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GEOMORPHOLOGY

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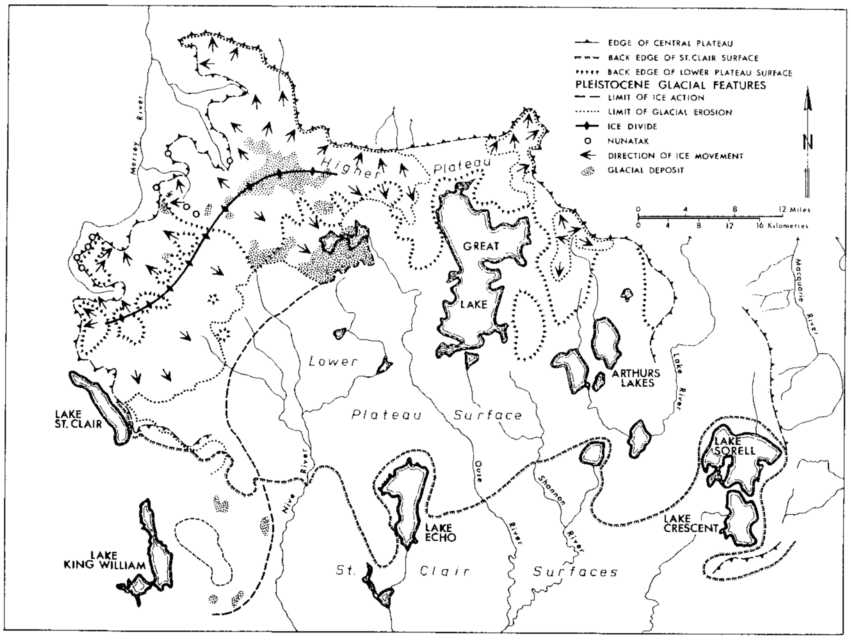
Surface Form

The Central Plateau rises from about 600m in the south and east to a maximum of about 1420m in the north and west. It consists of three main surfaces. The lowest or St. Clair Surface (Davies 1959 after Browne 1950) lies between 750 and 825m (see fig. 10), the middle or lower Plateau Surface between 900 and 1050m with many erosion residuals rising to heights of just over 1200m and the highest or Higher Plateau Surface rising from 1200m at its south-eastern limit to 1420m in the north-west. Lakes St. Clair, Echo, Sorell and Crescent lie on the St. Clair Surface close to its junction with the Lower Plateau Surface. The Lower Plateau Surface is separated from the Higher Plateau Surface by a sharp scarp, Great Pine Tier, in the south-west but the contact between the two surfaces near Great Lake is highly indented. On available evidence Great Pine Tier is probably a scarp which has retreated from the Great Pine Tier Fault (Macleod *et al.* 1961, Gulline 1963, and fig.7), but the faulting preceded the development of the Higher Plateau Surface as the level of the Surface extends across the scarp and appears as the tops of erosion residuals south-west of the fault (fig.10). It is interesting to note that at least four major lakes Augusta, Great Lake and Arthurs Lakes lie on the Lower Plateau Surface close to its junction with the Higher Plateau Surface thus repeating the relationship of lakes to the two lower surfaces. The relationships between the three surfaces suggest that they represent successive erosion levels separated in time by uplift phases as postulated by Davies (1959). It is noticeable that the lavas, including the Late Oligocene and Miocene lavas of the Great Lake area, occur only within the confines of, but form part of the two lower surfaces. The outpouring of lava must therefore have preceded the formation of these surfaces. However no such limit can yet be placed on the age of the Higher Plateau Surface.

Drainage

The plateau is drained mainly to the south by such tributaries of the Derwent as the Nive, Dee, Ouse and Shannon Rivers, but short tributaries of the Mersey, Meander and Macquarie Rivers drain the western, northern and north-eastern rims. The dominant stream trend on the Plateau is from north-west to south-east with



10. Geomorphological map of the Central Plateau.

a subsidiary trend from NNE to SSW over most of the Plateau but meridional south and west of Lake Echo. These directions, also well represented in the scarps bounding the Plateau and in Great Pine Tier, reflect the dominant joint and lineation directions in the dolerite and the directions of known faults. The joint and fault control result in the rectangular type of drainage pattern noted by Davies (1965, p.19).

Glaciation

Within the last 25,000 years, much of the western part of the Plateau was ice-covered (see Glacial Map, Derbyshire *et al.* 1965) and subject to glacial erosion. The glacial divide extended from just east of the Travellers Range to just south-west of Julian Lakes (see fig.10). Erosion extended to the rim of the Plateau to the north and west, east as far as Wild Dog Tier and south almost to Clarence Lagoon. Major glacial depositional features occur along the eastern flank of the ice sheet only in the area north-west of Double Lagoon and there are few along the southern flank except between Clarence Lagoon and Lake St. Clair. Minor ice caps occupied the south-westerly flank of Drys Bluff where the form of the ice-eroded surface suggests flow from the south-south west, and on the northern ridge of Bradys Lookout and Sandbanks Tier which seems to have been quite separate from the other caps. The main evidence of ice erosion is in the form of ice-gouged and smoothed surfaces and roches moutonnees but striations are very uncommon. Glacially abraded valley steps occur in several places as do over-ridden cirques. The western edge of the plateau has also been over-ridden by ice. Depositional landforms resulting from ice action are mainly areas of hummocky moraine north and west of Lake Ada and extending almost to Blue Peaks, and area of ground moraine north and west of Double Lagoon and scattered minor moraine ridges. Glacial boulders are widespread and, as might be expected, are predominantly dolerite although erratics of basalt and hornfels are also known to occur locally. A basaltic boulder train extends from Lake Augusta to Lake Kay. The paucity of depositional landforms relative to the very extensive erosional ones may be partly due to the location of the ice divide close to the western margin of the plateau so that much of the ice and its moraine spilled over into the Mersey valley or into the Lake St. Clair basin, partly to the relatively minor amount of material eroded, as shown by the paucity of cases of breached divides and drainage diversions (Jennings and Ahmad 1957). The relatively minor remodelling of the landscape by the ice, especially that east of the divide, was noted by these authors who regarded it as a region of passive glaciation, produced by "very gradual slopes and slighter precipitation". The lack of end moraines has been attributed to gradual as opposed to spasmodic retreat of the margin of the glaciers (Davies 1969, p.178). The evidence suggests an ice cap sitting on the western and northern part of the Central Plateau about 50 km by 20 km and at least 240m thick in places with only occasional hills, such as the West Wall, Howells Bluff, top of Western Bluff, projecting through it as nunataks. Evidence recently collected near Great Lake and Monpeelyata Canal (Derbyshire 1968) suggest a cold period preceding the main glaciation, a cold period which may be an earlier phase of the last main cold stage or an earlier cold glacial stage. Two glacial stages are also suggested by evidence in the Forth Valley (Paterson 1965).

The lakes vary in character. Some occupy shallow depressions in the till plain and are simple whereas others in the same terrane are divided or almost divided by ice-pushed block ramparts (e.g. Double Lagoon). Some lakes (e.g. Clarence Lagoon) are impounded by end-moraine barrages. South of Lake Nameless are scattered small lakes which occupy depressions in till possibly due to collapse of ice blocks in the moraine. A few small lakes surrounded completely by solid rock are due to glacial over-deepening and the sides of these not infrequently parallel lines of structural weakness in the dolerite. Many, if not most of the larger lakes are of compound origin, partly occupying hollows due to over-deepening, partly dammed by moraine.

In addition to the numerous, rather small (less than 7.5 km long) lakes of the western part of the Plateau, are a few large lakes in the eastern and southern parts of the Plateau, e.g. Lake Augusta, Great Lake, Arthurs Lakes, Lake Sorell, Lake Crescent, Lake Echo and others. All of these lakes are wide and shallow and lie beyond the known limits of glaciation. As pointed out earlier, they all lie close to the upper limits of the St. Clair and Lower Plateau Surfaces. Their origin is not clear but it seems likely that they were formed by slight northward tilting of the erosion surfaces on which they lie (Davies 1965, p.22). This tilting is probably very recent, perhaps only a few thousand years ago, as the lakes although shallow have not been destroyed by filling with sediment. Dr. Colhoun (pers. comm.) remarks, however, "that if tilting is recent old shore lines should be preserved, at least at one end. If tilting is a result of glacio-isostatic response which is dubious but possible then the north-west should be raised and the south-east lowered. If tilting is tectonic, the old shorelines should occur in places determined by the direction of tilting, i.e. if the argument advanced above is correct they should occur at the southern end." An emerged shoreline is present near the pumping station at the western end of Arthurs Lake (as pointed out by K.D. Nicholls during the excursion) and reconnaissance study of aerial photographs suggest more deposition and perhaps emergence on the western sides of Lagoon of Islands, Woods Lake and Lakes Sorell and Crescent. This, if true, suggests the glacio-isostatic response mentioned above and implies that these lakes were already there as the ice began to melt.

Periglacial effects are particularly noticeable in the form of block streams that rim the Plateau on the eastern, northern and western sides but frost shattering resulting from Pleistocene and perhaps Holocene frost action is widespread, albeit less spectacular. The Pleistocene snow line has been estimated to have been at about 1200m in this area and the limit of periglacial activity must have been appreciably lower, perhaps about 600m as suggested by Nicolls (1965, p.28) and Davies (1968, p.12). Patterned ground occurs on moraine at about 900m in the south-western part of the Plateau (Jennings 1956). A block stream underlies the Chalet at Poatina at 260m above sea-level (McKellar 1957, Davies 1968).

POST-GLACIAL EVENTS

Several of the smaller lakes (e.g. Lagoon of Islands) are bordered on the eastern side by vegetated sand dunes suggesting a period dry enough to allow deflation, probably the Mid-Holocene

Arid Period from about 7000 to about 4000 years ago. Such dunes occur along the east sides of Lakes Sorell and Crescent thus suggesting that they, and the tilting which probably produced them, are Mid-Holocene or older. Seismic records over the last decade or so allow epicentres to be recognised on or near the Plateau (fig. 7). This suggests that the Plateau area is still seismically active, although only very mildly so, and therefore presumably slight deformation is still occurring. No signs of movements resulting from seismic activity have yet been seen on the ground.

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