



## **Active landslides on the rocky coast of Tigullio gulf (Liguria, Italy)**

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The stretch of rocky coast between Rapallo and Chiavari (Golfo del Tigullio) is characterized by significant geomorphological instability phenomena, mainly contained between the shoreline and the Aurelia road n.1, with a partial extension as far as the watershed line.

The study takes into consideration the well-known landslides below the Santuario di N.S. delle Grazie, situated towards the western margin of the town of Chiavari. The landslides have been examined previously in scientific studies conducted in the second half of the 19<sup>th</sup> century.

These are gravitational movements involving portions of the Flysch del M. Antola, composed of marly limestone with thin interlayers of clayey shale, with an unfavorable structural orientation along the cliff. Thick debris covers overlie the bedrock and they undergo continuous erosion by wave motion. Proceeding from W to E, we can observe various landslides: the Liggia unit, the Sanctuary unit, the Via Aurelia unit, the Colonia Piaggio unit and the Belvedere unit.

Detailed geomorphological surveys, geomechanical analyses, the interpretation of aerial photographs, comparisons with historical maps and field investigations have made it possible to define the state of activity and the morphological variations of the landslide masses, which have undergone very recent changes.

The phenomena are classifiable as complex landslide types, with evident components consisting of rockfalls and translational rock slides. These components are definitely triggered also by the quarry activities carried out in historical times at the base of the coastal slope.

The dynamics of the landslide masses have led to marked deformation of roads and structural damage to the dry stone walls of agricultural terraces and to buildings, among which the famous Sanctuary mentioned above.

The study offers a contribution to encourage concrete efforts to monitor the evolution of this area on the part of public and private agencies. The overall objective would entail the planning of general stabilization measures, or at least activities to reduce evident geomorphological hazard, also taking into account the remarkable environmental value and qualities of this coastal sector.