



Modern biotic and abiotic analogues from the surface soil of Ganga-Ghaghara-Gandak interfluves of the Central Ganga Plain (CGP), India: Implications for the palaeoecological reconstructions

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ABSTRACT

Modern surface analogue dataset combining biotic and abiotic proxies (*i.e.*, pollen, phytolith, diatom, stable carbon and nitrogen isotopes of organic matter, soil geochemical and textural parameters together with magnetic susceptibility) were generated from the Ghaghara-Gandak and Ganga-Ghaghara interfluves of the Central Ganga Plain (CGP) to determine the extent to which comprehensive multiproxy data can distinguish different types of depositional sub-environments (lacustrine and fluvial deposits; cropland and forestland). This modern analogue aims to provide basis to reconstruct reliable palaeoecological changes of the CGP, India during the Late Quaternary. The pollen assemblages reflect the mixed deciduous forest under a warm and humid climate in response to rainfall variations in the region. The anthropogenic activities could be well observed in the CGP through marker pollen taxa like cereal, Solanaceae and Brassicaceae. The overall pollen, phytolith, and diatom data indicate a comparatively denser vegetation cover and ecological variability in the Ghaghara-Gandak interfluve than in the Ganga-Ghaghara region. The $\delta^{13}\text{C}$ and TOC/TN values in the sediments indicate a mixed C₃-C₄ source of vegetation in the lakes and rivers of both the interfluves. However, the sediments from the forest floor indicate relatively lower $\delta^{13}\text{C}$ values (-27.6 to 29.1‰), indicating the typical C₃ source of vegetation. The low kurtosis values suggest fine-grained sediments combined with low-energy-level reworking in the two interfluves. The Principal Component Analysis (PCA) and Box-plot of the different proxy data was used to test if the soil from different depositional settings can be distinguished or not. Thus, the generated multiproxy data are consistent with the extant ecology and depositional setting, although some site-by-site variations were observed and are indicative of taphonomic bias, climatic alterations, geological, and anthropogenic factors. The present multiproxy analogue should be taken into account while reconstructing the past environment and ecology of the CGP and adjoining region.

1. Introduction

The Central Ganga Plain is one of the most densely populated regions of the world due to its fertile soil, availability of water, smooth landscape and suitable climate (Singh and Awasthi, 2011). They are the important physiographic features of the Indian subcontinent having

monsoon dependent agrarian economy. The land-sea thermal contrast between sub-continental landmass and the northern Indian Ocean got abruptly due to enhanced Sea-Surface Temperatures (SSTs) in the Indian Ocean, which possibly leads to increase in dryness in the CGP (Roxby et al., 2015). Thus, the recent decline in the rainfall distribution might have a negative influence on the water resources and crop productivity

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