



## **Monitoring Compliance with the CTBT – Contributions by the German National Data Center**

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Contributions on various CTBT related topics by authors from the Federal Institute for Geosciences and Natural Resources in Hannover (Bundesanstalt für Geowissenschaften und Rohstoffe, BGR), which has been mandated by Germany as the National Data Center (NDC), are presented. This work is published since November 2017 by BGR as “Geologisches Jahrbuch B105”, distributed by E. Schweizerbart’sche Verlagsbuchhandlung and available under ISBN 978-3-510-96858-9.

Studies on institutional, technical and scientific aspects in the CTBT context are described to highlight recent, current and future work at the German NDC and to contribute to the CTBT monitoring and verification tasks. Nevertheless, this book focuses primarily on those aspects of the verification regime where BGR has expertise as well as BGR’s activities and responsibilities as the German NDC and an IMS station operator during the last twenty years.

An overview of the CTBT history, verification, and implementation in Germany is provided together with a description of the five German IMS stations and the seismology, infrasound, hydroacoustic and radionuclide technologies. Studies on the global performance of the IMS technologies to detect, locate, and identify nuclear and non-nuclear events are presented, as well as various case studies on the application, testing and benchmarking of these technologies. These case studies include, in particular, the North Korean nuclear weapon tests from 2006 to 2016, but also the National Data Centre preparedness exercises from 2007 to 2013, the Tohoku earthquake with tsunami and Fukushima reactor accident in 2011, and the Chelyabinsk meteoroid explosion in 2013. Further studies are related to considerations on the quality of CTBT International Data Centre waveform products, and to the usefulness and potential of satellite remote sensing in CTBT context as a National Technical Means (NTM). Finally, the role of On-site Inspection (OSI) in general and, specifically, Seismic Aftershock Monitoring Systems (SAMS) are discussed for investigating potential treaty violations as the ultimate step in the verification chain.