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Impact of hinterland evolution in mineralogy of clastics sediments: first results from mineralogical analysis focus on the Zambezi system during meso-cenozoic times

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The early stage of oil exploration in sedimentary basins is based both on large scale tectono-stratigraphic approach from previous workss and conventional industrial 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, subsidence, 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 constraint the causes of major changes in basin sedimentation of the well documented Zambezi S2S system through times using a combination of mineralogical/petrographical analysis tools. Here, we propose to combine petrographical and heavy minerals quantifications with U/Pb on detrital Zircon and the evolution of clays minerals association on cuttings from two offshore wells through the Meso-cenozoic to constraint changes in provenance or weathering conditions.
Our first petrographycal and HM results through the basin series show four mains HM assemblages, a clear evolution of sandstone composition in Quartz, Feldspars and volcanic fragments content trough time (QFL diagram), and six U/Pb age reflecting the erosion and recycling of six Units which signal in sediment change in space and time. An evolution of sediments provenance is proposed with the erosion of permo-triassic volcano/sedimentary series during earliest Cretaceous following by a syn-sedimentary alcalin-volcanic event probably Aptian in age and an increase of recycling of older sedimentary cycles quartz-rich through time. On-going clay analysis show changes in clays association suggesting change in chemical VS physical weathering conditions through times. Even if the base of the serie is diagenetically impacted, the Cretaceous to Pliocene clays series evolutions indicates an increase of physical weathering condition since the end of the early cretaceous to Pliocene sediments probably interrupted during Paleocene-Eocene times.