Constraints on terrestrial and shallow marine environments of 3.2 Ga Earth: ICDP full proposal for Moodies Group Drilling Project in South Africa

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3.2 Ga Moodies Group is a part of Barberton Greenstone Belt, which hosts early to middle Archean rocks. Moodies Group is dominated by clastic sedimentary rocks, with minor chemical sedimentary and mafic igneous rocks. Those rocks were uniquely formed alluvial to very shallow marine environments. Such very shallow sedimentary rocks may have directly recoded redox state of early atmosphere, nature of early continents, traces of alluvial to fluvial biosphere.

International field workshop was held in early October of 2017 at Barberton, South Africa. Scientific problems of Moodies Group were discussed and outline of ICDP proposal was agreed by the workshop attendees. Currently our group submitted ICDP full proposal for multiple drilling project of 3.2 Ga Moodies Group. Scientific targets in the proposal and their impacts will be introduced in this presentation, besides brief report of the field workshop.

Traces of microbial mats have been found in alluvial to fluvial sedimentary rocks of Moodies Group. Very shallow environments were created by rise of the earliest continent, and such shallow environments offered cradle for early microbial communities. Banded iron formations were also found in such very shallow marine sedimentary rocks. They were most likely formed in oxic water mass, which indirectly indicates the presence of 3.2 Ga oxygenic photosynthesizing bacteria. Marine to terrestrial sediments exposed to the contemporary atmosphere and weathered right after their sedimentation. Evaporate minerals were formed in those pale-weathered rocks. They are often associated with biogenic pyrite, suggesting microbial activities in terrestrial soils even at 3.2 Ga. Those surprising phenomena have been discovered recently. New drilling project of Moodies Group will offer more concrete evidence of redox state of the atmosphere, role of the earliest continent to biosphere, presence of terrestrial and very shallow biosphere. New findings from this drilling project will alternate our understanding for the early Earth.

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