Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5226

Depositional system and terrigenous influence in an Archaean deep water environment (3.2 Ga-old Fig Tree Group, Barberton greenstone belt, South Africa)

QUENTIN AQUILA[1], MARION GARÇON[2], NICOLAS OLIVIER[1], JOHANNA MARIN-CARBONNE[3] AND DR. CHRISTOPHE THOMAZO[4]

[1]Université Clermont Auvergne

[2]CNRS - University Clermont Auvergne

[3]University of Lausanne

[4]Laboratoire Biogéosciences, UMR CNRS 6282, Université de Bourgogne Franche-Comté

Presenting Author: quentin.aquila@etu.uca.fr

Sedimentary rocks from the 3.26-3.225 Ga-old Mapepe Formation outcrop in the Barberton greenstone belt in South Africa. The base of the Mapepe Formation displays a stratigraphic succession made of sandstones, conglomerates and orthochemical sediments such as banded ferruginous chert (BFC) and banded iron formation (BIF). At the geo-site “Tsunami conglomerate”, a 4.5-m thick BFC breccia was interpreted as an Archaean tsunami deposit. Giving a unique opportunity to address sources and fluxes of terrigenous components into PaleoArchaean deep water sedimentary setting, we conducted a detailed petrographical and geochemical study on a 87-m thick succession at the geo-site locality. We interpret the depositional setting of these Mapepe sediments as an equivalent to a modern deep-sea fan sedimentary system. The petrological and geochemical signatures of the detrital deposits suggest variable terrigenous supply along the succession. The BFC and BIF have the typical trace-element signature of Archaean seawater (<0,5wt% Al_2O_3; <3 ppm of Zr and a superchondritic Y/Ho) while the higher Fe enrichment of BIF compared to BFC may be due to fluctuation of hydrothermal input in the deep-water basin. The trace element pattern of the Tsunami breccia is very well reproduced by a mixture of only 10% of terrigenous material and 90% of the underlying BFC. This suggests a limited but significant terrigenous influence during the BFC breccia deposition due to gravity instabilities driven by turbiditic currents within the BFC units. The others and overlaying sandy and conglomeratic detrital units reveal a stronger terrigenous content. These units are interpreted to reflect channel and turbiditic lobe migrations associated to the dynamic of the deep-sea fan system. Geochemical analyses of the terrigenous-rich sediments highlight unusual positive La-Ce-Pr anomalies relative to the PAAS composition. Such anomalies strongly perturb the use of La/Yb ratio as a source proxy and likely reflect a complex post-depositional history involving the circulation of La-Ce-Pr-rich fluids in oxidant conditions. Using Th/Sc ratios and calculated primary La/Yb ratios of the sediments, we show that the eroded continent was mainly mafic (>80% of the eroded surface). This result contrasts with previous studies suggesting more felsic contribution throughout contemporaneous deposits of the Mapepe Formation.