Application of 3D modeling and geostatistics to the study of the Early Jurassic Clacari Grigi carbonate platform

Seminario
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Relatore: Marco Franceschi
Abstract:

The Calcari Grigi carbonate platform formed on one of the highs that were outlined during the Early Jurassic rifting in the area now occupied by the Italian Southern Alps. Rocks were brought to the surface by Alpine orogenesis, but escaped strong deformation and metamorphism leaving preserved the original paleogeographic setting. The Calcari Grigi Group is now exhumed in an area ~100km x 100km wide and comprises the marine shallow-water sedimentary rocks deposited in several platform sub-environments (tidal flats, deep lagoons, oolitic shoals etc.). Good outcrop continuity, extensive geological mapping carried out during the last decade and previous studies provide a great wealth of field-information on this geologic body.

A striking feature of the carbonate platform is represented by the evidence of active syn-sedimentary tectonics testified by exposed structure. Despite the good outcrop conditions, however, the reconstruction of the Early Jurassic faultnetwork is particularly challenging because direct evidences of syn-sedimentary faults are sparse and discontinuous. To the end of exploring the characteristics of this ancient fault-network useful information can be obtained from the analysis of the spatial distribution of the thicknesses of the platform units. Indeed different cumulative subsidence was reflected in the creation of variable accommodation space and thus in sharp changes in sediments? thickness. Spatial analysis reveals an organization in the thickness variability and helps to retrieve information about the arrangement of the Jurassic fault-system that drove subsidence during the platform growth. This permits to estimate the position of main Jurassic faults and reveals an extensive orthorhombic fault-network at the platform scale. This fault arrangement suggests a true 3D strain field that could shed new light on the rifting mechanisms in the South Alpine.

3D modelling was carried out with SKUA® geomodeling software and allows to estimate fault throws helping in investigating the past degree of linkage of the ancient faults. Moreover modelling of main stratigraphic horizons permits to model the 3D geometry of the sedimentary prisms outlined by the main faults. Facies information derived from field investigations can now be used to populate the model and will represent the starting point to evaluate if tectonics influenced the sedimentary environments. A field data-based model of a carbonate platform of this size potentially represents a useful analogue for carbonate reservoirs and could help the understanding of the evolution of similar present and buried sedimentary bodies.

Afferenza: MuSe - Museo delle Scienze di trento
Proponente: Nereo Preto, Matteo Massironi

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