Geophysical Research Abstracts, Vol. 8, 08831, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08831

Forward stratigraphic basin modelling as a key to relief evolution at subduction margins: first results on the Meso-Hellenic piggyback basin (Greece)

J.Y. Reynaud (1), D. Granjeon (2), J. Ferrière (3), M. Bêche (4), P. Weill (5), F. Chanier (3) and I. Coutand (3)

(1) Muséum National d'Histoire Naturelle, Paris, France, (2) Institut Français du Pétrole, Rueil-Malmaison, France, (3) Université des Sciences et Technologies de Lille, France , (4) Université Laval, Québec, Canada, (5) Ecole Normale Supérieure, Paris, France (reynaud@mnhn.fr / Phone : ++ 33 1 40793474 / Fax : ++33 1 40793474)

The Meso-Hellenic Basin (MHB) is one of the deepest and largest piggyback basins in the world. Filled up with locally 4500 m of gravity-driven deltaic deposits (ranging from shelf to basin floor fans), it can be considered as the best stratigraphic record of the continental Hellenides orogenesis. The MHB was formed in the Oligocene and Miocene during the eastward subduction of the Pindos basin and underthrusting of Gavrovo-Tripolitza platform beneath the Pelagonian microcontinent. The Gavrovo-Tripolitza constitutes the uppermost unit of the Olympos tectonic window, implying a minimum shortening of about 200 km across the Hellenic belt.

The basin and range-like structure of the present-day relief of Northern Greece was partly originated in response to subduction, at least for the area west of the Aegean fault. Subsidence and deposition in this area shifted eastward due to the growth of blind-ramp anticlines at the top of the underthrusted units. Based on published and new data (including seismic profiles, field investigations and biostratigraphy), the geologic evolution of the MHB and its relationships with the Hellenic subduction have been refined, highlighting the link between underthrusting and the rise of the mountain ranges that flank the basin.

The purpose of this communication is to show how modelling can be used at a geological scale in order to put constraints on the reliefs feeding the basins in the rapidly changing topography that characterizes active margins. We used the DIONISOS strati-

graphic forward model, which is based on a water-driven diffusion equation calibrated on well-established case studies. One advantage of this model is to allow us to test and understand the interaction of geodynamic and sedimentary processes at geological time and space scales (1-100 km, 1-10 Ma).

Preliminary results can be summarised as follows: (i) The complex morphology of the MHB infilling can be modelled using standard values of diffusion coefficients. (ii) For each step of basin development, the amount of relief in source areas that is needed to produce one depositional megasequence falls into the range of modern analogs (about 2000 m). (iii) Production rate of sediment in the headlands (based on bedrock weathering) has to be high for erosion and transport to keep pace with deformation (uplift).

This study opens the door to calibration of stratigraphic forward models of active margin basins at the reservoir scale and helps understanding of relationships between relief evolution and subduction mechanics. In the near future, a 3D modelling of the basin heterogeneities controlled by inherited structures of the margin shall be processed.