The sedimentary geology off Mesoprotozoic Ahlmannryggen Group, Western Dronning Maud Land, East Antarctica: prospects for future research

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Abstrak (Abstract)

Field studies conducted on the Mesoprotozoic Ahlmannryggen Group in Western Dronning Maud Land in East Antarctica in summer 2003/2004 revealed that sediments the Ahlmannryggen Group are more widespread and varied than previously mapped. Emphasis were made on two previously mapped Formations of this Group: the Pyramiden Formation and the Grunehogna Formation. In addition, a thick widespread mixed clastic-carbonate sequence were found to the west of the Ahlmannryggen Mountain which had not been previously known.

The oldest clastic Pyramiden Formation is composed of at least 7 cycles of dark, very burrowed shale overlain by cross-bedded sandstones and capped by thin shales and lenticular and flaser beds. Mud cracks and organic trails are abundantly present in the mud caps. This cycles are interpreted as the progradation of beach sand over lagoonal mud and capped with tidal flats sediments. A detailed petrological study of these clastics is currently undertaken to unravel the sources of these sediments. This provenance study will help understand the pre-existing geology of this region and afford a more precise reconstruction of the East Antarctic craton and their reassembly with other known cratons.

The younger Grunehogna Formation is composed of at least 4 units, each of a different facies. The oldest unit is composed of laterally uneven thickness of slumped and plastically-distorted sandstone-shale beds which were deposited on an uneven volcanic basin floor. Syn-sedimentary volcanic injection are common within this horizon. The overlying predominantly shale sequence contains thin graded sandstone which in turn is overlain with a thick blanket

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sequence of cross-bedded sandstone with large shale clasts. The youngest unit is composed of interbeds of rippled sandstone bed, conglomerate-breccia beds rich in volcanic clasts and shale with abundant burrows and mud-cracks. The Grunehogna sequence is interpreted to be a filling of a volcanic basin. Uneven basin floor together with syn-sedimentary volcanism induced an unstable environment leading to the collapse and slumping of the oldest sedimentary unit followed by a quiescence phase in which the shale accumulated with intermittent turbidity current flow bringing in the sand. The sequence built up into a high energy environment, probably a beach or a fan delta and overlain by a braided stream deposit and flood plain in a arid setting. Extensive diagenetic changes was probably induced by the reactive volcanic-hydrothermal system as well as the arid condition. Further detailed study of the Grunehogna Formation will help unravel the paleoenvironmental and paleoclimatic condition during its deposition.

A new thick mixed clastic-carbonate sequence underneath the volcanics in the western Ahlmannryggen which have not been mapped before. It is named as the Flarjuven sequence after the large nunatak where this sequence is best exposed and is the thickest and the most widespread of all the sedimentary sequence in the Ahlmannryggen. Accessibility to these nunataks is difficult as the largest and deepest windscoops are found here. Its stratigraphic position has to be resolved as they are 30 km from the nearest Pyramiden exposure and about 20 km from the Grunehogna Formation. As they are overlain by dolerite, they have been thermally metamorphosed beneath the contacts and have a hornfelsic texture. Primary structures are still visible especially in thicker sequences away from these contacts. Thick cross-bedded sandstones forming shallow chanellised sandbodies, overlain by dark shales and carbonate couplets with algal growth structures and teepee structures and in places mud cracks which are overlain by intraformational conglomerates are interpreted as tidal flat progradation on tidal channel deposits. These dolerites have been dated as 1100 Ma and hence the mixed clastic-carbonate is probably of Mesoprotozoic age. This is the oldest carbonate sequence in Dronning Maud Land and among the oldest known in Antarctica.

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