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owing to its influence on mountain villages in the past and, at present, on the penstocks of the Ceresole-Rosone hydroelectric plant, which have been suffering constant deformations since their construction, completed in 1930. The sliding affects the orthogneiss of the Gran Paradiso unit, and is located at the step of the 3°-5° NW trending major faults. Three main joint sets affect the rock mass, facilitating its generalised dislocation, Outcrops of silicified marble, included in the 3°-5° NW trending major faults, are found in the upper part of the landslide, trending parallel to the slope, as most of the geologic schistosity.

Since 1960 numerous borehole and investigation campaigns have been concerning the eastern, mostly detritic sector, where the penstocks are located; an integrated monitoring system including GPS stations is presently working, recording movements of up to 15 mm/year in periods of heavy rain. Up to date, from data base, little information was available concerning the rest of the landslide, where large dislocated basement outcrops occur. New investigations, whose results are presented in this work, were carried out in 2006 including field surveys, deep boreholes and seismic tomography, aiming to define the site geometry with respect to the existing hydroelectric tunnels, especially in its poorly known uppermost part. The base of the slide lies at a maximum depth of 160-170 m from the surface, much deeper than previously known from investigations in the eastern area, where the penstocks lie and where an average depth of about 40 m is reported.

Boreholes show a gradual transition to the sound basement rock, by progressive disappearing of voids and crushed zones, still present at depth, anyway, even where no active sliding is supposable any more. Seismic tomographies confirm this gradual transition within the landslide body. It is not possible to identify a single sliding plane; movements occur at different depths and seem to be mostly related to micastich levels; local sliding along the regional schistosity cannot be excluded as well. Crustal movements along the diapirs and erosion along the sliding surfaces; friction products include gravelly to clayey incrustation material, often characterized by a chaotic composition. Variation of such levels facilitates the movement onset. The dislocation of the rock mass determine an overall high permeability, which explains the absence of groundwater during drilling. However, signs of infiltrating water are common at the upper part of a sliding mass and even in the sound basement rock, which in normal conditions appears to be drained as well.

The sliding surfaces are connected by sub-vertical steps relatable to the main structural discontinuities, as most of the observed morphodynamics in the ridge zone. The basin basal sliding rises from the central sector eastward, reaching the surface where the penstocks stand; westwards it goes up more gradually, keeping a few meters of depth, up to its morphologically poorly defined western edge.

T35-16 Poster Falcucci, Emanuela
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DETECTION AND ANALYSIS OF DEEP SEATED GRAVITATIONAL SLOPE DEFORMATION IN THE CENTRAL AND SOUTHERN APENNINES
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Key terms: landslide, gravitational deformations; parametric inventory; central and southern Apennines
Modern geomorphological investigations have been properly focused on the deformation of the central and southern Apennines, indicating a progressive evolution. One of the integration of these factors as the litho-structural setting, the local relief and the climatic conditions and the seismicity plays a key-role in determining large scale slope instability phenomena which displays the complex nature of gravitational deformations (DGD).

The present work aims to detect the large scale gravitational deformation affecting the central and southern Apennines and to provide an accurate and comprehensive assessment of the evolution of these phenomena. The approach is based on the use of a 3D morphostructural map of the studied areas, obtained from satellite images, integrated with data on active tectonics, glaciation, seismicity and hydrogeological conditions. The study area is divided into several sub-areas based on the DGD distribution, in order to obtain a hierarchically organized description of the rock slope instability phenomena, including their geometrical and kinematical characteristics.

Hence, these parameters allow to provide a qualitative and quantitative description of the DGD and information useful for a better definition of the deformation mechanism.

The final objective of the present work appears to be the present literature, i.e. the DGD may evolve in rapid, catastrophic mass movements (e.g. Vajont, Val Pola) and i) this paroxisimal variations may be triggered by high magnitude seismic events, permits to better understand the necessity to map in detail these large scale slope instability phenomena, including their geometrical and kinematical characteristics, in a perspective of land-use planning of a part of the Italian territory. The analysis of the central and southern Apennines, characterized by a high magnitude historical seismicity.

T35-17 Poster Galvani, Alessandro
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GEOMETRIC, MORPHOLOGIC INVESTIGATIONS ACROSS THE CENTRAL APENNINES (ITALY)
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Key terms: GPS; Active tectonics; large scale gravitational deformations
Introduction: Active tectonic deformation in the Central Apennines is derived from the distribution of the historical and instrumental seismicity and from geometry and kinematics of active fault systems. GPS data make us understand the present active deformation of the area. In order to cast light on the complex regional kinematic pattern, characterised by faults inherited from the pre Quaternary tectonic regime, but responsible for the formation of Pliocene intramontane basins, the geodetic GPS network, "LA Geofit", was set up and monitored continuously. The Istituto Nazionale di Geofisica e Vulcanologia since 1999, with the aim to estimate the active strain rate of the area. The network is distributed across the Apennine regions of Umbria, Abruzzo, Marche and Lazio covering an area of ~180 x10^3 km, from the Tyrrhenian to the Adriatic sea, across the main seismic faults. In this study we show the new GPS velocity field obtained from GPS data collected since 1999. Data analysis performed with Bernese 5.0 software, shows strain at ~ 10 microstrain and identify areas with different velocity patterns. In the Fucino area three vertices were located on areas involved in large scale gravitational movements. The residual GPS signal obtained after the removal of the signal related to superficial gravitational movements due to large scale deep seated slides, show results which are consistent with the present tectonic regime.

The geological and geomorphological analysis, allowed to define the kinematics of gravitational displacements and indicate geological deformations and erosional modifications of the landscape. The GPS data provide a new quantitative analysis of horizontal and vertical displacements and, linked with the detecting of the geomorphic features of large scale deep seated slides, has implications for the displacements evolution and the hazard of this region.

T35-18 Poster Giardino, Marco
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THE QUART-CROCE DI FANA DEEP-SEATED GRAVITATIONAL SLOPE DEFORMATION (AOSTA VALLEY): GEOMORPHOLOGIC AND TECTONIC FACTORS IN THE STABLE DRAINAGE BASIN
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Key terms: deep-seated gravitational Slope Deformation (DGD); Neotectonics; Dissolution phenomena
The Quarti-Crocio di Fana Deep-Seated Gravitational Slope Deformation (DGD) affects a portion of the Aosta Valley characterized by an extremely complex and multilayered preneogene geological history. In the Quarti-Crocio di Fana, on the left hydrographical side of the middle Aosta Valley, a multi-km, E-W sized, slope is developing. Recent seismic activity, rich in deep and shallow earthquakes, suggest that the Aosta-Ranzola fault zone, one of the most important neotectonic lineaments, has been involved for a long time in the main seismogenic history range from Oligocene to Present.

Detailed geomorphological, geological, historical mapping and morphostructural studies of the Quarti-Crocio di Fana DGD, evidenced very distinctive associations and patterns. The steep and erosional deflation of the middle Aosta valley, especially on the right side of the valley, is due to the deep dissolution phenomena evidenced by high sulphates contents of the deep waters sampled in the hydroelectrical tunnel and a progressive underground deepening of the valley and later release of glacial pressure, at the withdrawal phases; strong seismicity, either caused by the high magnitude and shallow instabilities. Analyses of the role of these different instability factors lead to the proposal of an interpretative model for Quarti-Crocio di Fana DGD evolutionary stages. The glacial dynamics and the contemporary - post-glacial hydrogeological processes follows immediately after the Quarti-Crocio di Fana DGD evolution, reflecting the part of the last glacial PLR cycle, i.e. 15-10 kyBP. Also, the role of the Aosta-Ranzola shear zone seems to be confirmed: its important tectonic activity acts as a refraction of the Aosta Valley system, and the induced secondary permeability allowed the superficial waters to reach the evaporate layers located in specific tectonic positions; dissolution and collapses process activated, and propagated causing the slope deformation. Trace of this dissolution are clearly visible and affect different portions of the rock masses, being formed in different periods. This events succession seems to be related to the successive thawing settings during the erosional deepening of the Aosta Valley.

All the above mentioned processes, combined in space and time, and with a regional varying grade of importance, gave origin to the present day landscape features, of the Quarti-Crocio di Fana DGD and still have a role in conditioning natural instability. Evidences based on the analysis of recent deformations on buildings and other recent man-made structures on and levelling and GPS measures indicate the formative importance of a new model to be associated with present day deformations.

T35-19 Poster Guerrichio, Alessandro
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WIDE DGD IN A TERRITORIAL DEFORMATION (IN SERRA STELLA, SPEZZANO DELLA SILA, TRIGGERED BY THE METAMORPHISMS OF THE BAGNI UNIT (CODENZA PRESILA)
SESSIONE T35