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ABSTRACT BOOK

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S35.

Field mapping and stratigraphy: significant insights from the geologic record

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From 2D geological maps to 3D models: A case-study in the Central Alps (Lombardy, Italy)

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Building 3D geological models from field data is a common task in geological studies aiming at natural resources management and hazard assessment. The geological history of sedimentary basins as well as mountain chains originates multiple-scale, nested heterogeneities which must be represented by 3D models. The most relevant input data for these models derive from field geological mapping and are integrated by remote-sensed surface surveys and geophysical subsurface images. A gap between the field survey process and the set-up of geo-models exists, mostly concerning the scale and accuracy of input data vs. the expected model outcomes. Besides the accurate representation of geological geometries, bridging this gap would imply an efficient conceptualization of topological and cross-cut relationships between the geological entities. This might be obtained by translating the geological evolution into straightforward, simple, and flexible modelling rules that should advise the field survey approach to permit the collection of efficient input datasets. We were challenged to tackle these problems while developing the 3D model of hydrostratigraphy of the Alpine rock aquifers of Lombardy, based on a set of nonuniform geological maps. Our first attempt led to combine the geological knowledge based on geological maps, with a novel approach for 3D modelling. We present it fora small part of the new 3D model of the Lombardy Central Alps, within the Southalpine fold-and-thrust belt

The heterogeneous dataset was normalized, classified, and stored into an *ad-hoc* built hierarchic Geodatabase. The 3D geological model was computed based on the potential field interpolation method of 3DGeoModeller®. The new conceptual model (1:25.000 to 1:250.000 scale) represents the palimpsest arrangement of the three components of the geological heterogeneity (structural, lithostratigraphic *l.s.*, geomorphological), accounting for the hierarchy of their assemblage and the relative chronology of the geological evolution. The separate geologic entities (bounding surfaces classified by their nature and intervening lithosomes) were ordered into a hierarchic geologic pile, permitting to codify the lithological variability and the chronology of the geo-history. The relationships set between faults and lithosomes drove the modelled cross-cut relationships coherently with the geological evolution.

The resulting 3D geological model draws the geometry of the geological heterogeneities nested into one another through the decreasing rank of the geologic pile. The present model, predisposed for hydrogeological studies, allows for instance to inspect the location of water springs in relation to the 3D representation of permeability thresholds, induced by structural and morphological features like thrust surfaces, regional fold axes, steep cross-cutting faults, deep valleys and so on.