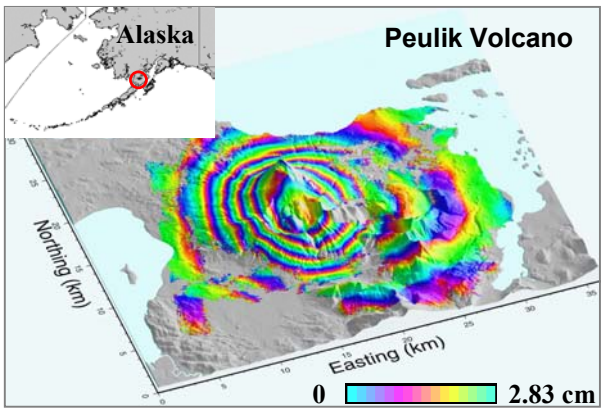
Inteferometric Synthetic Aperture Radar (InSAR)

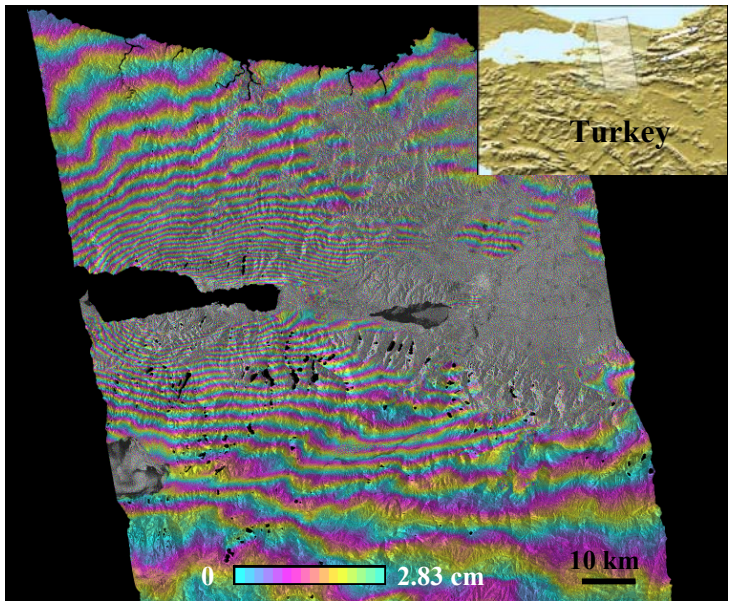
Interferometric synthetic aperture radar (**InSAR**) is an all-weather satellite remote sensing technique capable of measuring ground-surface deformation with centimeter to sub-centimeter vertical precision and spatial resolution of tens-of-meters over a relatively large region (~10^4 km^2). Precise mapping of surface deformation is a critical element in the assessment and mitigation of natural and human-induced hazards. InSAR can measure how a volcano's surface deforms before, during, and after eruptions; reveal essential information about magma dynamics; and provide a basis for mitigating volcanic hazards. InSAR can map spatial and temporal patterns of surface deformation that are direct manifestations of the crustal processes that lead to earthquakes. This deformation mapping is extraordinarily useful in seismic risk assessments. InSAR can map surface deformation related to extraction and injection of fluids in aquifers and petroleum reservoirs. This mapping provides fundamental data on reservoir/aquifer properties and processes and improves our ability to assess and mitigate undesired consequences. InSAR can potentially measure and document the development and activation of landslides in urban settings, thus reducing the hazards posed by landslides in areas of rapid urban growth. EDC is collaborating closely with scientists from GD, WRD, NMD, and BRD on InSAR applications.

InSAR reveals magmatic Inflation at a Dormant Stratovolcano, Mount Peulik Volcano, Alaska



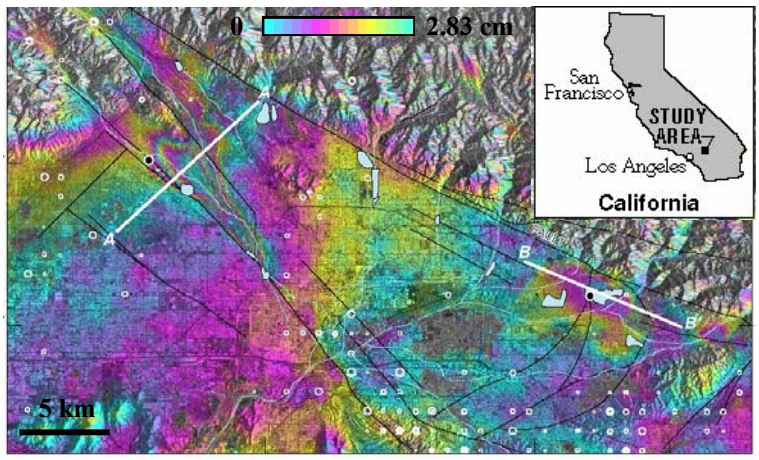
InSAR studies of the 1996-1998 inflation episode at Mount Peulik 1) demonstrate that InSAR can detect magma accumulation beneath dormant volcanoes at least several months before other signs of unrest are apparent, and perhaps years before an eventual eruption, and 2) represent a first step toward understanding the eruption cycle at Peulik and other stratovolcanoes with characteristically long repose periods and could lead to improved eruption forecasting and hazards mitigation.

InSAR maps the coseismic deformation field of Kocaeli earthquake, Turkey



InSAR refines our understanding of the earthquake cycle through mm-level interseismic and coseismic vector deformation maps along faults and plate boundaries.

InSAR images land surface deformation, San Bernardino, California



InSAR detected several centimeters of uplift during the first half of 1993 in two areas of the San Bernardino ground-water basin of southern California. This uplift correlates with unusually high runoff from the surrounding mountains and increased ground-water levels in nearby wells. The deformation of the land surface identifies the location of faults that restrict ground-water flow, maps the location of recharge, and suggests the areal distribution of fine-grained aquifer materials. The preliminary results demonstrate that naturally occurring runoff and resultant recharge can be used with interferometric deformation mapping to help define the structure and important hydrogeologic features of an aquifer.

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