

The Global Geodetic Observing System (GGOS): a Cornerstone for Monitoring Systems enabling Early Warning

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The helplessness we feel in view of natural disasters demonstrates very clearly that at present our knowledge of the Earth's complex system and our tools for the timely detection of potentially disastrous events are rather limited. Space geodesy, however, is making important contributions to the growing monitoring capacity for these risks providing a sound basis for reliable and rapid decisions to release early warnings in order to reduce the impact of these events. The Global Geodetic Observing System (GGOS) that has been set up by the International Association of Geodesy (IAG), provides the umbrella for the extensive services provided to the Earth observation community and the public through the IAG activities. Besides the establishment of a very accurate reference frame for all early warning observations, major contributions are high-accuracy Global Navigation Satellite System (GNSS) satellite orbits and clocks and predictions thereof that, for example, enable real-time monitoring of deformations from earthquakes as well as a fast identification of the earthquake rupture processes for an improved tsunami modelling/prediction using, for example, a combination of 10-20 Hz GNSS and seismometer measurements of ground motion. For the determination of reliable magnitudes of great earthquakes in near-real time, GNSS observations appear to be indispensable. For most geohazards, the identification of geographical areas requiring particular focus on early warning is based on space-geodetic observations. Volcanoes are monitored with GNSS station networks and, increasingly, Synthetic Aperture Radar (SAR).

In the future the monitoring capabilities will be complemented, for example, by constellations of low orbiting satellites monitoring the sea surface in almost real-time for a global tsunami detection system using GNSS altimetry/reflectometry techniques and sounding the atmosphere with GNSS radio occultation techniques for a better prediction of hurricane paths. Similar constellations of SAR satellites will eventually help to monitor landslides, volcanoes and flood areas in near-real time.

GGOS is a Contributing Organisation in the Group on Earth Observation (GEO) and linked to the Integrated Global Observation Strategy Partnership (IGOS-P) Geohazards Theme. Realizing that GGOS is crucial in maintaining and improving the monitoring capabilities for early warning, GGOS has a strong focus on real-time services that support the Global Earth Observation System of Systems (GEOSS) and the International Disaster Reduction Strategy (IDRS) in their quest to reduce the loss of lives and property in disasters through efficient early warning systems. GGOS is determined to develop the services in coordination with GEOSS, taking into account the specific needs of the emerging early warning systems.