



## **On ground truth events reported in Sweden: assessment of the IDC location calibration data**

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Location accuracy along with confidence estimates, as indicated by mislocation and error ellipses, are key parameters of events reported in products for CTBT purposes. The International Data Centre (IDC) location accuracy is evaluated quantitatively using ground truth (GT) data from 44 explosions that occurred in Sweden between 2003 and 2005 - six within the Stockholm archipelago and thirty-eight at the Aitik mine. The data provided by the Swedish National Data Centre define these events as GT1, i.e. with an accuracy of 1 km. Further assessments focused on travel time residual distribution and effects of modelling errors.

The investigations are based on relocation experiments for these events included in the Reviewed Event Bulletin (REB) and on the location calibration data (source specific station corrections - SSSCs) used at the IDC. Five IMS stations at regional distances are, in general, used for location (ARCES, FINES, NOA, HFS, SPITS) using the defining phase parameters included in the REB, i.e. arrival time, azimuth and slowness with associated uncertainties. In addition, several events are reported with teleseismic phases and we retain these phases for consistency between the relocation and REB results.

From the relocation experiments several important results were obtained in terms of the currently applied location calibration data:

- The current set of SSSCs improves location accuracy for the Stockholm archipelago events, but slightly degrades in the case of the Aitik mining explosions.
- The average mislocation using the IASPEI velocity model is smaller for the Aitik mine events and larger for Stockholm archipelago events.

- SSSCs used before 2004 yield a better performance in the location of the Aitik mine events than the current ones.
- Confidence ellipses associated with the current SSSCs are too optimistic and do not conform to their definition, as Aitik location results demonstrate, while those obtained with the IASPEI model are consistent.

The examination of travel time residual distributions indicates that the usage of secondary regional phases in location is a critical issue based on the potential for inaccurate readings and misinterpretation of phases.