Integrating Space-Based Measurements (Satellites) to Uncover Surface Deformation from Major Earthquakes

project subtitle

Department: Earth Sciences
Research group: Tectonics
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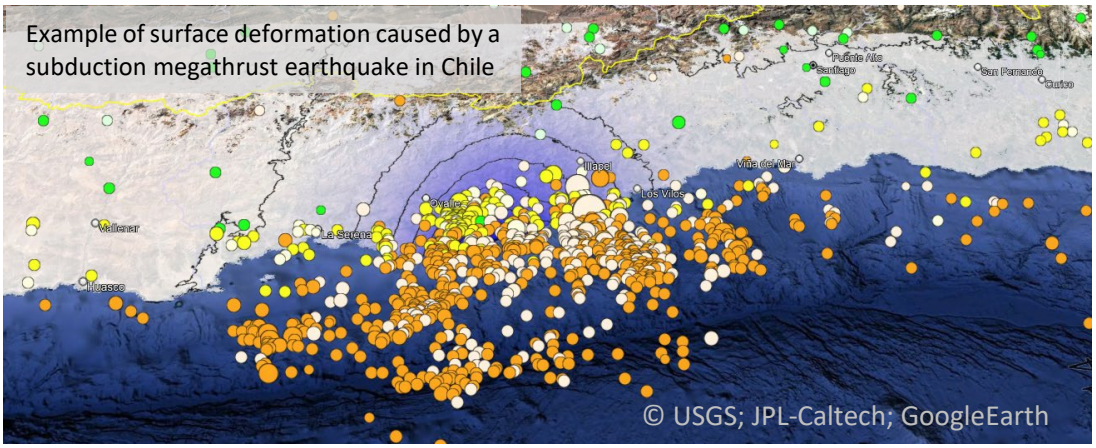
Project description

Subduction zones, where one tectonic plate slides beneath another, produce Earth's largest earthquakes (e.g., the 2004 Sumatra earthquake and the 2011 Japan earthquake, which caused over 220,000 and 19,000 casualties, respectively). Studying these earthquakes is vital for understanding how the Earth's crust stores and releases stress, as they cause the strongest shaking, tsunamis, and lasting ground deformation. They also offer rare insights into fault behavior and the long-term evolution of tectonic boundaries.

Satellite radar (InSAR) provides frequent, global coverage of ground motion during and after major earthquakes, even in remote areas. By combining data from multiple satellites, we can derive three-dimensional deformation maps that show horizontal and vertical ground movements. These data help identify fault slip zones, rupture depth, and post-seismic adjustments.

The student will collect and process satellite data covering a large subduction earthquake (e.g., 2025 Mw 8.8 Kamchatka earthquake), combine them to create 3D maps of ground deformation and estimate fault displacement at depth, and interpret the results. Through this work, the student will gain experience in tectonic geodesy, modeling, data processing, and earthquake deformation analysis.



Job requirements

- High motivation in processing satellite data and researching earthquake topics.
- Good Python/MATLAB programming skills. Experience with the Jupiter notebook is an asset.
- Experience with, or highly interested in learning, forward and/or inverse modelling.