

# **Remote monitoring of our hazardous planet with Sentinel-1 SAR**

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The devastating earthquakes that struck Türkiye-Syria in February 2023 were a tragic reminder of the power of our planet. Since the year 2000, there have now been 8 earthquakes in which we have lost more than 10,000 people, with 2 of these (2004 Sumatra, 2010 Haiti) resulting in losses of greater than 100,000 lives. At the same time, volcanic activity has resulted in evacuation of hundreds of thousands of people and events like the 2010 Eyjafjallajökull eruption have caused major economic disruption through airspace closures. On a smaller spatial scale, but occurring much more frequently, landslides are a major geohazard that have widespread impact – from 2004 to 2016, around 55,997 people lost their lives in 4862 non-seismic landslides. All of these hazards are associated with ground movement. Tectonic faults slowly accumulate strain, volcanoes deform as magma approaches the surface, and catastrophic landslides are typically preceded by a period of accelerated ground movement.

Over the last decade, a new generation of SAR satellites has transformed our ability to monitor how our hazardous planet deforms at increasingly high spatial and temporal resolution. The European Commission's Copernicus Sentinel-1 satellite constellation has been particularly important. It is an operational mission that has been acquiring data systematically over the entire planet since 2014. Importantly, the data is fully free and open. This has allowed scientists and commercial operators to develop a large number of services that use the data. Sentinel-1 results include the mapping of ground movement over very large areas, rapid response to earthquakes, detailed automatic analysis of volcanoes globally, and numerous studies of active landslides. In this presentation I will highlight some of the results to date from Sentinel-1, focusing on some of the work we have been doing in COMET, the UK Natural Environment Research Council's Centre for the Observation and Modelling of Earthquakes, Volcanoes and Tectonics. I will end by discussing the future for SAR monitoring of our hazardous planet.