



## **A multidisciplinary geomatics approach to morphometric and morphotectonic analysis of the Cannobino Basin (Piemonte Region, NW-Italy).**

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The paper presents an integrated multidisciplinary approach to the morphometric and morphotectonic characterization of the Cannobino Basin (Piemonte Region, NW-Italy).

The basin is drained by the Cannobino river; in its first 8 km, it flows SE to NW along a wide valley characterized by glacial landforms; thereafter it suddenly turns South assuming a W to E direction, by flowing in a deeply entrenched valley to the intermontane basin of the Maggiore Lake.

This area belongs to the Lepontine Alps, which from the geological point of view belong to the Southern Alps. Its Hercynian basement is divided in two units: Ivrea-Verbano Zone (IVZ) and Serie dei Laghi (SDL). The IVZ outcrops in the northern sector of the basin, while the SDL outcrops in the southern and central sector. They are separated by the Cossato-Mergozzo-Brissago (CMB) and Pogallo lines (PL). These major discontinuities and the neotectonic activity of their shear zones possibly control Quaternary evolution of the alpine relief.

Detailed studies of the area are needed for understanding possible interactions of neotectonic activity, fluvial/glacial erosional/depositional processes and slope dynamics. Our focus is on drainage basin characteristics and its evolutionary stages in response to local and regional base level changes and to differential rock uplift.

GIS methodologies combined with DEMs analyses are among the most common geomatics approaches to geomorphology.

Based on this framework, an evaluation of the geomorphometric characteristics of the Cannobino Basin has been carried out by using an aerial LIDAR DEM (5x5 meters, Regione Piemonte, 2009). The workflow followed for calculating the geomorphic indexes can be summarized in different steps: i) drainage network extraction and hierarchization; ii) lineament features digitalization and interpretation; iii) azimuthal distribution of drainage pattern; iv) DEM analysis and evaluation of linear, areal indexes and SWAT profile.

The multidisciplinary and innovative geomatics approach was a fundamental step in order to manage morphometric and morphotectonic data of the Cannobino Basin. The results of the analysis have been used for the creation of different geomorphic maps. The spatial distribution of detected stream length gradient index (SL) anomalies, highlights concentrations (up to 17% of the total) at the confluence of the Cannobino river with its main tributaries. Relationships with geological and tectonic features indicate 10% of the anomalies being at the contacts between different lithological units. Of these, more than 80% trace the transition between orthogneiss and paragneiss. Moreover, a clear asymmetric distribution of SL anomalies has been verified from the geomorphological point of view: in the upper part of the basin, the anomalies concentrate in the NW sector, while in the central and lower parts they are concentrated in the SE sector.

The analyzed data so far indicates a recently active tectonic control on the basin form and the river network. This effect is more evident close to the CMB and PL. In addition, other scattered areas of the lower Cannobino Basin show possible local neo-tectonic phenomena causing rejuvenation of relief. Other detected anomalies in the central and lower sectors, seem to be related to lithological and structural controls.