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# Installation of a seafloor geodetic network offshore northern Chile (GeoSEA)

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The seafloor stores crucial information on sub-seafloor processes, including stress, elastic strain, and earthquake and tsunami generation. This information may be extracted through the nascent scientific field of seafloor geodesy. The target of the recently installed GeoSEA array (Geodetic Earthquake Observatory on the SEAfloor) is to measure crustal deformation in mm-scale 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/Pisagua earthquake (Mw=8.1). The southern portion of the segment remains unbroken by a recent earthquake. Seafloor geodetic measurements provide a way to monitor crustal deformation at high resolution comparable to the satellite-based GPS technique upon which terrestrial geodesy is largely based. The GeoSEA Network consists of autonomous seafloor transponders installed on 4 m high tripods, which were lowered to the seabed on the deep-sea cable of RV SONNE in December 2015. The transponders within an array intercommunicate via acoustic signals for a period of up to 3.5 years and measure acoustic distance, tilt and pressure. An additional component of the network is GeoSURF, a self-steering autonomous surface vehicle (Wave Glider), which monitors system health and is capable to upload the seafloor data to the sea surface and to transfer it via satellite. We have chosen three areas on the middle and lower slope and the outer rise for the set-up of three sub-arrays. The array in Area 1 on the middle continental slope consists of 8 transponders located in pairs on four topographic ridges, which are surface expressions of faults at depth. Area 2 is located on the outer rise seaward of the trench where 5 stations monitor extension across plate-bending related normal faults. The third area is located at water depth >5000 m on the lower continental slope where an array of 10 stations measures diffuse strain build-up. Data from all networks and all stations were successfully uploaded to GeoSURF and/or a high performance USBL transceiver lowered into the water from RV SONNE. The seabed installation of a total of 23 transponders records pressure, temperature, water sound velocity, salinity, and baselines between stations. Baselines cover distances of up to 2600 m with a precision of $\pm$2 mm.