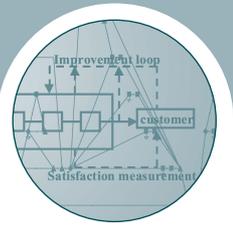


## Major Programme 5: Evaluation



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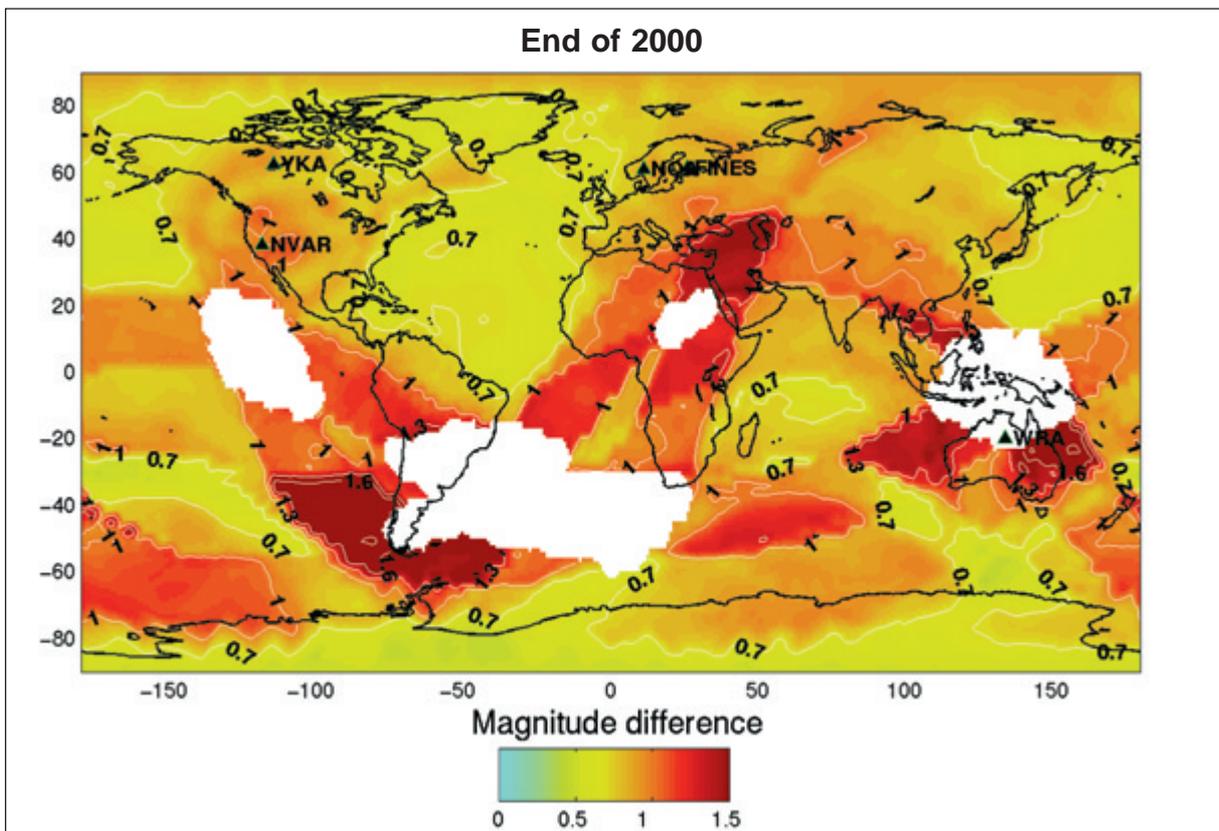
During 2001, significant progress was made in developing and implementing within the PTS an evaluation framework and a quality assurance (QA) system for the verification regime. As the implementing body for Major Programme 5, the Evaluation Section conducted its work on these two basic components in a balanced manner, while increasing the emphasis on their interactive use. New approaches were undertaken, especially through the development of synergies between evaluation and QA. Specific capabilities were further refined for contributing to an overall evaluation of the verification system and for focusing on issues related to key components and subcomponents of this system as it evolves.

ESTIMATED AUTOMATIC DETECTION CAPABILITY OF CERTIFIED IMS PRIMARY SEISMIC STATIONS AT THE END OF 2000 (BELOW) AND 2001 (OPPOSITE) RELATIVE TO THAT OF THE 49 CURRENTLY KNOWN STATIONS OF THE PRIMARY SEISMIC NETWORK UNDER IDEAL CONDITIONS (FULL STATION AVAILABILITY AND LOW BACKGROUND NOISE).

### ■ EVALUATION

Refinements were made to the Threshold Monitoring (TM) software tool, designed for interactive assessment of the performance of the IMS seismic network, especially its detection capabilities under various circumstances. These refinements included incorporation of additional functionalities, improvement of coding and preparation of documentation for the software product. For ease of comparison with TM results, various options for presenting the graphical outputs of a complementary software for seismic network simulation (NetSim) were explored. Future work on the two tools will concentrate on enhancements and routine use for evaluation purposes.

*Relative detection capability is shown as a difference in body wave magnitudes. An event is considered detected when its signal exceeds the noise level by a factor of 3 at three or more stations. The shadow zones (white) and areas with large magnitude differences (dark red) in the map for the end of 2001, when there were 11 certified stations, show a marked decrease in size relative to the end of 2000, when there were 5 certified stations. Since only primary seismic data were considered in this evaluation, fusion with inputs from other IMS technologies would improve the overall picture even further.*





Upgrade work started on another software tool (Bulcmp), which is used in comparing a seismological bulletin with a reference bulletin.

Improvements were made to the data processing and reporting capabilities of a software tool called Aatami, which is used for evaluating radionuclide technology. Efforts focused on the usability, maintainability and documentation of the software as well as on its automated usage. Technical documentation was developed on the basis of an automated system which extracts relevant technical information directly from the source code. Comprehensive tools are now available to assess the performance of IMS radionuclide stations and the quality of data processing by the IDC. A first evaluation using these tools suggested changes in the data processing that could improve the quality of automated spectrum analysis. This would reduce the need for human intervention and increase the analysis capabilities of the PTS.

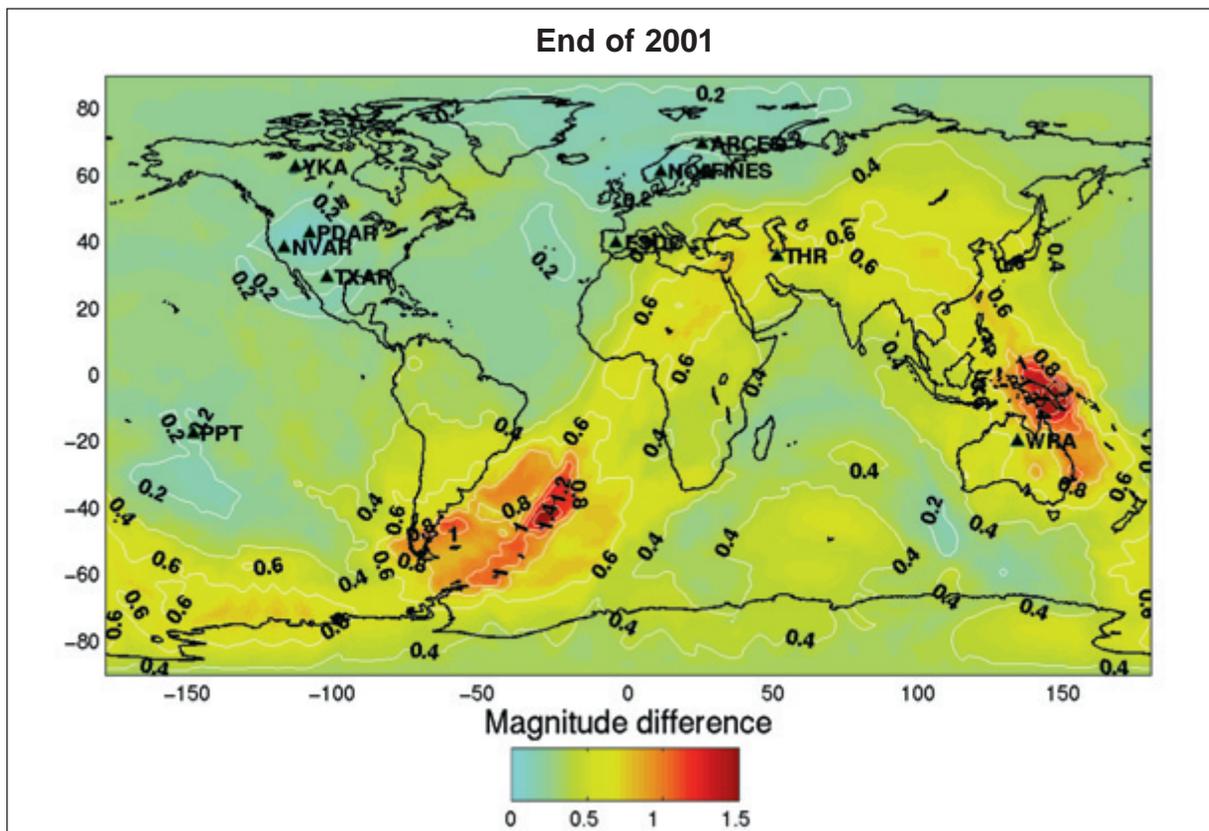
The Evaluation Section participated in the development of metrics used during the 2001 OSI field experiment in Slovakia for assessing the performances of

specific processes (e.g. the time to set up equipment). The analysis of the collected data could provide a basis for planning future work, especially in relation to time constraints and resource requirements.

## ■ QUALITY ASSURANCE

The Evaluation Section performed an evaluation of the IDRT of the OSI Operational Manual and highlighted features that could be drawn upon during the elaboration of the manual. During OSI Workshop-7 in October 2001, presentations were made of internationally agreed QA standards potentially relevant to various issues covered by the manual.

On the basis of suggestions from the Evaluation Section, Working Group B considered the possible restructuring of the draft IMS Operational Manuals. Work was then undertaken in parallel by the Task Leader for the IMS Operational Manuals and the Evaluation Section to cross-check the concepts for restructuring. Results were presented during a QA workshop (see “Workshops” below) with a view to supporting further discussions in Working Group B.





The Evaluation Section contributed to the development of the quality management system for the Global Communications Section. The work in 2001 focused on the management, operation and maintenance of the GCI, the mechanisms of coordination with all parties involved and the quality inspections of VSATs.

In cooperation with the Seismic Monitoring Section of the IMS Division and using external expertise, work was undertaken to draft a Quality Assurance Manual and technical procedures for this Section. The new manual complies with the PTS Quality Manual, the decisions of the Commission on quality matters and the latest international standards.

During 2001, work was also initiated on QA inputs for the certification of IMS stations. To date, the certification reports have consisted of high level documents referring to certification worksheets, which in turn mention voluminous technical documents in hard copy. Although this system is considered efficient, the Evaluation Section and the Seismic Monitoring Section began the study of a complementary approach using electronic documents with hyperlinks. It is considered that such an approach could lead to cost savings.

### ■ SYNERGY OF QA AND EVALUATION

The synergy component of Major Programme 5 reflects a conceptual and practical interaction between QA and evaluation as complementary means to achieve the best possible verification capabilities in terms of efficiency and value for money.

An example of this is the quality assessment of IDC applications software (Release 3). Apart from the general testing by the IDC Division of the functionality of the software, the Evaluation Section organized specific assessments of its long term maintainability based on standardized evaluation modules for tasks such as code complexity measurement and checking of programming rules. Such 'static analysis' initiated with the C programming language was extended to include other programming languages. A 'dynamic analysis' of the C software was also

undertaken. These activities led to the definition of general programming rules that may be applied to future software development.

The QA and evaluation synergy was also employed in offering specific inputs for the IMS and IDC State of Health Monitoring. The Evaluation Section contributed to the assessment of the CRISTAL NG software, especially for characteristics such as maintainability and reliability. On the basis of specific PTS software requirements, a comprehensive software acceptance test plan was developed, resulting in the formalization of reproducible test cases.

Combined QA and evaluation inputs were offered during 2001 for the evaluation of atmospheric models used at the PTS for radionuclide transport. The Evaluation Section formed an ad hoc expert group of external and PTS specialists to provide an assessment report on the performance of the atmospheric transport modelling system available at the PTS (see also "Scientific Methods and Data Fusion" in Major Programme 2).

### ■ WORKSHOPS

A workshop on Evaluation of the CTBTO Verification System by States Signatories: Enlarging Participation and Increasing Contributions was organized in cooperation with the Canadian NDC and held in Vancouver in April 2001. The participants provided recommendations for access to the IDC database and processing parameters, the follow-up of evaluation activities, and the organization of a joint evaluation exercise by the NDCs and the PTS in 2001 focusing on data availability and data product comparison. Conclusions were also drawn regarding standardized evaluation of IDC products and the exchange of software.

A workshop on Quality Assurance Issues in the Context of IMS Operational Manuals was held in Vienna in November 2001. The workshop offered QA recommendations on the drafting process, structures, outlines and contents of the IMS Operational Manuals. QA issues related to the certification and operation of IMS stations according to the provisions of the manuals were also discussed.