Session: J07 Tracking the sea floor in motion
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Monitoring submarine fault deformation using direct-path ranging

F. Petersen[1], H.Kopp[1], D. Lange[1], K. Hannemann[1], M. Urlaub[1]

(1) Helmholtz Centre for Ocean Research Kiel GEOMAR

The seafloor stores crucial information on sub-seafloor processes, including stress, elastic strain, and earthquakes. This information may be extracted through the nascent scientific field of seafloor geodesy. The GeoSEA (Geodetic Earthquake Observatory on the SEAfloor) array uses acoustic signals for direct-path ranging and relative positioning at mm-scale resolution for a period of up to 3.5 years. The transponders also include high-precision pressure sensors to monitor vertical movements and dual-axis inclinometers in order to measure their altitude as well as any change in submarine fault zones and characterizing their behavior (locked or aseismically creeping). A further component of the network is GeoSURF, a self-steering autonomous surface vehicle (Wave Glider), which monitors system health and is able to upload the seafloor data to the sea surface and to transfer it via satellite. Seafloor transponders are currently installed across a dextral strike-slip fault to measure the instability of the eastern flank of Mt Etna in Sicily, along the North Anatolian Fault offshore Istanbul to measure the strain build-up along the fault in a seismic gap. In addition, three arrays are currently deployed on the marine forearc and outer rise of the South American subduction system around 21°S. This segment of the Nazca-South American plate boundary has last ruptured in an earthquake in 1877 and was identified as a seismic gap prior to the 2014 Iquique earthquake (Mw 8.1). The southern portion of the segment remains unbroken by a recent earthquake. The first 12 month of all geodetic installations were analyzed and we discuss baselines with precision less 5 mm for ranges up to 2000 m of distance and compare them to synthetics baselines. The North Anatolian across-fault baseline changes remains within the resolution and preclude fault-displacement rates larger a few millimeters-per-year, which suggests a locked fault zone.