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Geodetic Earth Observation

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Mankind is constantly threatened by a variety of natural disasters and global change phenomena. In order to be able to better predict and assess these catastrophic and disastrous events a continuous observation and monitoring of the causative Earth processes is a necessity. These processes may happen in time scales from extremely short (earthquakes, volcano eruptions, land slides, ...) to very long (melting of ice sheets, sea level change, plate tectonics, ...). Appropriate monitoring and early warning systems must allow, therefore, the detection and quantification of catastrophic events in (near) real-time on the one hand and the reliable identification of barely noticeable, but crucial long-term trends (e.g., sea level rise) on the other hand. The Global Geodetic Observing System (GGOS), established by the International Association of Geodesy (IAG) in 2003, already now contributes in a multitude of ways to meet this challenge, e.g., by providing a highly accurate and stable global reference frame, without which the measurement of a sea level rise of 2-3 mm/y would not be possible; by measuring displacements in near real-time and deformations over decades that offer valuable clues to plate tectonics, earthquake processes, tsunamis, volcanos, land slides, and glaciers dynamics; by observing the mass loss of ice sheets with gravity satellite missions; and by estimating essential variables such as the amount of water vapor in the troposphere relevant for weather predictions and climate and the content of free electrons in the ionosphere crucial for space weather.