Resource from animation found at: <http://www.iris.edu/hq/inclass/search>

**Narration from the animation:**

**Airborne LIDAR: Light Detection and Ranging**

Airborne LIDAR is an optical remote sensing tool that uses laser pulses to measure the precise distance to the ground. The airplane-mounted laser range-finding system, transmits and receives data, which are precisely located using a highly sensitive GPS receiver.

The laser fans the ground perpendicular to the flight path producing thousands of pulses per second in a tight saw-tooth pattern.

Let’s take a look at the dense forest southeast of Lake Tahoe to see what Lidar might reveal beneath the vegetation. The airplane makes multiple overlapping passes as **t**he laser range finder emits light energy which precisely measures the travel time to the ground and back. As many as 100,000 data points can be captured every second. Position, altitude, laser angle, & measured range, in concert with the ground-proofed GPS, make it possible to measure surface variations with an accuracy of a centimeter or less, all the while compensating for the changing position of the aircraft relative to a ground-based GPS receiver. The data yield highly accurate digital elevation models.

Vegetation is removed using computer-algorithm software that allows detection of subtle geomorphic featuresassociated with active faulting…that may have been previously undetected. Remember that before digital removal of the trees, this could not be seen.

In this case, scientists deduced that faulting is younger the young glacial moraines and alluvial features that had been offset by the fault.And by determining the tectonic displacement over time using 3D modeling techniques and ages of the moraines, they were able to determine that faults along this basin-range front are potentially capable of generating earthquakes of moment magnitude 6.3 to 6.9, which represents a substantial seismic hazard to the region

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Tahoe lidar link:

[**http://gallery.usgs.gov/photos/05\_21\_2012\_dhx3Bnm00U\_05\_21\_2012\_0#.UH7E0UJ2mJc**](http://gallery.usgs.gov/photos/05_21_2012_dhx3Bnm00U_05_21_2012_0#.UH7E0UJ2mJc)

**Title:** Comparison of Aerial Photo and LiDAR Image

**Description:** Comparison of color aerial photography with airborne light detection and ranging (LiDAR) imagery in an area west of Lake Tahoe, California. (A) Color aerial orthophoto for part of range front along eastern base of Mt. Tallac with geomorphic features obscured by dense forest cover. (B) Same scene, first-return LiDAR imagery. (C) Same scene, last-return (bare-earth) LiDAR imagery showing range-front fault scarp (between white arrows) cutting colluvium, alluvium, and Tioga moraine.

**Location:** Lake Tahoe, CA, USA **Date Taken:** September 2008   
**Photographer:** [James Howle](http://answers.usgs.gov/cgi-bin/gsanswers?pemail=jfhowle) , U.S. Geological Survey