

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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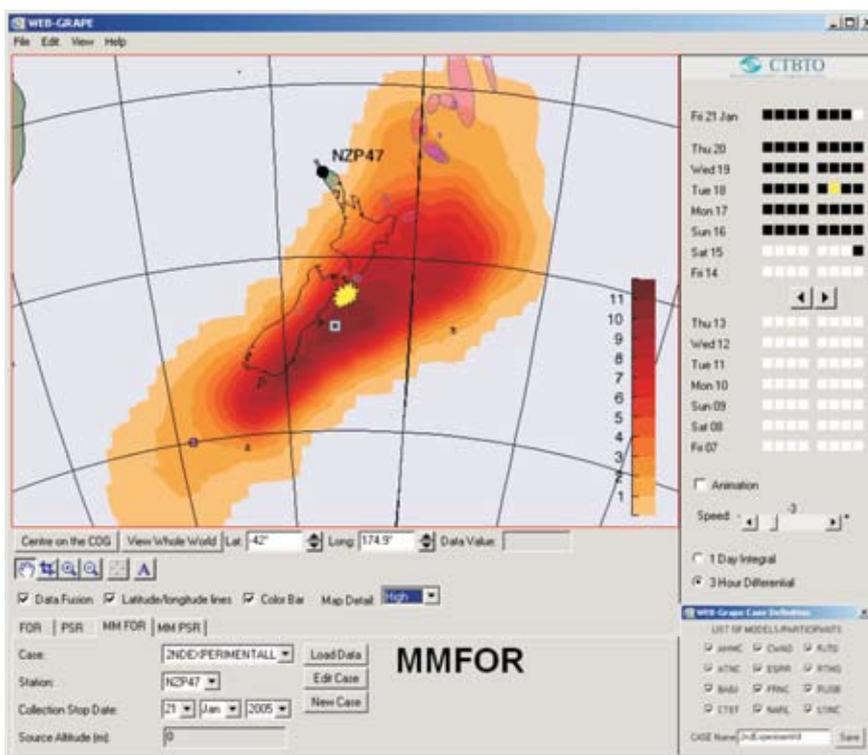


FIGURE 1: SOURCE REGION ESTIMATION OF A HYPOTHETICAL NUCLEAR EVENT BASED ON THE RESULTS OF THE JANUARY 2005 CTBTO-WMO EXPERIMENT.

Treaty Status

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| Signatures | 176 |
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| Annex 2 Ratifications | 33 |

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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). ■

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| 27th Session | 13 – 17 November 2006 |

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| 29th Session | 29 May – 2 June 2006 |
| 30th Session | 2 – 6 October 2006 |

Working Group B:

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| 26th Session | 13 Feb. – 3 March 2006 |
| 27th Session I | 15 – 26 May 2006 |
| 27th Session II | 28 August – 8 Sept. 2006 |

Advisory Group:

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

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