Geophysical Research Abstracts
Vol. 14, EGU2012-9214-1, 2012
EGU General Assembly 2012

Synsedimentary structural control of foredeep turbidites of the Marnoso-arenacea Formation (Langhian-Tortonian, Northern Apennines, Italy)

R. Tinterri (1), P. Muzzi Magalhaes (2,1), E. Mutti (1), A. Tagliaferri (1), R. Soares Cunha (2,1)

(1) Department of Earth Sciences, University of Parma, Italy (roberto.tinterri@unipr.it), (2) Petrobras, Rio de Janeiro, Brazil

The Marnoso-arenacea Formation (MAF, Langhian-Tortonian) was deposited in an elongate, NW-stretched foredeep basin formed in front of the growing Northern Apennines orogenic wedge. These deposits have always played a fundamental role in the history of turbidites, because many models and facies schemes proposed in the literature have been developed on these types of deposits.

Among Apennine foredeep turbidites, the MAF is probably the most famous, the best exposed and less structurally deformed, due to its relatively external position within the Apenninic orogen. It consists of a shoaling upward stratigraphic succession (about 5000m thick) recording the progressive closure of the Apennine foredeep basin due to the propagation of thrust fronts toward north-east, i.e. toward the outer and shallower foreland ramp. In a transect oriented perpendicularly to the main structural axes, the sedimentation of a foreland region took place in three distinct and coeval basins which, from inner to outer zones, include: a) wedge-top basins characterized by alluvial, deltaic and low efficiency turbidite systems; b) a foredeep basin consisting of high-efficiency turbidite systems; c) an outer and shallower ramp. The progressive thrust propagation toward the outer margin of the basin produced a vertical superimposition of these three basin types, as in the MAF, where Langhian to Serravallian high-efficiency basinal turbidites were replaced by Tortonian “mixed” low-efficiency turbidites overlaid by shallow water Messinian euxinic shales and evaporites.

Consequently, not only did the north-eastward thrust propagation produce a complex foredeep characterized by synsedimentary structural highs and depocentres, but also a progressive narrowing of the foredeep, which resulted in the uplift of the inner portions of the foredeep and in the subsequent shifting of the main depocentres in the same direction. The MAF stratigraphic succession, therefore, can be described as developing in three stages: 1) an older and inner Langhian-Serravallian basin consisting of basinal turbidites controlled by subtle structural reliefs; 2) an intermediate Upper-Serravallian phase that records the transition between inner and outer basins characterized by mass-transport complexes and thick accumulations of sandstone lobes that filled in thrust-related structural depressions and 3) a younger and outer Tortonian basin characterized by relatively sand-rich turbidite systems deposited by turbidity currents with a low degree of efficiency, due to flow decelerations induced by basin narrowing. In this stage, however, a fluvio-deltaic influence cannot be ruled out. Consequently, during this evolution, the structural control and associated morphologic confinement progressively increased over time, thus significantly controlling the lateral and vertical distribution of turbidite facies.

This work, therefore, focuses on the influence of synsedimentary structural highs and depocentres on the lateral and vertical distribution of the MAF turbidite facies; it also discusses the significance of the vertical facies changes characterizing the MAF stratigraphic succession in relation to the progressive closure, uplift and consequent fragmentation of the foredeep. This discussion is based on a new high-resolution stratigraphic framework performed by measuring eleven stratigraphic logs, for a total thickness of about 11,000m, between the Santerno and Metauro Valleys (100km apart), especially in the Langhian and Serravallian deposits of Stages 1 and 2.