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KATHMANDU



An InSAR look at the Nepal earthquake

The magnitude 7.8 earthquake that struck Nepal some 80 km northwest of the country's capital, Kathmandu, on 25 April 2015 was the largest to hit the region in 80 years. The temblor was shallow—only 15 km—and the slip region extended for an estimated 120 km east-southeast along the boundary where the Indian tectonic plate is subducting under the Eurasian plate. Including aftershocks, one of which was magnitude 7.3, the event killed more than 8800 people and injured more than 20 000.

Satellite-based interferometric synthetic aperture radar (InSAR) is a key tool for gathering detailed measurements of ground shifts caused by earthquakes and other processes. (See the Quick Study by Matt Pritchard, *PHYSICS TODAY*, July 2006, page 68.) As a satellite sweeps over a region, it can record the amplitude and phase of radar pulses reflected off Earth's surface. Subtracting the phases recorded in different passes over the same area yields an interference pattern that is sensitive to changes in topography along the satellite's line of sight.

The Japan Aerospace Exploration Agency's *Advanced Land Observing Satellite-2 (ALOS-2)*, led by project scientist Masanobu Shimada, is one of several InSAR satellites currently in orbit. This interferogram was calculated by David Sandwell (University of California, San Diego), Shimada, and colleagues using *ALOS-2* data. Based on measurements made in precisely timed 350-km-wide swaths on 3 May and 22 February, it captures the deformation from the initial quake throughout the region—despite the challenges presented by the largest topographical relief on Earth, dense vegetation, and snowcaps. Same-color fringes are separated by a line-of-sight, mostly vertical shift of 12.1 cm, half of the satellite's radar wavelength; the color order distinguishes positive and negative displacements. The interferogram thus reveals a peak rise of more than 1 m outside Kathmandu and a drop of 0.8 m to the north. From the shifts, the team could extract the fault slip, which reached 6.5 m in some areas. But some fault segments showed no slip, which may signal the potential for a future damaging quake. (E. O. Lindsey et al., presentation at the International Workshop on Nepal (Gorkha) Earthquake 2015, Kathmandu, 17–18 June 2015; <http://topex.ucsd.edu/nepal>.)

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