

Democratization of Monitoring

by Raymond Jeanloz

The International Monitoring System (IMS) is being successfully deployed, with more than 80 percent of its stations operational and an independent technical assessment of its capabilities – the International Scientific Studies (ISS) project – underway. Its sensitivity and reliability are also validated by non-IMS – even non-governmental – capabilities, from the global community of research seismologists to the commercial availability of high-resolution satellite imagery. It has also successfully confronted a real-world application in its definitive assessment of North Korea’s sub-kiloton nuclear test of 9 October 2006.

It is time to capitalize on the momentum of this deployment by making plans for broadening global monitoring with more stations and a greater diversity of sensors, and by engaging a wider range of communities.

Potential civil and scientific applications

Expanded monitoring capability, with increased spatial density, improved sensitivity and diversified applications, offers significant opportunities. A case in point is the recent enhancement in tsunami warning, motivated by the tragic consequences of the Sumatra earthquake of 26 December 2004. Infrasound can be used to help monitor volcanic eruptions that threaten commercial flights, and bolides that continuously enter the atmosphere from space; and seismometers provide crucial information about earthquake hazards. These are all significant enhancements beyond the IMS’s immediate responsibilities of nuclear test-ban monitoring.

Whether as part of the IMS or as separate deployments, one could envision far more extensive monitoring of the 3-D time-variable properties of the oceans, as well as



ERUPTION OF VOLCANO LOPEVI, VANUATU.

the gases and aerosols of the atmosphere. The latter can greatly improve atmospheric modelling as well as environmental monitoring, in both cases of great benefit to society. It may even be possible to apply the astronomer’s concept of a “guide star” by using controlled sources of sound to improve high-resolution spatial-temporal imaging of the oceans and atmosphere.

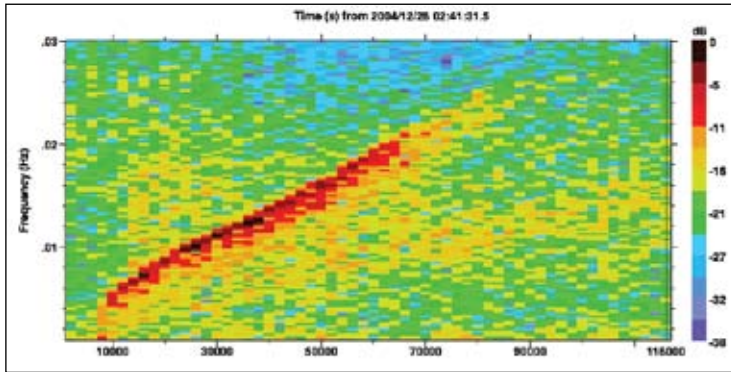
Recognizing that micro-organisms can be lofted across oceans or continents on small particles, there is even a potential impact on public health with better characterization of disease transmission around the globe.

Treaty’s technological opportunities

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) represents one of the most extensive and – from a technical perspective – most successful applications of science and technology in the realm of international treaties. It is this success that offers new opportunities as the technologies continue to develop, all the more so as capabilities that were once in the sole domain of nations or large institutions – overhead imagery, seismic records, near-instant global communication, and more – are becoming available to the world at large. It is barely an oversimplification to suggest that the



THE DEVASTATING FORCE OF A TSUNAMI.



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.

validate and continuously improve IMS technical capabilities. The key will be to identify means by which interested outsiders can communicate with each other as well as with the Treaty professionals in improving global monitoring and

monitoring of our global environment more broadly and to reaffirm the international norms represented by the Treaty's regime. ■

Biographical note



Raymond Jeanloz is Professor of Earth and Planetary Science and Astronomy at the University of California, Berkeley, where he conducts scientific

research on planetary interiors and on materials at high pressures. Jeanloz also chairs the U.S. National Academy of Sciences' Committee on International Security and Arms Control that engages in scientist-to-scientist dialogue on topics ranging from nuclear weapons and non-proliferation to biological threats and counter-terrorism. ■

IMS is constantly checked: not only through the efforts of interested governments, but at least as much by the community of graduate students and other researchers monitoring the globe through their internet access to vast arrays of sensors and data banks.

enhancing its applications, all in a manner that is constructive of – and avoids undermining – the Treaty and its verification regime. One approach is through the scientific community's engagement in the ongoing ISS project. Another useful mechanism may be through a Treaty-monitoring "wiki," an internet-based forum that is publicly accessible but editorially controlled, for exploring new ideas about monitoring, exchanging open data and even discussing anomalous events.

Treaty monitoring must be left to the professionals, and there is no intention of suggesting inadequacies in this regard. To the contrary, non-specialists can be highly supportive of the professionals' efforts, a case in point being the academic community that has served to both

In the end, the objective is to build on the success of the CTBT's IMS, both to expand

Notes & quotes



"I will begin working to build the necessary bipartisan support for US ratification of the Comprehensive Nuclear Test Ban Treaty, which would impose a worldwide ban on nuclear testing under the watch of a far-reaching verification regime. Winning approval of two-thirds of the Senate will be a long and difficult process. It will require the unyielding support of the Obama administration and my colleagues on both sides of the aisle. But success would be the single greatest arms control accomplishment for the new Senate and it would reestablish America's traditional leadership role on nonproliferation."

JOHN F. KERRY, U.S. SENATOR AND CHAIRMAN OF THE SENATE FOREIGN RELATIONS COMMITTEE, *THE BOSTON GLOBE*, 13 JANUARY 2009