

Paleoenvironmental changes recorded in late Triassic sediments in the Tethyan Himalaya, central Nepal

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Important episodes of biotic changes in the Triassic period that occurred during the Carnian - Norian stages are recorded at many places in the western Tethys. One such episode is the Carnian crisis (Hornung et al., 2007) that is characterized by a decrease in the carbonate production; the other episode is the onset of end-Triassic mass extinction that occurred during the late Norian period (Ward, et al., 2004). Oceanic and climatic conditions during the late Triassic period were more severe than those during the middle Triassic period, and they affected the faunal and floral assemblage in marine and terrestrial environments. However, certain aspects of the changes that occurred during the late Triassic period remain unclear, especially those that occurred in the southeastern Tethys. Additional inspection of both hypotheses is necessary on the basis of comprehensive data on stratigraphic and chemostratigraphic evidences.

The objective of this study is to impose constraints on the drastic environmental changes that occurred during the late Triassic period in the southern Tethys on the basis of the changes in the stable carbon isotope of carbonate and geochemical proxies in mudstones. The upper Triassic sections in the Jomsom areas in central Nepal, Tethyan Himalaya were examined between the Carnian and Rhaetian stages.

In these sections, lithofacies of the upper Triassic section consists of alternating beds of limestone and mudstone (Mukut limestone formation; Anisian - Carnian), a thick bed of mudstone with thin sandy limestone (Tarap Shale Formation; Norian), and a bed of quartzite (Rhaetian?). Results of a sedimentological field study suggest the deposition of Mukut limestone and the formation of Tarap shale in the shelf environments and the Quartzite formation in the upper shoreface - fluvial environments, in stratigraphic ascending order.

In particular, during the formation of Tarap shale, most of the strata were deposited in the lower to upper shoreface environments by frequently intercalated HCS structure with Monotis beds. However, several horizons, which were characterized by a thin laminated black shale and the lack of burrowing and bioturbation, are intercalated in the lower and middle parts. The chemical composition of mudstone along the thin laminated black shale shows a high concentration of trace metals.

In the upper section where Mukut limestone Formation, significant swings toward lighter values of stable carbon isotope from +2 to -3 permil(vs. PDB) is occurred until the uppermost horizon of the Mukut Limestone Formation. The intercalated mudstone exhibited moderate bioturbation, indicating the deposition in shallow shelf environments with frequently intercalated HCS marly sandstones.

The lower Norian section in the studied areas is found to be strongly affected by a decrease in the sediment input accompanied by an increase in the concentration of several trace elements. The lithofacies and characteristics of this section are interpreted in terms of a temporal and abrupt rise in the sea level and the occurrence of dysoxic/anoxic conditions in the local depositional environment in the continental shelf. Though the perturbation of the stable carbon isotope in the upper Carnian section causes global carbon cycle events, direct relationship between these two events is still unclear.