The Global Earth Observation System of Systems (GEOSS): Building the Link from Global to Local

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The intergovernmental Group on Earth Observations (GEO) aims to reduce the gap between science and Earth observations on the one side and end users in many societal areas on the other side. The nine Societal Benefit Areas (SBAs) of Earth observations as identified by a Ministerial Summit on Earth Observations in 2004 cover most of society: Climate, Weather, Water, Disasters, Energy, Health, Ecosystems, Biodiversity, and Agriculture. In these SBAs, understanding and mitigating a wide range of problems depends on environmental information, including, for example, disasters caused by floods, hurricanes, earthquakes, and volcano eruptions; agriculture and land use changes; food shortages; water scarcity; climate change impacts, such as sea level rise and increasing extreme weather; many debilitating diseases, such as malaria, meningitis, cholera, and dengue; extinction of species; loss of ecosystems; and reliable and sustainable supply of energy. GEO is implementing the Global Earth Observation System of Systems (GEOSS) to ensure comprehensive monitoring of key parameters of the Earth system. By implementing GEOSS, GEO intends to enable scientific analysis and to provide data, information, and tools that empower policy and decision makers to make better-informed choices. In the nearly five years since its establishment in 2005, GEO has made considerable progress in the implementation of GEOSS. A core element is the GEOSS Common Infrastructure (GCI), which includes three registries that enable users of Earth observations to access, search, and use the data, information, tools, and services available through GEOSS. A number of pilot projects in the GEO Work Plan focus on the link between the global services of GEOSS and local applications, and these pilots demonstrate how end-to-end links between Earth observations and users can help to assess challenges and to mitigate problems, for example, related to wildland fires, flood warnings, air quality, and droughts. Most of these pilot projects depend heavily on integration of Earth observations into GIS tools, and limited access to GIS expertise can constitute a bottleneck.

A new proposed pilot project would aim to extract useful and actionable information for local authorities from low-latency information on solid Earth surface displacements. The processes causing these displacements include, among others, tectonics, pre-, co- and post-seismic processes, magmatic processes, ground instabilities (including landslides and slow slope motions, subsidence, swelling and shrinking), hydrological subsurface changes (including groundwater mining), and hydrological loading (including reservoir/lake level changes, snow-load changes). Low-latency surface displacements can be determined from a combination of GPS and InSAR. A key challenge is the separation of the signals caused by different processes and the timely identification of "abnormal" signals - which would require actions. The southwestern United States constitutes an ideal area for such a pilot project.