**ACTIVE FOLDING IN A SUBSIDING SEDIMENTARY BASIN: A CASE STUDY IN THE PO BASIN (Northern Italy)**

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**1. GEOLOGICAL FRAMEWORK**

The Po Plain is the flat surface expression of the common foreland of two tectonic chains: the Southern Alps (SA) and the Northern Apennines chain (NAP) (Fig. 1). The most important tectonic phases can be easily recognized along the basin margins, marked by the deformation and tilting of river terraces and of exposed syntectonic sediments, conversely their detection is particularly difficult in the central-east part of the basin.

**STRATIGRAPHIC SCHEME**

The stratigraphic scheme of the study area is based on the interpretation of a huge seismic dataset (12,000 km2, provided by ENI S.p.A.), 136 well logs (p) and the correlation with the existing literature data that provide stratigraphic and magnetostratigraphic constraints.

During the complex interaction of tectonic processes, sea-level fluctuations, climate changes, and sediment supply produced the filling of the basin with the progradation of the fluvi-deltaic system, from west toward east.

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**2. RESEARCH TOPICS**

A. Detect elusive syn-sedimentary folding signals related to compressive structures growing in general subsiding basins.

B. Discriminate sedimentary processes from regional signal of the foreland tilting and local tectonic signals.

C. Define a 3D modeling, decomposition and sequential restoration workflow to quantitatively analyze the mutual relationships/rips between folding and sedimentation. 

D. Calculate the uplift rates of buried anticlines.

The workflow consists of successive steps of unfolding and decompression of the units bounded by unconformities mapped within the Pleistocene succession of the Mantova-Monferrato. The aim of this methodology is to obtain a 3D picture of each horizon unfluected by the effects of sediment compaction and by the local and regional tectonic deformations recorded in the present horizons.

The procedure is subdivided into 3 steps:

- Unfolding
- Decomposition and unfold
- Removal of regional monocline dip

The maps of basin evolution and Pleistocene sedimentation rates are the results of the methodology applied.

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**3. BASIN EVOLUTION & PLEISTOCENE SEDIMENTATION RATES**

The methodology is based on the analysis of the 3D model built for the GeomMod Project that includes 15 horizons (top and unconformities) and more than 130 faults (thrusts and extensional faults).

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**4. PIADENA ANTICLINE: COMPARISON OF TECTONIC AND SEDIMENTARY SIGNALS**

The Pliocene–Pleistocene portion of the basin is subdivided into three main units: the Flysch, the marine carbonates, and the continental sediments. The Pliocene–Pleistocene succession is characterized by a frequent occurrence of unconformities, which are better identified by the analysis of the sedimentary and tectonic signals.

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**RESULTS**

This methodology approach allows to discriminate and to have a quantitative evaluation of both sedimentary and tectonic (folding processes), also when very subtle.

A preliminary basin analysis (i.e. paleomorphology, sedimentation rates) is needed before approaching the study of folds, whose nature is believed to be active, located within the basin.

Active anticlines growth can be recognized and defined by using the basin subsidence, using a 3D approach which takes into account the different compaction effects.