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UNDERSTANDING LATE-STAGE EXHUMATION USING AN INTEGRATED MULTIDISCIPLINARY APPROACH: A CASE STUDY IN THE INNER COTTIAN ALPS (NW ITALY)

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Late-stage exhumation of the Western Alps is understood as the interplay of tectonics and erosion. While the former has been influenced by a decrease in plate convergence, the latter has been suggested to be affected by climatic variation.
This study area focuses on the Inner sector of the Cottian Alps. This area is affected by a diffuse low- to moderate- seismicity (ML<5) characterized by shallow hypocenters (< 20 Km depth). Available apatite fission tracks data indicate that this sector reached shallow crustal levels, where brittle deformation mechanisms prevail since Late Oligocene times. Historical earthquakes (e.g. Prarostino's earthquakes, 1808 MS=5.5; Cumiana's earthquakes, 1980 Ml=4.8) caused both material and social damages in the area.
From tectonic point of view the Western Alps is characterized by a widespread extensional regime located in the core of the belt and a dominant transcurrent tectonic regime at the outer borders of the chain, with some local compressive areas.
The present work aims to understanding the late-stage of exhumation in the Germanasca Valley, through an integrated, multidisciplinary approach combining structural lineament analysis, PSInSAR™ approaches, geomorphological mapping, geomorphometric analysis and thermochronology.
A lineament geometry analysis has been conducted by using TerraExplorer® Software. Statistical analysis of lineament trend individualized three sets of tectonic features: Ln1 (N0° - N30°E), Ln2 (N50° - N70°E), Ln3 (N80° - N100°E).
PSInSAR™ interferometry data provide a complementary method to investigate ground deformation phenomena. A second generation of the PSInSAR™ technique was also adopted (SqueeSAR™) in this study. To analyse the current tectonics and the crustal mobility the vertical components map (VVC) were extracted. The results suggests that the Inner Cottian Alps are uplifting.
Geomorphology and geomorphometric analyses have been performed using field mapping activities, digital orthophotos, and DEMs. All collected data have been included in a GIS project, and then elaborated in a morphotectonic map. Preliminary interpretation shows strong geomorphological anomalies affecting hydrographic network, slope morphology and distribution of Quaternary deposits.
The cooling history has been investigated by using apatite and zircon (U-Th-Sm)/He thermochronometers along a pseudo-vertical bedrock profile (elevation between 650 and 2850 m) resulting in a total elevation difference of nearly 2,2 km. First (U-Th-Sm)/He data suggest slow rates (<0.2 km m. y.-1) of erosional exhumation across this region during Oligocene-Miocene times (~29–10 Ma).