Geochemical investigations of the intrabasaltic palaeosols (bole beds) from Deccan Traps, India in deducing the palaeoclimatic conditions

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Geochemical analysis of the intrabasaltic bole beds (palaeosols) occurring in the parts of Deccan Volcanic Province (India) was applied in deducing the palaeoenvironmental conditions prevailed during their formation. The bole beds the study area occur as red or green couloured clayey intercalations between the basaltic lava flows and show distinct environmental conditions during their formation when compared with the modern soils. In general red boles show higher weathering intensity, much leaching of the bases than the green boles while modern soils show moderate weathering but quite high leaching of the bases. The Weathering Potential Index (WPI) however suggests higher weathering in red boles, moderate in green boles and lesser in the modern soils. The Parkers Weathering Index (PWI) and calcination values indicate an enrichment of calcium during the formation of green boles thereby indicating aridity. Red boles were formed under higher rainfall but lesser temperature (more hydrolysis) than the green boles (less hydrolysis) while modern soils were formed under much higher rainfall and comparatively low temperature (strong hydrolysis). Iron species ratio, Product Index and FeO/Mgo values suggest that red boles were formed under strongly oxidizing but lesser acidic conditions while green boles were formed under less oxidizing but higher acidic conditions. The modern soils however indicate not much oxidizing but alkaline conditions. More retention of original mafic components in red boles and felsic components in green boles indicate selective dissolution of mafic components from green boles in more acidic fluids. Less hydrolysis and more calcination in green boles (than red boles) point towards more arid conditions during their formation than the red boles. However modern soils were formed under considerably humid conditions. The values of salinization indicate that the red boles were formed under fairly leached but relatively poorly drained conditions than the green boles while modern soils formed under quite intensely leached but poorly drained conditions. In conclusion the red boles were formed as a result of intense weathering under strongly oxidizing, acidic, more humid (more hydrolysis) environment with fairly leached but relatively poorly drained conditions than the green boles, suggestive of distinct weathering regimes. As a whole the palaeoclimates during the bole bed formation were quite different than the Holocene as the conditions were rather arid, fairly drained more acidic and strongly oxidizing with comparatively lesser rainfall but higher temperature. Although there is lack of age of control it is believed that the modern soil formation from Deccan traps represent much longer geomorphic history than the time lapsed during the formation of individual bole bed. In view of this, much intense weathering under stronger oxidizing conditions and more acidic conditions yet more aridity than the Holocene indicate catastrophic climatic conditions during the bole bed formation which can be related to the perturbations due to Deccan volcanic activity.

Inter-hemispheric patterns of Holocene Glacier and Temperature Change

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Glacier and Temperature Change

Glaciers are among the most sensitive recorders of climate change, making them highly valuable as paleo-climate recorders and, at the same time, highly vulnerable to ongoing climate change.

Using independent lines of argument from glaciology, glacial geology and climate science, we make the case that glaciers in temperate climate zones are pre-dominantly driven by temperature change and, in turn, form sensitive thermometers.

Holocene Temperatures from glacier and marine records

Recent progress in the method of cosmogenic nuclide surface exposure dating now affords for precise reconstructions of glacier fluctuations throughout the Holocene and up to present day. In combination with detailed mapping of the paleo-snowline, a measure of past glacier extent, relative to today's snowline, we present comprehensive records of glacier advances in southern and northern mid-latitudes during the Holocene, and deduce regional Holocene temperatures. We compare these terrestrial temperature records with near-by and far field marine temperature estimates to better understand the inter-hemispheric patterns of Holocene temperatures.

We finally discuss implications and potential of these data sets for improving climate models.