Quantifying sedimentation rates during early rifting. Tectonic versus climate controls on fluvial sedimentation in the Plio-Pleistocene Corinth rift (Greece)

Romain Hemelsdaël *[1] Julien Charreau [2], Mary Ford [2], Maria Sekar Proborukmi [3], Fabrice Malartre [4], Brigitte Urban [3], Pierre-Henri Blard [2].

[1] Université de Montpellier - CNRS - Géosciences Montpellier - France
[2] Univesrsité de Lorraine - CNRS - CRPG, Vandœuvre-lès-Nancy - France
[3] Institute of Technology of Bandung - Indonesia
[4] GéoRessources- ENSG - Vandœuvre-lès-Nancy, France
[5] Leuphana University - Lüneburg, Germany

We present a multi-method approach to the dating of Plio-Pleistocene fluvial sediments deposited in the early Corinth rift (Greece). We provide estimates of sediment accumulation rates and discuss the relative controls of tectonics and climate on continental rift sedimentation.

During the Plio-Pleistocene the antecedent Kalavryta fluvial system (30 km long) developed across several active normal fault blocks in the early Corinth rift. These blocks are now uplifted along the southern rift margin. The alluvial architectures are characterised from the proximal basin margin to the river outlet. In four magnetostratigraphic sections, the correlations to the reference scale are mainly based on the identification of the Gauss/Matuyama magnetic reversal and rare biostratigraphic age constraints. The fluvial succession is dated between about 3.6 and 1.8 Ma, with sediment accumulation rates from 0.40 to 0.75 mm/yr. In the context of overfilled intra-mountainous rift basins, these are minimum rates and can be used as a proxy for accommodation rate. Therefore this succession, deposited by an antecedent river system, records not only high sedimentation rates but also high subsidence rates. We propose that continuous high sediment supply generated differential loading of hangingwall depocentres and enhanced subsidence during normal fault growth.

Finally, in the distal river system, the vegetation types identified through pollen analysis in the alternating fluvio-deltaic and shallow lacustrine deposits, are coherent with the relative lake level variations. Dry/cool climate is preferentially recorded in mouth bars and deltaic plain deposits during periods of low lake level, while a wet/warm climate is recorded in prodelta deposits during periods of high lake level. This correlation suggests that, despite the dominant control of active faulting, climate plays a key role in controlling syn-rift stratigraphic architectures and facies types and distributions.

Keywords : rift initiation, antecedent river system, alluvial architecture, deltaic unit, sediment supply, magnetostratigrahy, sediment accumulation rate, palynology, climate signal

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