



SEDIMENTOLOGY OF THE LATE PRECAMBRIAN MUNDALLIO
SUBGROUP : A CLASTIC-CARBONATE (DOLOMITE, MAGNESITE)
SEQUENCE IN THE MT. LOFTY AND FLINDERS RANGES,
SOUTH AUSTRALIA.

(VOLUME I)

by

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SUMMARY

During deposition of the mixed carbonate-clastic sequence of the Mundallio Subgroup, the "Adelaide Geosyncline" was a very shallow, elongate sedimentary basin, flanked to the west and east by older Precambrian basement.

In much of the southern and northern Flinders Ranges, clastic deposition predominated in the lower Mundallio Subgroup. In the north, alternating development of shallow mudflats and sandflats (Nankabunyana Formation) depended on the interplay between the sediment supply and winnowing processes, while dolomite mudstones were locally deposited in the shallowest areas. In the eastern half of the Willouran Ranges, massive shales were deposited as the environment remained persistently below wave base (Camel Flat Shale), but a renewed sand influx led to deposition of the Tilterana Sandstone. In the southern Flinders Ranges, terrigenous clay and silt were deposited on submergent mudflats which shallowed into intermittently exposed dolomite mudflats (Nathaltee Formation). Dolomite mudflats were a more persistent feature in areas more distal from the terrigenous source, and sometimes contained isolated, ephemeral lakes which were sites of magnesite deposition (Yadlamalka Formation). Dolomite and magnesite mudstone deposition of the Yadlamalka Formation became widespread in the northern and southern Flinders Ranges in the upper Mundallio Subgroup, as shallowing and retreat of the basin margin led to the formation of semi-isolated lakes, separated and enclosed by exposed carbonate mudflats. The clastics deposited in association with these carbonate mudstones consisted largely of sand sized detritus, probably derived from the reworking of aeolian deposits. In the eastern Willouran Ranges, the greater influx of sand and the slightly deeper, largely submergent environments, led to the deposition of the sandstones, dolomites and siltstones of the Mirra Formation.

Because of little clastic influx into the northern Mt. Lofty Ranges, shallow to occasionally exposed environments were largely sites of dolomite

deposition (Skillogalee Dolomite). To the south, shales were deposited in slightly deeper environments (Woolshed Flat Shale), although local dolomite deposition occurred in the Adelaide region (Castambul Formation, Montacute Dolomite). In the uppermost part of the subgroup, the area of shale deposition extended northward, encroaching over the dolomite mudflats of the upper Skillogalee Dolomite.

Dolomite, occurring largely as mudstones, is the major carbonate mineral present in the Mundallio Subgroup, but magnesite is also widespread. Limestones are not present. The carbonates experienced minor replacement by early diagenetic chert, initially precipitated as both crystalline and amorphous phases. Within the upper Mundallio Subgroup, the preservation of fine details of the detrital texture of dolomite mudstones and peloidal dolomites, and the high Sr contents of dolomites (largely in the range of 400-650 ppm), suggest that these sediments consisted of Ca-Mg carbonates (protodolomite, Mg-calcite) at the time of deposition. Slightly greater recrystallisation of dolomites in the lower Mundallio Subgroup resulted in their lower Sr and higher Mn and Fe contents.

Magnesite mudstones may have initially precipitated as hydrated Mg-carbonates. Lithification of surface sediments as a result of subaerial exposure, led to the formation of micritic magnesite. Much of this magnesite was subsequently reworked into intraclastic beds.

The carbonate mineralogy of this sequence, and the evidence of only rare sulphates, indicate that the carbonates were precipitated from alkaline, Mg-Ca-CO₃ waters, with a higher carbonate and lower sulphate content than seawater.

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