

VOLCANIC HISTORY AND CLIMATE CHANGE DURING THE PAST FEW CENTURIES AS RECORDED IN AN ICE CORE FROM THE CENTRAL DRONNING MAUD LAND, EAST ANTARCTICA

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In order to assess the spatial and temporal environmental changes in East Antarctica, shallow to medium depth ice core drilling is being carried out by India along a transect within the Central Dronning Maud Land (CDML). As part of this initiative, a 62.2 m long ice core (IND-22/B4) was recovered near the Tallaksenvarden nunatak of CDML (70° 51' S & 11° 32' E). Systematic glaciochemical studies were carried out on this core to identify the natural changes in environment and climate during the past few centuries. The sulphate (SO₄²⁻) content varied widely between 15 and 377 ppb within the core, with several spikes that closely mimic a large body of ice core records from Antarctica and elsewhere. Comparison of the estimated non-sea-salt sulphate (nssSO₄²⁻; after accounting for the possible background sulphate of biological origin) profile of this core with that of the well-dated ice core records from Antarctica, reveals the existence of several dramatic events during the recent past. A chronostratigraphic model based on the prominent occurrence of a doublet of nssSO₄²⁻ peaks attributed to the 1815 Tambora eruption and an unknown eruption of 1809 (considered to be the most remarkable interhemispheric marker horizon in recent history), provides an average annual accumulation rate of ~10 cm ice equivalent at the drilling site. Adopting international criteria, we have detected several prominent spikes above the nssSO₄²⁻ background that seems to be directly related to volcanic events that had global and/or regional implications. Major volcanic events recorded at the core site include Pinatubo (1991), Agung (1963), Krakatau/Tarawera (1883/1886), Tambora (1815), Huaynaputina (1600), among several others. Relatively high Cl⁻/Na⁺ ratio throughout the core (mean 3.1) compared to that of the seawater imply additional sources of Cl⁻, most likely due to the intense scavenging of gaseous Cl⁻ in the lower atmosphere. The nitrate (NO₃⁻) profile reveals a systematic negative shift since mid-18th century from an average value of 151 ppb to an average value of 76 ppb, suggesting a possible change in the zonal wind transport over the ocean to the Antarctic continent.