Workshop IODP-Italia "Lo stato delle proposte di perforazione nell'area mediterranea"
Scientific Drilling in the Mediterranean Sea
Roma, 15-16 gennaio 2018

Abstract
Nuove idee per la perforazione scientifica

The Altotiberina Strainmeter Array (STAR project)

L. CHIARALUCE[1], R. BENNETT[2], D. MENCIN[3], M. R. BARCHI[4] AND M. BOHONHOFF[5]

(*[1]) Istituto Nazionale di Geofisica e Vulcanologia
(2) University of Arizona
(3) UNAVCO
(4) Università di Perugia
(5) Helmholtz-Centre Potsdam GFZ

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Abstract

The seismically active normal fault system that characterizes Central-Northern Apennines (in central Italy) is responsible for notably destructive earthquakes - such as the Mw6.1 2009 L'Aquila and Mw6.5 2016 Norcia events - and complex earthquake sequences that may last for several months or even years. All of these damaging earthquakes occur on SW-dipping high angle normal faults. On the contrary, the shallowly dipping Altotiberina fault (ATF), placed north of this fault system, is instead a larger an active low-angle detachment dipping to the East at about 20° that basing on GPS data appears to be creeping below 4-5 km depth. The ATF, about 60 km long and and cutting the whole upper crust down to about 16 km of depth, produces microearthquakes a nearly constant high rate of about 4 events/day. Numerical modelling indicates that creep on the ATF loads stress on the earthquake-prone high angle faults in its hanging wall. In addition, there is a deficit of seismic slip on these high angle faults over the ATF relative to the geodetic strain rate, as many of these faults have not ruptured for 1000 years or longer. Moreover, of particular importance is the observation that GPS coordinate time series data from the ATF record transient surface motion coincident with a seismic swarm during the period 2013-2014.

As of 1 August 2017, the US National Science Foundation has contributed with equipment and salary support toward the deployment of six borehole strainmeter stations over the ATF. We refer to this strainmeter array as STAR. Each station of STAR will include a Gladwin Tensor Borehole Strainmeter, a short-period seismometer, a pressure transducer, and other sensors. STAR will enhance and become part of the *The Altotiberina Near Fault Observatory* (TABOO), which is an INGV state of art monitoring infrastructure part of the broader *European Plate Observing System* (EPOS) network of Near Fault Observatories (NFOs; research infrastructures devoted to studying earthquakes preparatory processes and slow and fast deformation processes). TABOO (see Figure 1) currently consists of a set of multi-sensor instruments covering an area of 120×120 km^2. There are tens of seismic stations deployed at surface and at depth (within shallow boreholes, 250m deep) equipped with 3-components seismometers, one third of them hosting accelerometers. There are tens of GPS antenna and a series of geochemical station measuring Radon emissions and CO2 degassing.

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Data from the new borehole geophysical network STAR will help our community to address several first order questions: (1) Does the ATF detachment load stress on high angle normal faults steadily or episodically through time? (2) Does the pattern of ATF creep correlate with the pattern of micro-seismicity? (3) What are the spatial and temporal characteristics of ATF fault slip, including slip magnitudes, rates, propagation directions and rates, and event durations?

STAR proposal is currently underway to become a *full ICDP proposal* looking for financial and expert support for drilling operations.

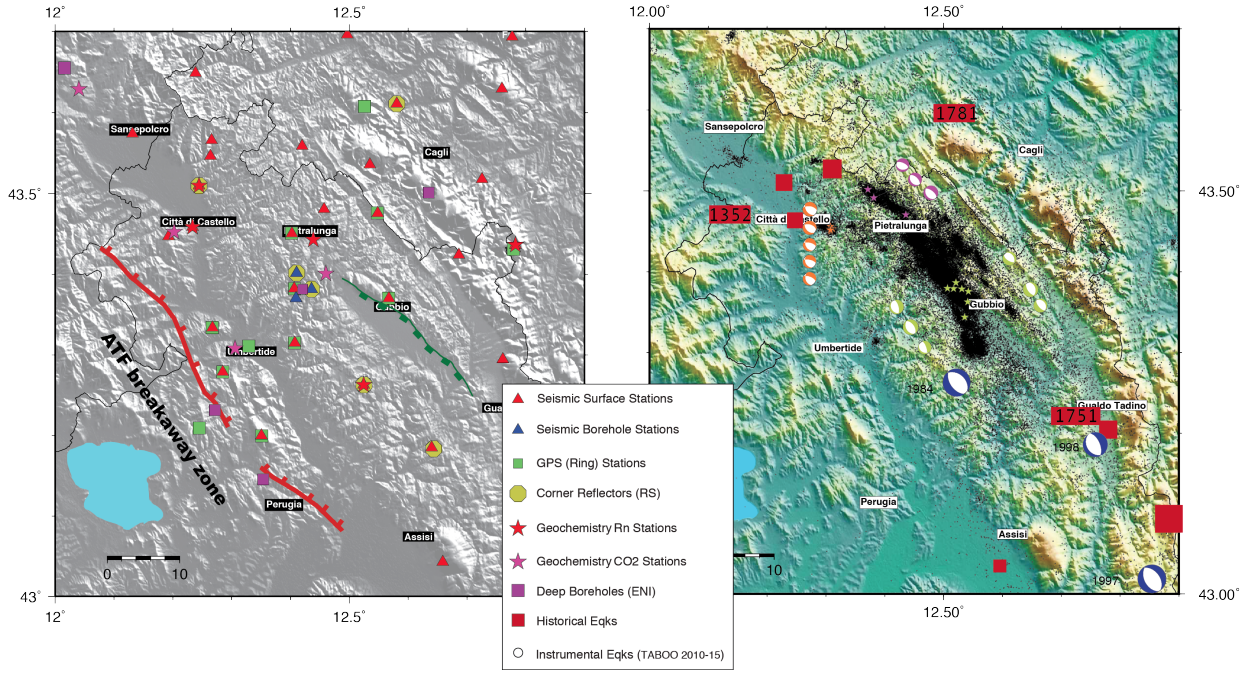

Figure 1 – The Altotiberina Near Fault observatory (on the left) and the historical and instrumental seismic activity of the region.