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Guidelines for seafloor geodesy nearby of Sicilian active volcanic area

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Ground deformation measurements are well suited to study geodynamic active areas, by quantifying stress and strain rates. Recently this kind of measurement has had considerable advances due to the rapid development of the geodetic surveying techniques based on either terrestrial (e.g. total stations, high precision self-levelling tiltmeters..) or space-based techniques (GPS and SAR interferometry). Now it is possible to measure deformations of the order of the millimeters or tilts in the order of 0.05 microradians, so that, with these techniques, we are able to define in detail the velocity field on the continental areas from few mm/y (continental scale) to tens of cm/y (local scale).
Geodynamics may receive a strong impulse by implementing techniques able to measure movements on seafloor with the precisions comparable with those achieved inland (i.e. with the same order f precision or slightly lower). With this aim, several experiments have been carried out in different areas (e.g. along the "Juan de Fuca" ridge in the Pacific Ocean, Tolstoy et al. 1998, or the Columbo volcano in the Aegean Sea, Huebscher et al, 2008). Achieving this goal would give a strong contribution to constrain the offshore continuation of onshore structures with the high dynamic, which are very evident onshore but often only supposed at sea.
These types of structures are well known in areas with active volcanism, in which the dynamics is certainly more intense and evident than seismogenic areas. The volcanoes active in and surrounding the Sicilian Island are particularly suitable for such kind of applications.
In particular, Mount Etna shows a close relationship between the geodynamic evolution of the continental margin and the fast dynamics affecting the eastern flank facing the Ionian Sea. The favourable tectonic conditions existing on the Etnean area make it as an ideal test site for designing, developing and implementing new seafloor geodetic techniques. Moreover the Aeolian and Pantelleria Islands and the Graham seamount volcano (this last located 40 km off the Sicilian southern coast) represent other suitable areas for this purpose.
Recently, INGV and INFN promoted initiatives aimed at making tests on systems able to measure horizontal displacements, since them are the most evident along the coastline of Mt. Etna (minimum displacements in the order of 2-5 cm/y). However, systems able to make direct strain measurements, such as extensometers or tiltmeters, have been studied and designed.

Huebscher, C.; Hensch, M.; Hort, M.; Dahm, T.; Klawonn, M.; Winter, S., (2008). The new Hamburg Ocean-Bottom-Tiltmeter (OBT): A first deployment at Columbo Seamount (Aegean Sea, Greece). American Geophysical Union, Fall Meeting 2008, abstract #S43D-1921.

Tolstoy M., Constable S., Orcutt J., Staudigel H., Wyatt F.K., Anderson G. (1998). Short and long baseline tiltmeter measurements on axial seamount, Juan de Fuca Ridge. Ph. Earth Plan. Int. 108 129–141.