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Impact of Hinterland Evolution in Mineralogy of Clastics Sediments: Presentation of a New Project Focus on the Mozambique Margin During Meso-cenozoic Times

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Summary

The early stage of oil exploration in sedimentary basins is based both on large scale tectono-stratigraphic approach from previous works and conventional imaging data mostly well-logs and 2D seismic. In particular geologists face to the lack of model to be able to better predict the reservoir presence and quality of undrilled basins. The source-to-sink studies ("S2S") on modern or recent systems are particular interest because they aim to understand and quantify the link from the source/hinterland area (drainage area, nature of the bedrock, climate and topography) to the sink/basin (slope gradient, shelf size, eustasy and sedimentary process). The application of this S2S approach on ancient sedimentary systems is challenging because of the lack of constraints of some controlling factors like the climate, the composition of the source material, the location and altitude of paleo-reliefs or the extent of the drainage area. Our aim is to explore if there is a way to anticipate the impact of the tectonic /geodynamic and climatic evolution of a hinterland on clastic accumulations in the basin and their related mineralogical composition in the basin using the same data-set that can be obtained during an early exploration phase.

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We focus our study in the well-documented system of the Mozambique margin during Meso- and Cenozoic times. The on-going studies by G. Baby, J-P. Ponte PHD's respectively on the South African Plateau and Mozambique Margin provide through times: 1) in the source area, valuable mapping of weathering paleosurfaces that allow to constraint the drainage areas and volume of eroded sediments and synthesis of thermochronology data and 2) in the basin, regional seismic interpretations, paleogeographic maps, quantification of deposited sediments based on news biostratigraphical data (Baby, 2017; Ponte *et al*., 2017). Knowledge of climate evolution during the Cretaceous is improved by palynologic studies from wells done by TOTAL.

Here, we present a new project which will focus on the lithological and mineralogical records on cuttings from two old exploration wells. In order to recognize the impact of provenance, climate, diagenesis and transport processes on sediments mineralogy, we focus on the signature of the sandstones including petrographical analysis (E. Garzanti; Milan University), heavy mineral quantification (S. Ando; Milan University) and U/Pb datation on zircon. We will also quantify along the two wells the clay mineralogical association of lutites by XRD analysis of the <2um clay fraction (D. Beaufort and P. Patrier; Poitiers University) and the lutites mineralogy by XRD analysis of bulk powdered lutites, Qemscan and XRF analysis (TOTAL). The objective is to integrate previous data from the onshore and offshore domain (geological maps, weathered paleosurface, seismic interpretation, known climate changes) to help us to recognize, characterize and quantify the impact of controlling factors in the changes of the mineralogy of the reservoirs. We project to complete the dataset by the characterization and "absolute" dating of weathered paleosurfaces to improve the link between hinterland evolution and the sediment mineralogy in this S2S system.