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Climate change during the glacial periods: Evidence from Sri Lanka

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Abstract

In the Earth's history, there were five major glaciations, namely, Huronian, Cryogenian (or Sturtian-Varangian), Andean-Saharan, Karoo and the Quaternary that occurred between 2,400 Ma and 0.0114 Ma. It is revealed that Gondwanaland emerged between the Huronian glaciation (2100-2400 Ma) in the Paleoproterozoic Era and the Andean-Saharan glaciation (420-450 Ma) in the Early Paleozoic Era. During this time, most continental land masses were clustered in the southern hemisphere, and the landmass of Sri Lanka remained joined to Africa-Madagascar and India to Antarctica. Within the Ordovician (488.3 - 445.6 Ma) to Permian (299.0 - 253.8 Ma) periods there were signs of the breaking up of Gondwanaland, and Sri Lanka and India were positioned within it. By the end of the Permian Period (260 Ma) Karoo Glaciation had ended and the present Mannar Basin developed within a deep canyon (about 4 km deep) on the Precambrian basement.

Although the present island of Sri Lanka lies in the Indian Ocean between 5° 52'N - 9° 54'N and 79° 30'E - 81° 55'E, to the southwest of the Bay of Bengal and southeast of the Arabian Sea, it was positioned within 68°S - 65°S and 34°E - 43°E during the Early and Middle (Lower) Jurassic Period (161.2 - 150.8 Ma). Climatic changes in the Permian, Triassic and Jurassic periods caused glacio-fluvial processes forming streams fed by melting glaciers. These glacio-fluvial processes emerged Sri Lanka on four occasions during the Jurassic, Eocene, Miocene and Pliocene times due to climatic changes and sea level fluctuations that broke up the glacio-fluvial sedimentary beds, initiating establishment of the present topography and structural configuration. As a result, the earlier sedimentary deposits were obliterated from the greater part of Sri Lanka. During the Quaternary Period the erosional rate increased and the resultant erratic boulders along with ice-rafted deposits can still be found on the "Planated surfaces". This paper reports the series of palaeo climate changes and their consequences based on erratic boulders and ice-rafted deposits observed in many localities within Colombo, Kurunegala, Trincomalee, Batticaloa and Ampara Districts.

Keywords: Glacial Periods, uplift, sedimentary deposits, erratic boulders.