will erode the ethical basis of civilization."

Professor Sir Joseph Rotblat, the only nuclear physicist to resign from the Manhattan Project, wrote this letter to the editor of the Bulletin of the Atomic Scientists shortly before this death on 31 August 2005. He received the Nobel Peace Prize in 1995 together with Pugwash "for their efforts to diminish the part played by nuclear arms in international politics and, in the longer run, to eliminate such arms."

The role of the Special Representative in the Article XIV Conference process

continued from cover page

Article XIV of the CTBT specifies the conditions for the Treaty's entry into force which will take place 180 days after the 44 States with nuclear capabilities listed in its Annex 2 have ratified it. As the Chairman of the CTBT negotiations in Geneva, I recall that it was a Canadian idea to include a mechanism under Article XIV, whereby on request of the Ratifier States regular conferences are convened by the United Nations Secretary-General to promote the entry into force of the Treaty.

This mechanism has become instrumental in moving the issue of entry into force forward. So far, Article XIV Conferences have taken place in 1999, 2001, 2003 and 2005. The 2003 Conference under the Chairmanship of Finland has adopted for the first time twelve specific measures, appended to its Final Declaration. One of them was the decision to appoint me as the Special Representative with the mandate "to assist the co-ordinating State in the performance of its function in promoting the early entry into force of the Treaty." In its Final Declaration, the 2005 Conference reconfirmed the measures adopted at the 2003 Conference, including my function to assist the current co-ordinating State, Australia, in promoting the entry into force of the Treaty.

My mandate does not make a distinction between the Annex 2 States and other countries which have not yet signed or ratified. At the beginning of my work I focused for practical reasons on Annex 2 States, namely China, Vietnam and Pakistan. I was encouraged by my visits to China and Vietnam, with particularly China being very supportive of my work. I am looking forward to an early visit to Indonesia.

Besides my facilitating role in the entry into force process, I would like to work now also on increasing the overall number of signatures and ratifications in order to strengthen the norm against nuclear weapon test explosions. Smaller countries ought to be aware that by signing and ratifying the CTBT, they too can contribute to this important objective and thus make the world a safer place.

It is a little over seven years ago that the world last witnessed nuclear weapon test explosions. The more countries sign and ratify the CTBT, the stronger the norm gets. It goes without saying that the series of unilateral moratoria that are observed now cannot take the place of the CTBT, which, once entered into force, would ban nuclear weapon test explosions once and for all. ■

FROM LEFT TO RIGHT: MR TIBOR TÓTH, CTBTO EXECUTIVE SECRETARY; H.E. ALEXANDER DOWNER, MINISTER FOR FOREIGN AFFAIRS OF AUSTRALIA; MR KOFI ANNAN, UNITED NATIONS SECRETARY-GENERAL AND MR NOBUYASU ABE, UNDER-SECRETARY-GENERAL FOR DISARMAMENT AFFAIRS, AT THE OPENING SESSION OF THE ARTICLE XIV CONFERENCE, NEW YORK, 21-23 SEPTEMBER 2005

Biographical note

Following the 2003 Article XIV Conference, Ambassador Jaap Ramaker was appointed Special Representative of the Ratifying States to promote the entry into force of the CTBT.

Ambassador Ramaker joined the diplomatic service of The Netherlands in 1970 and served in various positions in Cameroon, The Netherlands, Brazil and Portugal, and as Deputy Head of Delegation to the Conference of Disarmament in Geneva (1983-1986), Deputy Permanent Representative to the United Nations in New York (1986-1990) and Deputy Chief of the Mission in Moscow (1990-1994).

Between 1994 and 1997, he was Permanent Representative of his country to the Conference on Disarmament in Geneva. In this capacity, he chaired the CTBT negotiations and led them to a successful conclusion. He then served as Permanent Representative to the United Nations in New York (1997-1998) and to the United Nations and other international organizations in Vienna and as Ambassador of The Netherlands to Austria (1999-2004).

In 1998, Ambassador Ramaker received the 'Wateler Peace Price' of the Carnegie Foundation at The Hague, The Netherlands. ■

Commission update

Report on the November 2005 session

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) held its Twenty-Fifth Session from 14 to 18 November 2005 in Vienna under the chairmanship of Ambassador Taous Feroukhi of Algeria. Nintey-one Member States participated in the session.

The report of the Executive Secretary

Mr Tibor Tóth, Executive Secretary of the CTBTO Preparatory Commission, referred to the unique importance of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), its verification regime and the unique mandate of the Preparatory Commission. He reported that currently two thirds of the 321 stations and 16 laboratories of the International Monitoring System (IMS) are built.

The Executive Secretary identified three priority areas in the work of the Provisional Technical Secretariat (PTS): First, to continue the build up of the verification regime. Second, testing, evaluating and provisionally operating the system. Third, the consolidation of the verification regime through organization-wide cooperation such as the system-wide performance test and the on-site inspection integrated field exercise.

The universalization of the CTBT entails signature and ratification by all States, the Executive Secretary said, particularly those, whose ratification is needed for entry into force. In addition, he referred to the 'rich fabric of interactions' that needs to be woven between the PTS and the various constituencies of the CTBT in order to realize fully the potential of the unique verification regime. He informed about his intention to strengthen the cooperation and the assistance that the PTS can extend to the Member States and also to increase the capacity of States to benefit from the Treaty and the Commission.

In this context, the Executive Secretary announced a project on e-training to be started this year. This project would give access to training modules and expert advice through the Experts Communication System (ECS), thus providing States with the knowledge and the tools to benefit from participating in the work of the Commission. In order to improve further the service function of the PTS, he announced that all future meetings of the Commission and its subsidiary bodies will be made available through live video streaming on the ECS.

The Executive Secretary presented a plan for the incremental restructuring of the IMS and International Data Centre Divisions based on the recommendations of the report of the external review team on how best to adapt to the changing tasks of the PTS which are resulting from the transition of the build-up of the verification regime to the phase of testing, evaluation and provisional operation. The restructuring of the PTS would be undertaken in two phases and be completed at the end of 2007.

Plenary debate and conclusions

Member States welcomed the successful outcome of the Conference on Facilitating the Entry into Force of the CTBT, held in New York from 21 to 23 September 2005, and underlined the importance of promoting signature and ratification, especially by the Annex 2 States. In this regard, Member States welcomed the signing of the Treaty by Lebanon, and its ratification by the Cook Islands, Djibouti, Madagascar and Vanuatu.

The debate focused mainly on budgetary issues related to whether the costs for the security enhancement measures at the Vienna International Centre should be absorbed within a zero real growth budget or not. The Commission approved the budget for 2006 amounting to US$ 51 804 400 and € 44 421 300.

Views were expressed that a wider participation of experts from developing countries in Working Group B meetings would be beneficial for the work of the Commission. The Commission referred the issue for further examination to Working Group A with a view of developing a pilot project.

States Signatories expressed appreciation for PTS training courses and international cooperation activities. Some Member States expressed support for civil and scientific applications of the verification system in full conformity with the Treaty.

The Commission adopted the final report of the external review team as a basis for proceeding with the restructuring of the PTS with the understanding that all implementation steps proposed by the PTS in a "road-map" would be carried out on the basis of further consultations as well as regular reporting to and feedback from the Commission.

Ambassador Volodymyr Yelchenko of Ukraine was elected as the next chairperson of the Commission for 2006. ■

In the spotlight

H.E. Alexander Downer, Minister for Foreign Affairs of Australia

Q: *The adoption of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in September 1996 by the United Nations General Assembly marked the culmination of decades of international efforts to arrive at a complete ban on nuclear testing.*

Australia has made significant contributions to this achievement. Could you explain your personal efforts and the special historic role of Australia regarding the CTBT? Why is the CTBT so important for nuclear non-proliferation?

A: Preventing the further spread of weapons of mass destruction (WMD) and achieving their ultimate elimination are long-standing priorities for Australia. Successive Australian governments have recognized that more States acquiring WMD could threaten Australian, regional and global security.

Australia is a strong supporter of the major WMD treaties and we have built up over many years a strong reputation as an energetic and practical contributor on non-proliferation and disarmament issues. A ban on nuclear testing has long held a special importance for us. Australia was one of the first non-nuclear-weapon States to ratify the 1963 Partial Test Ban Treaty which was a major step towards the CTBT.

The text used as the basis for the CTBT negotiations in the Conference on Disarmament (CD) in Geneva was in large part based on elements Australia tabled in 1994. When the CTBT could not overcome the final hurdle of being adopted in the CD, I led international action in taking the Treaty to the United Nations in New York in 1996, where an overwhelming majority of countries adopted it.

As I said in my address to the 2005 Conference on Facilitating the Entry into Force of the CTBT (Article XIV Conference), this was one of my earliest experiences as Foreign Minister of Australia and one that I am very proud of.

Australia has over many years invested considerable effort in the development and maintenance of global WMD non-proliferation and disarmament treaties, their verification mechanisms and various bilateral, regional and multilateral measures supporting the main treaties. Neither these nor the other elements of the global non-proliferation and disarmament architecture stand alone. Rather they comprise a system of interlocking and mutually reinforcing parts. The CTBT is a vital component of this system. As the Final Declaration of the 2005 Article XIV Conference clearly says, "constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons constitutes an effective measure of nuclear disarmament and non-proliferation".

> "I have heard a lot of excuses, but I have yet to hear a convincing argument against the CTBT. None of the Member States at the Article XIV Conference was in any doubt about the CTBT's capacity to contribute to nuclear disarmament and non-proliferation. "

Q: *Nine years after its opening for signature, the CTBT is firmly entrenched in its path towards achieving universal adherence, but it is still not in force.*

As the President of the 2005 Conference on Facilitating the Entry into Force of the CTBT, which took place from 21 to 23 September in New York, you discussed with Member States ways and means to promote the entry into force of the Treaty. What were the main issues that were brought up by the Member States?

A: There is a very real sense of frustration felt by the vast majority of countries which have signed and ratified the Treaty that its entry into force is not closer. One hundred and seventy-six State Signatories and 126 Ratifiers is a clear demonstration of near universal support for the CTBT.

While Annex 2 countries have a special responsibility, given the entry into force requirements of the Treaty, all countries have an obligation both to their own citizens and the international community to ratify the Treaty. Each and every ratification moves the CTBT closer to universality and strengthens the normative value of the test ban.

Q: *The rather complicated entry into force clause of the Treaty requires the ratification by the 44 States listed in its Annex 2. Thirty-three of them have ratified the CTBT so far.*

In your statement at the Article XIV Conference you said that you had heard many reasons why the eleven remaining countries had not ratified the Treaty, but the

time for excuses was past and "it is time for them to act".

What measures in the Final Declaration of the 2005 Conference are designed to further signature and ratification of the Treaty by the concerned eleven States?

A: There is very strong focus on the eleven remaining Annex 2 countries whose signature is required to trigger entry into force. A number of those countries appear to have no particular policy reason for not ratifying the Treaty and we could reasonably expect that, with the continued encouragement and assistance of other States, they ought to be able to give the Treaty the priority it deserves and finalize their ratification processes.

A number of countries have said they do not support the Treaty or that there are complicating factors which prevent them from ratifying at present. I have heard a lot of excuses, but I have yet to hear a convincing argument against the CTBT. None of the Member States at the Article XIV Conference was in any doubt about the CTBT's capacity to contribute to nuclear disarmament and non-proliferation. As we all know, the proliferation danger is now even more acute, given the known interest of terrorists in acquiring weapons of mass destruction.

All of the measures contained in the Final Declaration have an application to the remaining Annex 2 countries. I would like to make particular note of the Special Representative, Ambassador Ramaker. He has already played a valuable role in promoting ratification with senior political figures in a number of countries, including some listed in Annex 2. As the coordinating-State from 2005 to 2007, Australia is pleased to have the support of Ambassador Ramaker in promoting the entry into force of the CTBT. We should not forget that he speaks on behalf of 126 Ratifier States.

Q: *In the previous Article XIV Conferences Member States have proposed measures to facilitate ratification of the Treaty such as urging officials of Ratifier States to raise CTBT ratification at meetings with counterparts in non-ratifying States.*

What other ideas are discussed among Member States to promote early entry into force of the CTBT?

A: What is very clear is that political impetus is often necessary to raise the profile and priority of issues such as the CTBT, particularly with countries which may not see any immediate benefit or who mistakenly think that their ratification won't make any difference. Ratifiers have a special responsibility to provide their friends and neighbours with the help and assistance they need to ratify the Treaty and implement its provisions. Often ratification will require only the establishment of a legislative framework and limited ongoing activities. Australia for obvious geographical reasons has a special focus on assisting countries in the South Pacific region. We hope that other Ratifiers will assist in their regions.

Q: *There is an emerging international consensus that the CTBT is vital because it contributes to national and international security by creating a climate within which a stop to nuclear test explosions is now regarded by many as a norm.*

What developments in the future role of the Treaty do you see at this stage?

A: We should never forget that the primary purpose of the Treaty's verification regime is the detection of nuclear explosions. What is also clear is the possibility that, without detracting from its verification function, the data collected by the CTBTO could make a contribution to disaster alert systems. Testing is continuing to see if CTBTO data can be used for tsunami warning, including the Australian Tsunami Warning System. We ought to continue to look for ways that civil and scientific benefits can be broadly shared by the international community. ■

Biographical note

His Excellency Mr Alexander Downer, Minister for Foreign Affairs of Australia, presided over the 2005 Article XIV Conference.

Since becoming Minister for Foreign Affairs in 1996, Mr Downer has overseen a range of important developments on the international stage. Prior to his current position, Mr Downer served as Shadow Minister in a number of portfolios, including Treasurer, Defence, Trade and Trade Negotiations, Housing and Small Business, and Arts, Heritage and Environment. He also held various senior Parliamentary positions.

Mr Downer served as Executive Director of the Australian Chamber of Commerce from 1983 to 1984. Prior to that, from 1982 to 1983, he was a Political Adviser to the former Australian Prime Minister, the Hon. Malcolm Fraser.

From 1976 to 1982, Mr Downer served as a diplomat in the Department of Foreign Affairs. He also worked as an Economist at the Bank of New South Wales from 1975 to 1976. ■

The history of CTBT negotiations – a Russian perspective

By Ambassador Grigory Berdennikov

On 3 February 1994, the multilateral negotiations to establish the Comprehensive Nuclear-Test-Ban Treaty (CTBT) began at the Conference on Disarmament in Geneva.

Scope of the test ban

The most fundamental Treaty provision addresses the definition of the scope of the ban. Article 1 of the Treaty reads that "each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion" as well as "to refrain from causing, encouraging, or in any way participating in the carrying out" of nuclear tests.

Behind this formula, however simple at first glance, are probably the most intricate problems of the CTBT negotiations. Since the beginning, Russia and other nuclear States insisted that the scope of the ban should be in line with the commonly accepted objectives of the Treaty and that it should not undermine basic scientific research in areas such as thermonuclear fusion and safe maintenance of existing nuclear weapon arsenals.

The principal issues facing the negotiators were as follows:

- Should all nuclear weapon tests be banned or only the explosion type tests?
- If explosion tests are banned, should the ban cover nuclear explosions or any explosion experiments, including purely chemical ones?
- Should any nuclear explosion tests be banned or can low-yield nuclear explosions not detectable by technical monitoring means be left outside of the ban, that is, should the negotiators aim at a 'threshold ban' or at a comprehensive nuclear explosions test ban?
- How about nuclear explosions which are carried out not for nuclear weapon purposes, but for industrial, scientific and other non-military needs of States?
- Should a provision banning preparations for nuclear tests be included in the Treaty?

Positions of States on all these issues differed considerably. A number of countries favoured the Treaty banning any nuclear weapon tests, both explosion related and non-explosion tests, such as computer modeling. On the other hand, some States initially favoured the possibility of carrying out full-scale nuclear explosions even after the conclusion of the Treaty 'in order to maintain safety, security and reliability' of nuclear weapon stockpiles and suggested that a respective quota should be established. Both of these widely different approaches were rejected during the negotiations: The first one because it is impossible to verify the ban on computer modeling and other non-explosion tests, and the second one because it would not have been consistent with the objective of concluding the CTBT, making it in fact a Treaty on the limitation of nuclear test programmes.

Eventually, an understanding was reached to address only the explosion tests. However, a 'gray area' of the so called low-yield explosions remained. A number of countries were in favour of not banning such explosions under the Treaty. Others were against such an approach. Russia, from the very beginning, was supporting the proposal of a nuclear explosions ban without thresholds.

The difficult negotiations resulted in a compromise. On the one hand, the Treaty prohibits any nuclear explosions however low the yield, and on the other hand, it permits experiments with nuclear weapons, including those of the explosion nature, but under the condition that they are purely chemical (the so called 'hydrodynamic experiments').

A separate problem with the scope of the ban was the proposal to allow the possibility of peaceful nuclear explosions (PNEs) within the CTBT framework for the purpose of geological prospecting or for the construction of underground gas-storage facilities. As the negotiations demonstrated, this proposal caused a problem because it is extremely difficult in practice (and many countries were even convinced impossible) to be sure that the PNEs were not carried out for the purposes banned by the Treaty. Practically all the Western and non-aligned countries were categorically against the PNEs and that problem threatened to deadlock the negotiations. Given that situation, the Russian delegation, based on the experience of the trilateral talks of the 1970s, proposed to incorporate a Treaty provision that the PNEs would remain to be banned until a procedure for their conduct was agreed which would rule out any military advantages. It was on this basis that a compromise on this matter was found.

Finally, one more problem among the issues relating to the scope of the CTBT prohibitions was the demand by a number of non-nuclear weapon countries that the Treaty should ban preparation activities for nuclear tests.

The nuclear States opposed such an approach, arguing that preparations (for example, drilling at nuclear test ranges) may have nothing to do with an intention to violate the Treaty. Moreover, adding the preparations to the scope of the ban would considerably complicate the verification mechanism, and on-site inspections would have to have as an objective not only to

verify the fact of the nuclear explosion, as is at present envisaged in the Treaty, but also to confirm the fact of the preparation activities. This would have considerably expanded the intrusive nature of such inspections, therefore this proposal was finally dropped.

Locations of IMS stations

Certain differences emerged on the location of the International Monitoring System (IMS) stations. The Russian delegation insisted that the Treaty should provide for such locations of the IMS stations that would ensure equal transparency of the existing nuclear test sites. In the Cold War years, the Russian test site in Novaya Zemlya was tightly monitored by seismic stations in Scandinavia, while the United States test site in Nevada was practically monitored only from rather long distances and with a high detection threshold. At first, this proposal met strong objections, but in the end other delegations had to admit that the Russian claim was justified. The current Treaty envisages an IMS network that meets the principle of equal transparency of the test sites.

Entry into force modalities

The provision on the modalities of the Treaty's entry into force was of primary importance in terms of viability and effectiveness of the future CTBT. Indeed, even if a best possible Treaty was to be negotiated but not ratified by the key players, but it entered into force nonetheless, it may become a caricature of itself rather than an effective means of strengthening international security. Considering this, the Russian delegation, from the very outset of the negotiations, advocated mandatory participation in the Treaty of all the five nuclear powers and – which is critically important – of the States capable of developing nuclear arms as a condition of its entry into force. Since this condition was practically impossible to formulate legally without violating the principle of sovereign equality of all States, it was necessary to select an objective criterion that would not hurt anyone's prestige and yet encompass all the countries of special concern in terms of the Treaty's purposes. Such a criterion was found as early as in 1994, when the Russian delegation proposed that the CTBT should enter into force after the instruments of ratification had been deposited by all States possessing nuclear power plants and/or research reactors.

This proposal gave rise to one of the most acute controversies. Some delegations strongly opposed the proposal. They insisted on a 'more democratic formula' providing for the Treaty's entry into force as soon as a certain number of countries had deposited their instruments of ratification, without specifying which countries these should be. However, Russia's position was actively supported by some important delegations, with a significant number of countries favouring it as well.

Eventually, this approach was accepted by all participating States with only slight modifications. The Treaty is supposed to enter into force only after the 44 Member States of the Conference on Disarmament listed in the Treaty's Annex 2 have ratified it. According to the IAEA, these States possessed, at the time of the negotiations, nuclear power plants and/or research reactors.

As a result of the 10 September 1996 vote, Resolution 50/250 providing for the opening of the Treaty for signature was adopted by the United Nations General Assembly by 158 votes in favour. Three States voted against – India, Bhutan and Libya, and five States abstained – Tanzania, Cuba, Syria, Lebanon and Mauritius.

The CTBT opened for signature on 24 September 1996. On the first day, representatives of 71 States signed it, including the 'Nuclear Five'. Foreign Minister Yevgueny Primakov signed the Treaty on behalf of Russia. ■

Biographical note

Ambassador Grigory Berdennikov is the Permanent Representative of the Russian Federation to the International Organizations in Vienna.

Ambassador Berdennikov studied at the Moscow Institute of International Relations. He joined the diplomatic service in 1973 and served in various positions at the Permanent Mission of the USSR to the United Nations in New York (1973-1978) and in Geneva (1981-1986). He also held positions at the Department of International Organizations (1978-1981) and at the Department of Arms Limitation and Disarmament of the Ministry of Foreign Affairs in Moscow (1986-1992).

Between 1992 and 1993, he was Deputy Foreign Minister of the Russian Federation. He was then appointed Permanent Representative of the Russian Federation to the Conference on Disarmament (1993-1998). Between 1999 and April 2001, when he took up his present post in Vienna, he served again as Deputy Foreign Minister of the Russian Federation. ■

Verification highlights

IMS station installation in Kamchatka: A challenging mission to one of the remotest places on earth

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.

ON THE WAY TO THE INSTALLATION SITE OF IS44 AND PS36, KAMCHATKA, RUSSIAN FEDERATION

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.

As of 31 October 2005, 208 of these stations are installed and are either certified as part of the IMS or substantially meet specifications. Of these 208 installed stations, approximately 178 are sending data to the International Data Centre in Vienna. An additional 73 stations are either already under construction or under contract negotiation, and 87 stations and four radionuclide laboratories have contracts for operation 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 approximately 90 per cent of the IMS network will be completed and sending data to Vienna. ■

The Kamchatka peninsula is situated in the far east of the Russian Federation, nine time zones from Moscow. It occupies an area of more than 470,000 square kilometres, the combined size of Germany, Austria and Switzerland, with only 400 000 inhabitants. Due to its location on the north-western edge of the Pacific 'ring of fire', which is formed where the Pacific Plate collides with other tectonic plates, Kamchatka developed a landscape of exceptional natural beauty, consisting of more than 400 glaciers and 160 volcanoes, 29 of them still active, geysers and natural thermal springs, remote lakes, wild rivers, impressive mountain ranges and a spectacular coastline.

Until the early 1990's, Kamchatka was closed to foreigners and even most Russians, due to its strategic importance and the substantial military presence on the peninsula: Kamchatka is home to the Russian Pacific Submarine Fleet, has several major airbases and is an important testing ground for Inter-Continental Ballistic Missiles. While Kamchatka was shrouded in military secrecy, its animal population was left to flourish: The peninsula contains great species diversity, including the world's largest variety of salmon and the densest population of brown bears in the world. The bears, which reach an enormous size of up to three meters in length and 1000 kg in weight, live all over the peninsula.

BEAR ENCOUNTER ON THE ROAD TO INSTALLATION SITE

In October 2005, two staff members of the Provisional Technical Secretariat (PTS) returned from a four week mission in Kamchatka, where they supervised and coordinated the installation work for primary seismic station PS36 and

infrasound station IS44, located in a military base some 100 kilometres from Petropavliovsk-Kamchatskiy, the regional capital. The 30 installation team members consisted of Russian and Canadian specialists with different backgrounds, reflecting the complex contracting situation of the project.

The installation of these two International Monitoring System (IMS) stations is a landmark achievement in the entire process of establishing IMS stations in the Russian Federation. The preparatory work, which included design and execution of the site preparation, complex equipment procurement and other logistical, technical and administrative processes, stretched over five years.

The two co-located arrays required massive site preparation activities for the installation of the well-designed and built vaults, robust and modern radio antenna towers and state of the art central recording facilities. The site preparation activities were particularly challenging due to the harsh environment and the short summer, the only time of the year when such work could be carried out.

DISCUSSION OF INSTALLATION LOGISTICS AT IS44, KAMCHATKA, RUSSIAN FEDERATION

ONE OF THE 18 METRES TALL COMMUNICATIONS TOWERS INSTALLED AT IS44 AND PS36, KAMCHATKA, RUSSIAN FEDERATION

The project was also complex because of the different types of equipment – seismic, infrasound, communications and computer equipment – which needed to be procured from different suppliers in all three fields. The seismic and the digital parts of the infrasound equipment were delivered from Canada, the microbarometers from France, and the Canadian built communications and computer equipment was supplied from Moscow. Some smaller items were provided directly by the PTS. Integrating and assembling these various system components in the field required intensive preparation by the PTS staff members prior to the mission.

For hands-on training and for facilitating the completion of the first stage of the installation, the PTS team received support from two officers of the Special Monitoring Service, which is part of the Russian Ministry of Defence. The officers, graduates from the military academy with specialization in seismic monitoring, successfully installed the seismometers and digitisers in the vaults.

The PTS team was cut off from material and food supply for four days when a series of explosions in a naval ammunition depot on 1 October, located half way between the installation site and the accommodation of the PTS team, caused the

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SEALING THE INFRASOUND PIPE ARRAY, IS44, KAMCHATKA, RUSSIAN FEDERATION

Verification highlights

Development of noble gas equipment for OSI purposes

Radioactive noble gas (RNG) isotopes are the only radioactive elements that are likely to escape into the environment from a well-contained underground nuclear explosion. Therefore they play an important role in the different verification aspects of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), particularly in the case of an on-site inspection (OSI).[1]

During an OSI, RNG isotopes are measured based on considerations of yield (enough activity must be produced) and life time: The isotope in question must be long-lived enough to allow detection days or weeks after an event, and short-lived enough not to cause a continuous build-up of ambient background activity from various innocuous sources. Most isotopes fail either or both of these tests, but for OSI purposes four isotopes of xenon (131mXe, 133mXe, 133Xe and 135Xe) and one isotope of argon (37Ar) are of relevance. The xenon isotopes are fission products or are produced in the decay of fission products, while 37Ar is produced by high-energy neutron activation of calcium.

The development of RNG measurement equipment suitable for OSI purposes involves the production of mobile versions of xenon sampling and analysis systems and the adjustment of these systems to OSI-specific challenges, such as mobile field operations taking place under time pressure, potentially limited supplies of power, spare parts and repair facilities, and possible lack of transportation and trained personnel. Significant progress has been made in the re-engineering of RNG measurement equipment with the support of the Preparatory Commission, based on equipment designed for International Monitoring System purposes.

Furthermore, a crucial capability envisioned for an OSI system is the analysis of sub-soil gas samples. This task entails a limitation in available sample size which is not present in atmospheric sampling as well as a sample composition which is radically different from that of an atmospheric sample.

The development of the capability to detect the noble gas isotope 37Ar is unique to the OSI application. This isotope has a considerably longer half-life than the CTBT-relevant radio-xenon isotopes, and would so be more likely to remain in detectable quantities during the time-frame of an OSI. On the other hand, stable argon comprises an enormously larger fraction of standard air than does xenon, potentially resulting in unwieldy sample sizes once the chemical separation is accomplished. In addition, the determination of the sample activity is complicated by the very low energy of the emitted ionizing radiation.

A DETACHED HELICAL XENON GAS ADSORPTION COLUMN WHICH FORMS PART OF THE COMPLETE SAMPLE PURIFICATION SYSTEM

These difficulties could be mitigated by off-site measurement of samples in a designated laboratory – such a solution would be more profitable in the case of 37Ar than in the case of the radio-xenons due to the longer life-time of the former. Consequently, Provisional Technical Secretariat support to mobile argon sampling development by one Member State institution is complemented by support to another Member State institution to establish the capability for high-sensitivity laboratory measurements of samples collected on-site. This will also allow inter-comparison measurements with independent methods, an approach which has proven useful in the development of RNG analysis for the International Monitoring System.

To realize the potential of any of these techniques for OSI purposes, practical issues such as sub-soil sample extraction must be addressed, as well as issues of a more methodological character, such as the most profitable ways of employing the RNG equipment in an OSI situation. To address this challenge, further information and studies of noble gases migration from the site of an underground nuclear explosion would be necessary. ■

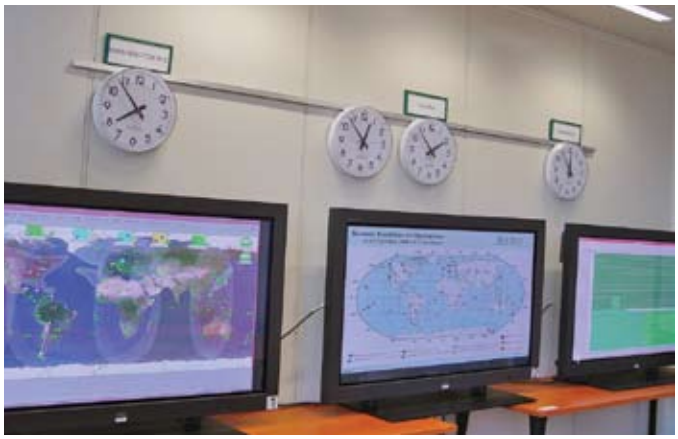
[1] An OSI clarifies whether a nuclear explosion has taken place in violation of the Treaty and gathers facts which might assist in identifying any possible violator. It can only be carried out, with the approval of the Executive Council, once the Treaty has entered into force.

Cross-divisional O&M coordination of the verification system

As the construction of the monitoring system advances, the task of provisional operation and maintenance (O&M) becomes ever more important. Since 2003, the Provisional Technical Secretariat (PTS) has been performing provisional O&M under more relaxed guidelines for data availability requirements than those expressed in the draft International Monitoring System (IMS) and International Data Centre (IDC) Operational Manuals which provide standards for performance following entry into force of the Treaty. The Commission has approved the continued application of these relaxed guidelines until the end of 2006. Nevertheless, processes and procedures must be designed, tested and practised so that the standards envisaged after entry into force can be met.

The provisional operation of the monitoring system involves generation of data at the IMS facility, data transmission to the IDC in Vienna, receipt and storage of data, automatic and interactive processing of data to create bulletins, and, finally, distribution of data and products to States Signatories. In order to be successful, this activity clearly requires the coordination of many different actors.

In March this year, the PTS established a cross-divisional Operations Centre which provides centralized monitoring and support functions for operation and maintenance of the verification system. It is currently located in temporary premises until completion of the outfitting of a permanent location which will enhance effectiveness and visitor access. This Operations Centre enables the efficient detection and resolution of incidents that affect operation, whether they occur at a remote location or at the Headquarters in Vienna. For more complex cases, after incident detection in the Operations Centre, the problem is referred to the appropriate party for resolution.



DISPLAY SCREENS AT THE PTS OPERATIONS CENTRE, VIENNA, AUSTRIA

The PTS is continuing to develop the unified tools and processes to record and track problems in the verification system and to monitor its state of health. An incident tracking tool supports a mechanism to open an incident report on any and every data outage and to track the incident until resolution. A system for monitoring state of health provides status information on a wide variety of hardware and software items at remote facilities and at Vienna Headquarters. As an added advantage, the tools and processes at the Operations Centre generate O&M statistics which can be used to assist in the elaboration of policies to enhance performance and optimize costs.

In performing the above tasks, various Divisions of the PTS collaborate to achieve the goals set for the PTS. Further, many of the actors are external to the PTS, such as station operators (designated by the host States), other State institutions as well as contractors to the PTS. The work of all of these actors needs to be successfully coordinated in order to produce optimum results. ■

ROUND TABLE MEETING AT THE PTS OPERATIONS CENTRE, VIENNA, AUSTRIA

Potential civil and scientific applications

IMS data on natural radionuclides released for WMO Programmes

By Dieter C. Schiessl

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.

DAILY CHANGE OF FILTER IN THE AIR SAMPLER AT RN51, NEW HANOVER, PAPUA NEW GUINEA

The Preparatory Commission for the CTBTO and the World Meteorological Organization (WMO) recognized soon after the establishment of the CTBTO that active collaboration would be beneficial for both organizations in fulfilling their missions and meeting their goals. To formalize and strengthen mutual cooperation and consultation, WMO and CTBTO signed a working agreement in mid-2003.

Within the framework of that agreement, several key activities have been implemented or are being pursued which have benefited or would benefit from civil and scientific applications of International Monitoring System (IMS) data and from methodologies, technical advice and services provided to the CTBTO by forecast centres and the Secretariat of WMO. These include in particular:

- CTBTO provides meteorological parameters, which were measured at selected IMS sites, to WMO;
- WMO provides specific meteorological forecast models and products to CTBTO to support calculations of backtracking of detected radionuclides (see CTBTO Spectrum 2, July 2003);
- studies to assess the application of IMS infrasound data to detect explosive volcanic eruptions for improved early warning to civil aviation against ash plumes (see CTBTO Spectrum 3, December 2003); and
- CTBTO provides IMS natural radionuclide measurements to WMO to strengthen the Global Atmosphere Watch (GAW) programme.

AIR INLET OF AUTOMATIC RADIONUCLIDE STATION, RN34, REYKJAVIK, ICELAND

This article illustrates the use and the benefit that could be gained by the GAW from additional routine measurements of natural radionuclides. The GAW is a global programme for systematic monitoring of the chemical composition of the atmosphere, related environmental analyses and assessments, and development of a predictive modeling capability on global, regional and urban scales. Within the GAW, the collected data are made available to international GAW data centres. The international community of environmental scientists accesses the archives to support research on atmospheric dynamic processes, pollutants and on the cycles of natural radionuclides originating from continental soils and from cosmogenic production.

A relative thin network of stations exists under the GAW network that measures natural radionuclides. Such measurements, including those of radon-222 (^{222}Rn), radon-220 (^{220}Rn) , lead-212 (^{212}Pb), lead-210 (^{210}Pb), beryllium-7 (^{7}Be), beryllium-10 (^{10}Be) and carbon-14 monoxide (^{14}CO), are essential to monitor atmospheric composition and air quality, to examine a variety of atmospheric processes and to validate global chemical transport models.

For example, evaluations of atmospheric chemical transport models rely in part on accurate estimates of the ^{222}Rn source term. Due to lack of reliable and representative measurements, our knowledge of the magnitude and the distribution of ^{222}Rn flux to the atmosphere over the earth's surface is still rather insufficient. Mapping the variation of ^{222}Rn flux over

MANUAL STATION AIR SAMPLER AT RN29, RÉUNION, FRANCE

the earth's surface requires supplementary information on a number of factors, such as type, temperature and moisture of the soil, as they control the release of ^{222}Rn gas to the atmosphere. Suitable global datasets are needed to predict ^{222}Rn emissions which are generated by the decay of ^{226}Ra. However, global information on ^{226}Ra in the soil is incomplete and observations of vertical profiles of ^{222}Rn concentrations are sparse. Due to the short half-lives of the ^{222}Rn offspring and the current sampling and counting practices at IMS stations, the CTBT system does not provide data on ^{222}Rn. This could be rectified, but would imply some extra costs and efforts.

While ^{210}Pb and ^{7}Be concentrations on the surface are measured routinely at the GAW stations by weekly cumulative filtration and subsequent gamma counting, very few measurements exist to assess the trans-continental transport of these radionuclides. Radionuclides, such as ^{210}Pb, ^{7}Be and ^{10}Be, which condense on particle surfaces, provide tests of aerosols physical processes including wet and dry deposition. In the last decade, substantial progress has been made in the field of numerical simulation of cosmogenic nuclide production rates. The rates as functions of altitude, latitude, solar and geomagnetic field intensity are available. With the advent of new particle flux measurements, the quality of numerical models can be tested.

Techniques of measuring radionuclides need to be standardized and harmonized, observations need to be collected and archived with information on uncertainty and, finally, research to generate even better source functions is needed.

Much still remains to be done to understand better the complex air chemistry processes. Researchers and operational environmental monitoring experts hope to gain substantive new knowledge from additional routine observations provided by IMS monitoring stations. In order to be useful, these observations need to be carried out on a truly world-wide scale and the station density of the final IMS network is really helpful in this context. It is now important that CTBTO and WMO intensify their cooperation in setting up the necessary data management functions to facilitate access to IMS data by the GAW data centres. ■

HIGH-PURITY GERMANIUM DETECTOR IN ITS LEAD SHIELD WITH AN INNER COPPER LINING

Biographical note

Dieter C. Schiessl is the Director of the World Weather Watch Department in the World Meteorological Organisation (WMO) since 2002. He studied Nuclear Physics at the Universities of Munich and Erlangen in Germany. After more than 15 years in the German Military Geo-Information Service, he joined WMO in 1989. From 1992 to 2002 he served as Director for Basic Systems, coordinating various WMO programmes related to the global meteorological infrastructure. In his current position he is responsible for the coordination of the operational collaboration, standards and procedures for observations, weather forecasting and information exchange of the National Meteorological Services of the WMO Members. ■

Potential civil and scientific applications

Tsunamis and the International Monitoring System

It often takes a tragedy to focus minds on disaster prevention and preparedness. Following the tsunami generated by the massive earthquake off Sumatra on 26 December 2004, the Provisional Technical Secretariat (PTS) received various enquiries from interested parties: Could we help to warn of such a disaster in the future, especially in the Indian Ocean region? The PTS was invited to participate in international meetings held under the auspices of UNESCO and the International Oceanographic Commission, which were considering the extension of existing tsunami warning systems into the Indian Ocean region. On 4 March 2005, the 24th session of the Preparatory Commission tasked the PTS to begin exploring its capability with National Authorities and with international tsunami warning organizations recognized by UNESCO. This task was renewed in November 2005 at the Commission's 25th Session.

For the analysts in the International Data Centre (IDC), the Sumatra earthquake of 26 December 2004 posed a very different problem. A large earthquake generates many aftershocks large and small, and many thousands were recorded by the International Monitoring System (IMS) during the following weeks. The sheer number of aftershocks created an unprecedented workload for analysts, and the Reviewed Event Bulletin for 26 December contained some ten times the average number of events. The issuance of Reviewed Event Bulletins for some days following 27 December had to be postponed.

Technically, the PTS could offer a number of special contributions to a tsunami warning effort. One would be the provision of data in near-real time from IMS seismological stations in remote regions where no other suitable stations exist; this is particularly relevant for the stations of the IMS auxiliary seismic network. Moreover, the Global Communications Infrastructure allows data to be transmitted immediately and continuously from the remotest of stations with high reliability.

TSUNAMI HITTING THE COAST OF PHUKET, THAILAND, 26 DECEMBER 2004

A further PTS contribution might be in the rapid location of the largest earthquakes. To this end, a 'proof of concept' has been conducted to demonstrate that, with minor reconfiguration of existing software, the IDC can produce location estimates of some large earthquakes within 20 minutes of their occurrence. Many IMS seismic stations consist of multiple sensors arranged in an 'array'. Seismic arrays are better for locating earthquakes, and the PTS can use this advantage when computing rapid location estimates – something not normally possible for disaster agencies.

Since the Commission's decision of 4 March 2005, the PTS has begun forwarding continuous data from selected seismological and hydroacoustic stations of the IMS on a test basis to the Northwest Pacific Tsunami Information Centre in Tokyo, Japan, and to the Pacific Tsunami Warning Centre in Hawaii, United States of America. Presentations at the 25th session of Working Group B by experts from international tsunami warning organizations, and from representatives of national institutes, concluded that data from the IMS were potentially of high value for tsunami warning purposes, partly because data are often transmitted faster and with higher reliability from station to warning organization. This gave encouragement that IMS data could contribute in a very practical way to tsunami warning efforts. The forwarding of data from the IDC in Vienna on a test basis to international tsunami warning organizations is continuing, and will be discussed further at the 26th Session of Working Group B in February 2006. ■

Verification science

A new tool for NDC analysis of atmospheric transport calculations

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 Provisional Technical Secretariat (PTS) requires a state of the art atmospheric transport modelling (ATM) to be able to determine the possible source region of a disguised or decoupled nuclear explosion.

Since August 2002, the PTS calculates source-receptor sensitivity (SRS) fields for each of the radionuclide samples taken at the radionuclide stations of the International Monitoring System in order to describe the transport of nuclear debris from possible test locations to these stations.

A computationally demanding effort, the daily calculation of the SRS fields is done at the International Data Centre (IDC) in a centralized manner, utilizing the global wind field analysis data provided by the European Centre for Medium Range Weather Forecast. With this database of SRS fields at hand, the remaining generation and visualization of the final ATM products such as the best possible source region estimation information, called a 'Field-of-Regard', is just a post-processing effort that can be done even on a notebook, provided it has access to the SRS data base at the IDC.

Based on this concept, the IDC designed and developed the so-called web connected graphics engine (WEB-GRAPE) software that the PTS and the National Data Centres (NDCs) can use to explore the full potential of the SRS database. It analyzes the relation between a detection of an event in the radionuclide network and possible emission points on the globe.

WEB-GRAPE hosts the generation and visualization of the following ATM products:

- the radionuclide sample specific 'Field-of-Regard' product for the Reviewed Radionuclide Report;
- the event period specific 'Possible-Source-Region' product, identifying those radionuclide samples that are caused by the same nuclear event, thus belonging to the Standard Screened Radionuclide Event Bulletin;
- the multi-model versions of the above mentioned products, supporting an integrated assessment and visualization of the data shared with authorized external meteorological centres under the umbrella of the CTBTO-World Meteorological Organization (WMO) Co-operation Agreement. In addition to addressing the uncertainties inherent to any kind of ATM calculation, these products also serve quality assurance purposes.

In preparation of the WEB-GRAPE software development, the PTS paid much attention to a user-friendly graphic interface design that allows the user to focus on the interpretation of the ATM products without loosing time on operation and maintenance of the underlying ATM efforts. The navigation through the ATM products is, for example, facilitated via the integrated zooming and calendar function.

Finally, WEB-GRAPE also provides a data fusion function by co-displaying radionuclide and waveform event location information (see pink ellipses for waveform data in figure 1). Future use and elaboration of this feature by the PTS and NDCs might

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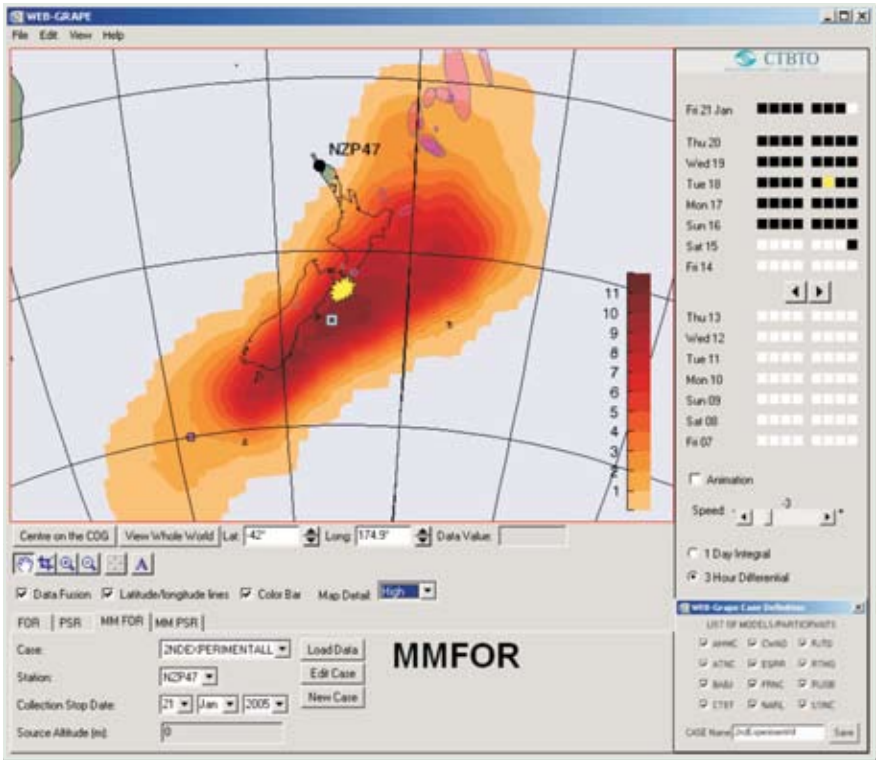


FIGURE 1: SOURCE REGION ESTIMATION OF A HYPOTHETICAL NUCLEAR EVENT BASED ON THE RESULTS OF THE JANUARY 2005 CTBTO-WMO EXPERIMENT.

Secretariat snapshots

The new state of the art computer centre of the PTS

In August 2005, the new computer centre of the Provisional Technical Secretariat (PTS) took up operations, following an intensive planning, procurement and construction process. Located in the basement of the central conference building at the Vienna International Centre (VIC), this high-tech computer centre hosts all central computer systems, networking devices and related infrastructure equipment that support the verification regime of the Preparatory Commission.

The Computer Infrastructure Section supervised and coordinated the meticulously prepared move of all equipment during a single weekend. Essentially, all equipment needed to be disconnected, disassembled, reassembled and reconnected within this short time frame. The most critical device was the so-called Mass Storage System, comprising 5000 cartridges, which carry about 100 Terabytes (10^{12}) of data. These cartridges contain all verification related data that have been collected since the start of the International Monitoring System in 1997 and all data from the prototype International Data Centre dating back some more years.

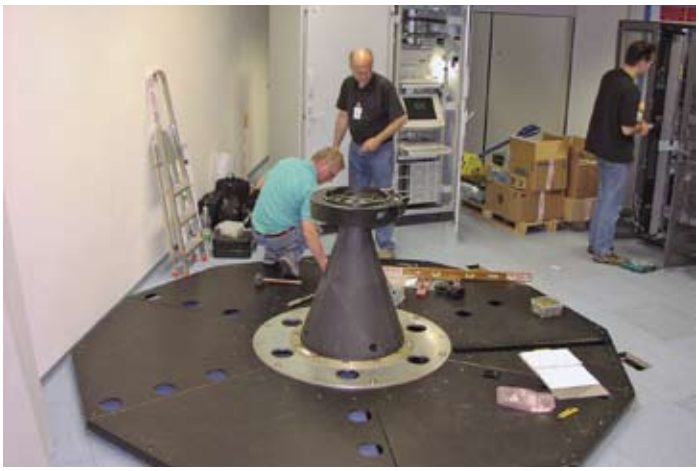
The underlying design for power-provision is fully self-sufficient in the case of power outages, relying on two 500kVA emergency diesel generators, un-interruptible power supply and an intelligent cabling system. The glass-fiber and copper network cabling is laid out in a structured fashion that minimizes the connection-time for new equipment. Air-conditioning units guarantee a temperature between 20-25° C, reducing the heat produced by all equipment located in more than 30 large computer racks.

The new computer centre features state of the art technology to provide optimum security for the data. In the case of fire or flooding, detectors will initiate alarms with the VIC and Viennese fire-brigades within seconds. Devices will automatically launch an inert chemical gas that will extinguish any fire.

Over 300 measuring points, registering person access, smoke, water leakage, temperature and humidity control systems, are positioned strategically to measure any anomalies in the centre and alert the VIC Buildings Management Service in the case of malfunction or danger.

CRANE MOVING UNINTERRUPTABLE POWER SUPPLY TO THE NEW PTS COMPUTER CENTRE

With these technologically advanced security measures, the centre is well equipped to fulfill the important computer security requirements of the Treaty. The centre has a visitors area which presents an overview of the verification regime and allows a peek into the construction phase and the current operations. ■



REASSEMBLING THE MASS STORAGE SYSTEM

THE NEW COMPUTER CENTRE AT THE VIC, VIENNA, AUSTRIA

CTBTO exhibition displayed at the Article XIV Conference

A CTBTO EXHIBITION CALLED 'CTBT – A GLOBAL VERIFICATION REGIME' PREPARED BY PUBLIC INFORMATION WAS DISPLAYED ON THE OCCASION OF THE 2005 CONFERENCE ON FACILITATING THE ENTRY INTO FORCE OF THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY IN NEW YORK, 21-23 SEPTEMBER 2005. ON ELEVEN PANELS, SIX FREE-STANDING SCREENS AND 24 PHOTOGRAPHS, THE EXHIBITION DETAILED HOW THE GLOBAL VERIFICATION REGIME WILL BE USED TO MONITOR COMPLIANCE WITH THE CTBT. A GLOBE DEPICTING ALL INTERNATIONAL MONITORING SYSTEM FACILITIES WAS ALSO PART OF THE EXHIBITION.

PTS establishes independent mediation procedure

Mediation has become a widely practiced form of alternative conflict resolution in the workplace. Mediation is an informal process in which a neutral third party, an independent mediator, assists the conflicting parties to reach a voluntary, negotiated resolution to their dispute. Mediation is strictly confidential and can help address discrimination or harassment grievances.

The CTBTO Preparatory Commission and its Provisional Technical Secretariat (PTS) are committed to ensure a multicultural work environment. No discrimination or harassment on the basis of race, ethnicity, religion, gender, sexual orientation, physical abilities or any other characteristic is tolerated within the Secretariat.

An Administrative Directive issued earlier this year sets out policies and procedures to address harassment-related grievances in the workplace. In the case of a harassment-related complaint, Administrative Directive No. 52 establishes a three-step procedure which every staff member has the right to invoke: an informal approach, a mediation procedure and a formal investigation.

The informal approach suggests that the best course of action is for the complainant to talk with the staff member whose behaviour is giving offence. If a staff member considers this approach inappropriate or unsuccessful, the staff member may contact one of the Independent Mediators, either directly or through the Mediation Secretary.

Working on a strictly confidential basis, the Independent Mediators will assist conflicting parties to find a workable resolution to their dispute. The Independent Mediators are nominated for a renewable period of two years. They function as individuals and are fully independent of any official or organizational entity.

Mediation gives the parties the opportunity to discuss the issues raised in the charge, clear up misunderstanding, determine the underlying interests or concerns, find areas of agreement, and ultimately, incorporate those areas of agreements into the conflict resolution.

If mediation does not lead to a satisfactory solution of a conflict, formal ways of addressing the issue may be taken.

Earlier this year, six PTS staff members were trained in conflict management and mediation by instructors from the Vienna Economic University. Five of them will serve as Independent Mediators and one will function as the Secretary of the Mediators. ■

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 Final Declaration of the 2003 Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty (Article XIV Conference) called for concrete measures to promote the entry into force of the Treaty. Since then, Member States undertook an impressive number of bilateral and multilateral activities which were partially coordinated and supported by the Provisional Technical Secretariat (PTS) and made available in a detailed compendium to the participants of the 2005 Article XIV Conference.

At the bilateral level, these initiatives included a wide range of activities consisting of: outreach activities aimed at promoting the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and encouraging its signature/ratification; assistance to the Special Representative of the Ratifier States; assistance to facilitate visits of the Executive Secretary and other PTS missions and their follow-up; provision of voluntary contributions for national seminars and information visits as well as organization of technical training programmes. In total, such bilateral initiatives targeted some 45 States, including all eleven Annex 2 States which have yet to sign/ratify the Treaty.

At the multilateral level, about 13 international organizations and multilateral forums adopted resolutions and declarations on CTBT or calling for its entry into force. In addition, a number of sub-regional workshops and expert meetings on enhancing Treaty understanding and national capacity building were organized. ■

PRESENTATION DURING INTERNATIONAL COOPERATION WORKSHOP, GUATAMALA CITY, GUATAMALA, 19-21 SEPTEMBER 2005

International cooperation

In the field of international cooperation, the Provisional Technical Secretariat (PTS) continues to organize workshops which aim at enhancing the understanding of the Treaty and the work of the Preparatory Commission, promoting technical cooperation among Member States and providing legal and technical assistance for national capacity building.

Recently, two workshops have taken place: One, from 19 to 21 September 2005, for the States of Latin America and the Caribbean, in Guatemala City, Guatemala, and the other one, from 18 to 20 October 2005, for the States of South East Asia, the Pacific and the Far East, in Seoul, Republic of Korea. Both workshops were well attended. The discussions focused on promoting regional security by adhering to the Treaty, prospects of its ratification in the respective regions, national implementation measures, progress in the installation of the International Monitoring System stations, technical cooperation among States and with other regions, and potential benefits deriving from civil and scientific applications of verification data. ■

PARTICIPANTS AT THE REGIONAL WORKSHOP ON CTBTO INTERNATIONAL COOPERATION, SEOUL, REPUBLIC OF KOREA, 18-20 OCTOBER 2005

Training

The Provisional Technical Secretariat (PTS) offers a wide range of training and capacity building activities. To coordinate them better, work is ongoing to establish an integrated PTS training management system keeping track of training schedules, history, attendants and related documents.

The databases linked to the system include information on International Monitoring System (IMS), International Data Centre and On-Site Inspection training and capacity building activities, international cooperation workshops and Personnel staff training. Information on States-sponsored training programmes for developing countries such as hands-on training programmes for National Data Centre staff and IMS station operators as well as on information visits is also included in this training management system. In August, the work on populating the database was started with the support of the software provider.

In addition, the PTS initiated plans on how to enhance capacity building activities through e-training. It is also proposed that the meetings of the Preparatory Commission and its subsidiary bodies will be made available to States through video streaming. ■

INTERNATIONAL DATA CENTRE ADVANCED TRAINING COURSE FOR NDC STAFF AT PTS HEADQUARTERS, VIENNA, AUSTRIA, 5-9 DECEMBER 2005

IMS station installation in Kamchatka: A challenging mission to one of the remotest places on earth

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PICTURE TAKEN FROM THE COMMUNICATION TOWER IN RADIO LINE-OF-SIGHT TO THE CENTRAL RECORDING FACILITY (CIRCLED IN RED), KAMCHATKA, RUSSIAN FEDERATION

MEASUREMENTS INSIDE CENTRAL ARRAY ELEMENT PS36, KAMCHATKA, RUSSIAN FEDERATION

closing of the only road and the evacuation of more than 4000 residents in the area.

Given all the challenges this mission had to overcome, it is a major achievement that PS36 and IS44 are sending test data since 1 December, which are transmitted in near-real time first to the Russian National Data Centre in Dubna and then forwarded to the IMS laboratory in Vienna. All this would not have been possible without the excellent cooperation among the members of the multinational installation team, especially the officers of the Special Monitoring Service, and the helpfulness of the local population. ■

Treaty Status

Signatures 176
Ratifications 126
Annex 2 Ratifications 33

AS OF 8 DECEMBER 2005

A new tool for NDC analysis of atmospheric...

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help to formulate suitable requirements for a still to be developed Fused Event Bulletin.

In the 2005 CTBTO-WMO experiment, twelve participating meteorological centres were tasked to find a hypothetical nuclear event that was chosen randomly to take place on 18 January close to the eastern coastline of New Zealand. Figure 1 on page 19 demonstrates how WEB-GRAPE created a 'multi-model Field-of-Regard' (MMFOR) based on the data provided during the experiment for the first event detection that was calculated to occur on 21 January at the radionuclide station Kaitaia (RN47), New Zealand. It is worth noting that the maximum number of overlaid 'Fields-of-Regards' (blue box) is located close to the real source location of the hypothetical event (yellow object). ■

CTBTO Spectrum contributors list

Editorial Board: Andrew Michie, Don Phillips, Florence Riviere, Daniela Rozgonova, Makoto Takano, Bernhard Wrabetz

PTS staff contributors:
Silvia Alamo, Sergio Barrientos, Andreas Becker, Hong-Lae Chang, Anthony Cook, Andre Cumagun, Ana Teresa Dengo, Emil Farkas, Lars-Erik De Geer, Cecilia De Vera, Karla Karhu, Kirsten Haupt, Martin Lawrence, Pavel Martysevich, Andrew Michie, Vikram Patel, Bob Pearce, Don Phillips, Lamine Seydi, Yuri Starovoit, Joep Winkels

Prepared and coordinated by: Andrea Wurm
Layout and design: Todd Vincent
Distribution: Christian Evertz

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Calendar of Meetings 2006

Preparatory Commission:
26th Session 20 – 23 June 2006
27th Session 13 – 17 November 2006

Working Group A:
29th Session 29 May – 2 June 2006
30th Session 2 – 6 October 2006

Working Group B:
26th Session 13 Feb. – 3 March 2006
27th Session I 15 – 26 May 2006
27th Session II 28 August – 8 Sept. 2006

Advisory Group:
26th Session I 24 – 28 April 2006
26th Session II 15 – 19 May 2006
27th Session 4 – 8 September 2006

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Public Information
Preparatory Commission for the
Comprehensive Nuclear-Test-Ban
Treaty Organization (CTBTO)

Vienna International Centre
P.O. Box 1200
1400 Vienna, Austria

T +43 1 26030 6200
F +43 1 26030 5823
E info@ctbto.org
I www.ctbto.org

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