UNICT_NET discrete geodetic network: monitoring of aseismic and coseismic ground deformations in different Italian peninsula areas affected by active tectonics

De Guidi G.*, Barreca G., Brighenti F., Carnemolla F., Lupo M., Messina D., Vecchio A. & Monaco C.

Dipartimento di Scienze Biologiche, Geologiche ed Ambientali, Università di Catania

** Corresponding email:* deguidi@unict.it

Keywords: deformation, aseismic, coseismic.

Since 2014, the Earth Science Section of the University of Catania, started a project for the training of a GEOmatica laboratory staff. The main team skills is to analyse the deformation in various scenarios. The applications are: analysis of post critical hydrogeological emergency; seismic events; volcano-tectonic deformation; monitoring with geodetic instruments (GNSS, Total Station, UAV application).
The GEOmatica_laboratory designed benchmarks of UNICT_NET in order to satisfy the following criteria of deformation analysis:
— Measurement along ground surfaces affected by active geological processes, through both measure of discrete points (GNSS, total station, and levelling applications) and high-resolution field topography by Structure from Motion (SfM) method (UAV Unmanned Air Vehicles application);
— Starting and allocation of “field 0” along active geological structures (Start-chronology-UNICT_NET fields);
— Monitoring of areas characterised by a deformation with variable magnitude scale both in space and time related to dissimilar rheological behaviour of the substratum.
Therefore, we have identified some areas in italian peninsula, affected by different processes of related to active deformation:
— The deformation bands along the active faults present on Etna volcano;
— Inter-, co- and post-seismic deformations along the fault segments of the Umbria-Marche Apennines;
— Sedimentary volcanism (the maccalube of S. Barbara Caltanissetta, central Sicily).
Assuming previously conditions, the positioning of network benchmarks follow these criteria:
— The distribution of the existing permanent and discrete benchmarks belonging to different networks that were active before the year 2014 (IGM; RING; CAGEONET; DPC; ISPRA; NETGEO; Etna@ref);
— The seismotectonic and volcanotectonic setting of the areas in relation to seismic data and to reactivated structures;
— Surface and deep geometry of the active structures related to the structural and tectonic setting;
— Morphostructural stability in both static and dynamic conditions at sites where the new benchmarks are built.
Finally, the distribution of the benchmarks was planned in order to reconstruct the principal deformation zone, which developed because of the historical event. Therefore, the network was planned as following:
— Much closer to the deformation source area;
— Equivalent distances from the active structures (eg. fault length area, outcropping of volcanic structures, dykes, inclined sheets, volcanic reservoirs;
— In topographic analysis, within a determined distance from the closest permanent network points not affected by deformation, allowing a rigorous elaboration during the post-processing phases.
To date, the results have provided main information about geometry, kinematic and local stress field, which allowed, together with seismic and geophysical data, to evaluate the criteria of strain and ground ruptures useful to upgrade the information useful to mitigate geological hazards.