

# The Glaciation of Marion Island

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The present-day topography of the volcanic island Marion clearly indicates that it was covered by glaciers at some stage during its history. The results obtained by the Biological-Geological Expedition of 1965/66 have given interesting information on this glaciation, which is of more than just local importance. According to Potassium-Argon dates the island is of middle to late Pleistocene age and the geological survey by W. J. Verwoerd (1967) has shown that the surface of the older grey lava has been smoothed by glacial action which also left behind typical striated platforms, while the younger black lava flows are of post-glacial age. These observations provide a 'terminus post' and 'ante quem' in stratigraphical terms and in absolute dates for this glaciation. The very interesting result shows that Marion Island was covered by glaciers at the same time that the Würm-Wisconsin-Valdai glaciation occurred in the northern hemisphere and when the Kenya glaciation spread over the highest mountains of East Africa.

Good proof for the final stages of this glaciation on Marion Island has been provided by analytical investigations of pollen by Schalke and van Zinderen Bakker Sr (1967) which have shown that between about 16 000 and 14 000 years B.P. the climate of the island near sea level must have been colder than at present. During this time the pollen of the cushion plant *Azorella selago* was predominant in the pollen spectra, which indicates that the vegetation of the higher mountain slopes descended to sea level. Slightly milder conditions prevailed from about 14 000 to 12 000 B.P. when the pollen of *Acaena adscendens* was dominant. This prostrate rosaceous dwarf shrub prefers more sheltered habitats and is not found at higher altitudes on the island. During the last 12 000 years a mire rich in *Gramineae*, *Cyperaceae*, *Ranunculaceae* and some *Lycopodium magellanicum* existed on the site of the boring, which indicates climatic conditions similar to those of today. This pollen evidence also shows that the glaciation ended at the same time as in the northern hemisphere and that it was followed by a late-glacial and post-glacial stage.

These results strongly support the view that, during the Quaternary, the entire world was subjected to synchronous and parallel variations in temperature. The

results may also indicate that shifts of minor magnitude have occurred in the position of the Polar Front. Marion Island is at present surrounded by sub-Antarctic surface water and at only 2° latitude south of the island the Antarctic Convergence occurs. A small northward displacement of this oceanic boundary would decrease the temperature of the surface water surrounding the island by about 2°C. Such a lowering of temperature could well initiate a glaciation in islands such as Marion and Prince Edward. Although it is possible to infer the glaciation from the marginal position of these islands, it should be kept in mind that a general decrease in the temperature of the ocean surface water, without postulating a shift of the Polar Front, could also explain these phenomena.

The data on the glaciation of Marion Island should be correlated with present and future research on oceanic sediments in the surrounding sea and also with the glacial history of the Antarctic continent.

The relatively young age and the glacial history of Marion Island make it a very interesting object in the study of plant and animal ecology and especially ecesis, migration, settlement and speciation. The first inventory of the flora and fauna of this island, which was made by the South African Expedition of 1965/66, should be followed up by more detailed analyses of certain groups by specialists and by cytotoxic studies. A comparison of these data with those of other sub-Antarctic islands, of which the geological history is well known, will give us a better insight into a number of general biological problems.

## References

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