2017 AGU Fall Meeting: T51E-0526

Measurement of shallow water sea floor motion with GPS on a rigid buoy: system design and preliminary analysis

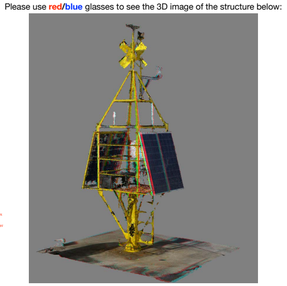
Timothy H. Dixon[1], Surui Xie[1], Rocco Malservisi[1], Chad Lembke[1], Giovanni Iannaccone[2], Jason Law[1], Mel Rodgers[1], Randy Russel[1], Nicholas Voss[1]

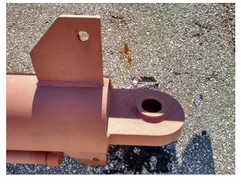
1. University of South Florida, USA 2. Istituto Nazionale di Geofisica e Vulcanologia, Naples, Italy

Abstract:

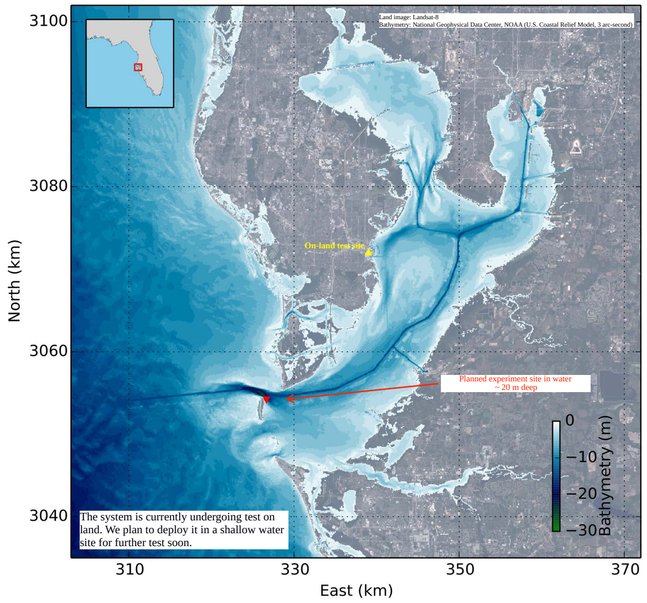
A GPS-buoy system to measure 3D sea floor motion in the shallow (<200m) continental shelf environment is being built and tested in the Gulf of Mexico. The system consists of a GPS mounted on a spar buoy rigidly connected to the sea floor, with a subsurface float to maintain near-vertical orientation. A 3-axis digital compass is used to measure heading/ pitch/roll. Potential applications include measurement of strain accumulation and release in the subduction zone environment, where areas with water shallower than 200 m typically constitute 25-40% of the shelf area between the coast and the trench.

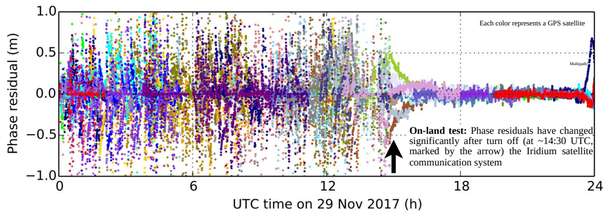
Please use red/blue glasses to see the 3D image of the structure below:

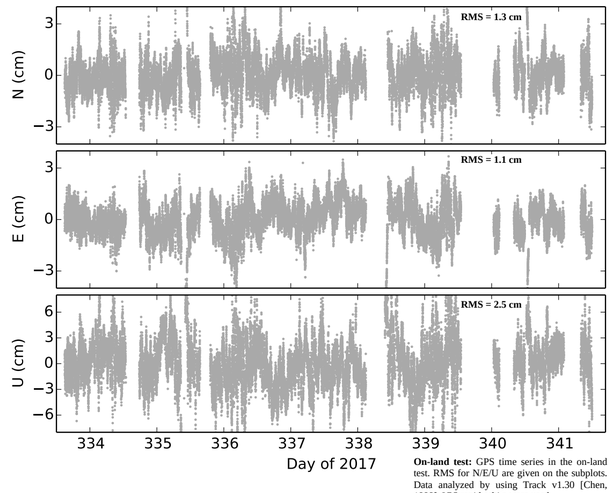




System tests:

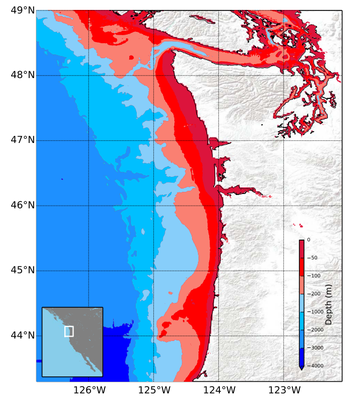


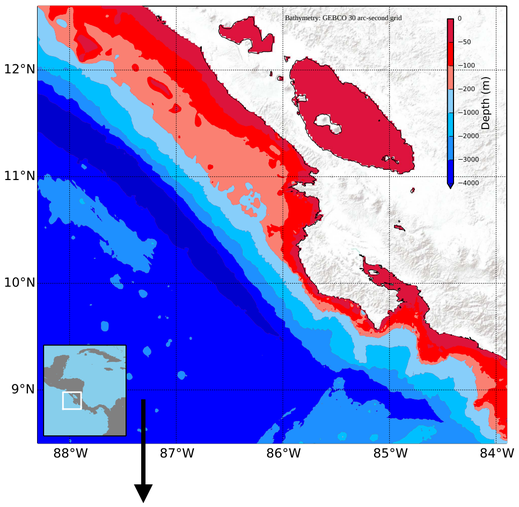


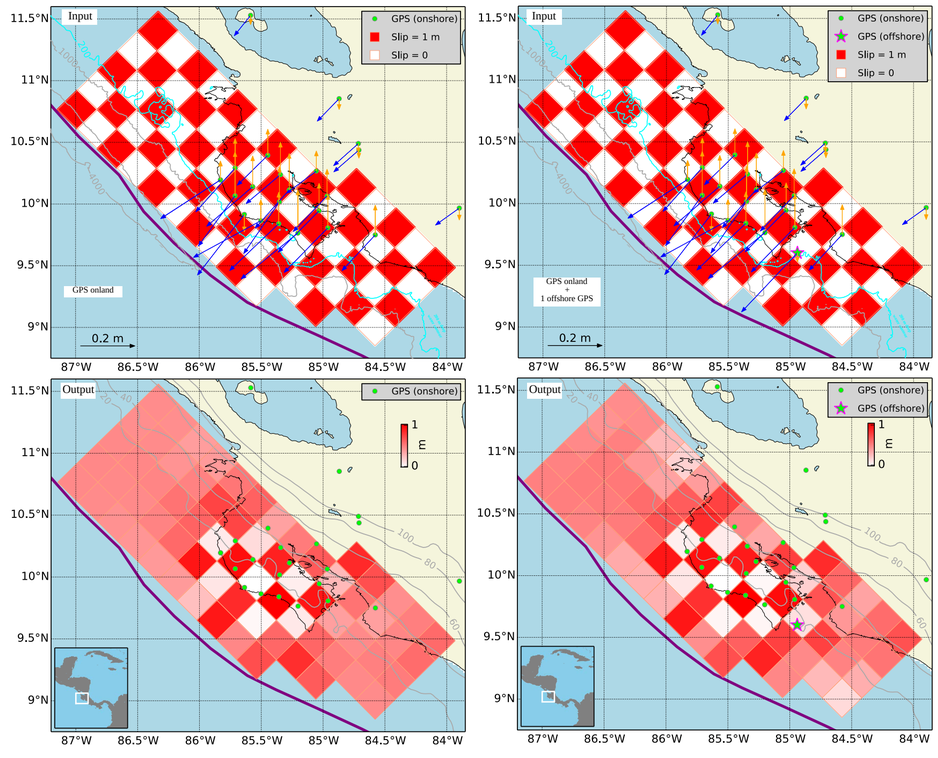


On-land test: GPS time series in the on-land test. RMS for N/E/U are given on the subplots. Data analyzed by using Track v1.30 [Chen, 1998]. IGS rapid orbits were used.

Potential areas to apply: Cascadia, **Costa Rica-Nicaragua** …







An example at offshore Costa Rica. Left: on-land GPS only; Right: one synthetic offshore GPS site applied. Displacements calculated by using Okada [1992].

Acknowledgements

This research is supported by NSF grant 1538179. We are grateful to Hydra Solutions SRL for design of the system. We thank James Mulhollan and Guy Grant at USF-CMS for their contributions in building the buoy, Nicolas Bayou from UNAVCO for technical support to the geodetic module, and David Naar at USF-CMS for assistance in test site location selection.