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Stratigraphic lithologic correlation of Mesoarchean oceanfloor sequence: Cleaverville-Dixon Island vs Mapepe formations

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The Mesoarchean has key period to understand changing environments on earth surface, such as continental growth, atmosphere, and biosphere during Archean. We try to correlate these changes from deep ocean sedimentary sequence at 3.2 Ga from following two localities; the Dixon Island ?Cleaverville formations in west Pilbara in Australia and the Mapepe formation in the Fig Tree Group in the Barberton belt in South Africa.

The 3.2 Ga Dixon Island ?Cleaverville formations is one of the best preserved immature island arc setting ocean surface environment (Kiyokawa et al., 2006). Lower portion the Dixon Island Formation is highly affected volcanic rocks with hydrothermal vein. Above volcanics, hydrothermal vein related thick chert bed was deposited. Upper portion formed well laminated organic rich shale, chert pyrite thin layer. After the pillow lava volcanic event, the Cleaverville Group deposited from thick massive black shale and banded iron formation. The stratigraphic change shows depth condition from the hydrothermal related relative deep ocean environment to weakly oxic shallow ocean.

On the other hand, 3.2 Ga Mapepe Formation in the Fig Tree Group which was reported well stratified turbidity sandstone-shale sequence above volcanic rich Onverwacht Group (eg. Lowe and Byerly, 1999). We focused one example of well bedded shale-chert sequence of the Mapepe Formation along the Komati River. This section was more than 300 m continuous outcrops. We reconstruct 150m long very detail stratigraphic columns at this section. This formation formed well laminated black-greenish shale, black-white chert, iron rich red chert, magnetite rich iron formation. Lower portion preserved few m thick massive black chert and start to well laminated more than 300m thick bedded sequence. There is thick red color iron rich sandstone bed sequence overlies in this formation. The Komati river section is identified as upward increase chert and iron rich sediment and coarsening upward.

Stratigraphy of these sediments are partly resemble. Both of contains hydrothermal chert sequence at the bottom, and well laminated black shale ? chert ? shale sequences. Also, grain size, thickness of bed and iron contents in each sequence are increase to the top. This stratigraphic character shows oxic condition may be formed at these ages. Organic matter below the iron rich sediment may be identified as producer of oxygen at this time.

Keywords: Archean, Black shale, BIF, hydrothermal activity, Pilbara, Barberton