



## **Installation and Initial Results of Borehole Strainmeters around the Marmara Sea in Turkey.**

David Mencin (1,4), Marco Bohnhoff (2), Haluk Ozener (3), Glen Mattioli (1), Roger Bilham (4), Wade Johnson (1), Mike Gottlieb (1), Elizabeth Van Boskirk (1), Digidem Aracel (2), Fatih Bulut (5), and Osman Bal (3)

(1) UNAVCO, Boulder, CO, United States (mencin@unavco.org), (2) GFZ, Potsdam, Germany, (3) Kandilli Observatory, Bogazici University, Istanbul, Turkey, (4) University of Colorado, Boulder, CO, (5) Istanbul Technical University, Istanbul, Turkey

Twice in the past 1000 years a sequence of damaging earthquakes has propagated during the course of a few decades along the North Anatolian fault (NAF) in Turkey towards Istanbul, with the final earthquake in the sequence catastrophically destroying the city. This occurred most recently in 1509 when the population was only about 200,000 yet ten thousand people died. The population of greater Istanbul is now 20 million, building stock more fragile, and the last earthquake of the current westward propagating sequence is considered geologically imminent. An opportunity to enhance the detection capability of a suite of deep seismometers installed near Istanbul has arisen, that will permit us to observe, characterize, and possibly predict the moment of imminent failure along the NAF, as well as monitor the tectonic processes leading to this failure.

As an augmentation of the Geophysical Observatory at the North Anatolian Fault (GONAF), UNAVCO installed two continuous creepmeters and six borehole strainmeters between July 2014 and October 2015 into boreholes provided by the several international sponsors, including NSF, GFZ, AFAD and Bogazici University Kandilli Observatory. The entire geophysical sensor network is collectively referred to as GeoGONAF. The borehole strainmeters enhance the ability of the scientific instrumentation to monitor ultra-slow process near the probable source zone of the  $M_w > 7$  earthquake that is soon expected beneath the Marmara Sea. The strainmeters and creepmeters allow us to make geodetic observations of this segment of the fault before, during and after a large earthquake, which combined with the seismic data from GONAF will provide valuable data for understanding earthquake processes. Installed instruments have already recorded both local and teleseismic events and observed creep events on the on-shore segments of the NAF to the East of the Marmara. In addition we have seen typical hydrological loading signals associated with normal modes of the Marmara.