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Photo by Jenny E. Ross

GEOHAZARDS – ASSESSING A GLOBAL THREAT

Why is the southern San Andreas Fault 100 years overdue for a large earthquake? Will cliff and beach erosion increase as a result of rapid sea-level rise?

The catastrophic impacts of the Dec. 26, 2004, Indian Ocean 9.0-magnitude earthquake and consequent tsunami brought into sharp focus the need to understand potential geohazards.

Scripps Oceanography researcher **Neal Driscoll** and his research group aim to understand natural hazards and how they initiate and evolve so that knowledge can be applied to develop strategies for hazard risk assessment and mitigation. They have developed state-of-the-art instrumentation and technologies to investigate the structure and evolution of continental margins as well as the physical processes controlling geohazards such as earthquakes, slope failure, and volcanic eruptions.

Rupture direction on large faults such as the San Andreas plays a major role in the predicted magnitude of ground shaking. What controls this process? What is the frequency of earthquake recurrence for major fault systems in California? How do faults move? How does strain travel among neighboring fault systems in the Californias? Answers to these questions will improve seismic hazard identification and help develop improved quantitative models—necessary first steps toward developing strategies for minimizing geohazards.

Additionally, Driscoll's research group is interested in determining how coastal regions will be impacted by larger storms and the rising sea levels predicted by global warming researchers. With nearshore regions facing increased pressures from fisheries, land development, and contaminated runoff, scientific understanding of depositional and erosion processes of coastal cliffs and beaches has become even more vital.

In order to advance their geohazards research, Neal Driscoll and his team of outstanding graduate students require updated tools and resources:

WISH LIST

Shallow water survey vessel **$200,000**
Used to map the seafloor and subsurface structure to examine the link between geology and biohabitats as well as to access geohazards.

New LIDAR system **$125,000**
High-resolution terrestrial LIDAR is an ideal tool for acquiring a quantitative time series of sea cliff morphology.

New vehicle and trailer for the LIDAR system **$15,000**
An ATV with a flatbed to secure the LIDAR system is needed for rapid response and to access the nearshore region to acquire quantitative data along the cliffs. A trailer is needed to transport the vehicle up and down the coastline.

Sedigraph grain size analyzer **$65,000**
Grain-size data is acquired to determine how much sand a coastal slope collapse failure adds to the total mass of a beach.

Multibeam software and processing computer **$7,500**

Securing donations to support Scripps students remains an ongoing priority.

EROSION ON THE RISE

Elizabeth Johnstone, a Scripps graduate student in Neal Driscoll's lab, is focusing her research on cliff and beach erosion in Southern California. Sea level is rising at an unprecedented rate of three millimeters per year due to global warming and raises concerns about the stability of beaches and adjacent sea cliffs. Liz is using ground-based 3-D laser scanning (LIDAR) to quantify the erosion rate of the sea cliffs through time. The LIDAR data, together with sediment grain size analysis of cliff failures, allow Liz to define the volume of sand liberated by cliff erosion that remains on the beach. Liz has been examining the fate of 10 failures in a 6.5-kilometer stretch of coastline in the Oceanside Littoral Cell to assess their impact on the total quantity of coastal sediment.