Marine geophysical exploration of tectonically active areas - a GEOMAR perspective

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Abstract

Understanding the geodynamics of any tectonically active area requires detailed imaging of the geological structures on different vertical and horizontal scales and robust integration of the available geological and geophysical information on different
time scales. While seismological investigations and onshore GPS data are key to understanding ongoing deformation much can be learned from augmenting this with the long-term record of deformation in sedimentary structures and monitoring of seafloor deformation. This requires state-of-the-art marine geophysical instrumentation. High-resolution 3D seismic imaging provides unprecendented insight into the small-scale configuration of tectonic structures - a prerequisite to placing seafloor instruments on or next to active faults. The P-Cable system allows the efficient collection of such data from research vessels and can produce images of the top 2000 m below the seafloor at 6 m horizontal and vertical resolution. Marine geodetic measurements using acoustic transponder networks overcome the limitatons of GPS measurements that can only reveal ground deformation above sealevel while the most important parts of tectonically active regions such as the North Anatolian Fault or marine subduction zones are frequently found in marine environments. Together these methods provide unprecedented insight the geohazard potential of tectonically active regions.

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