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Paleoenvironmental changes during last 700 kyr in Paleo-Kathmandu Lake, based on smear-slide and charcoal analysis

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We preformed smear-slide observation and microscopic charcoal grain analysis on the drilled core of the Pleistocene lacustrine sediments from the Kathmandu Valley, in order to examine the potential of sponge spicule, charcoal and phytoliths as proxy of paleoenvironmental changes. On the basis of the analyses, we reconstructed paleoenvironmental changes of the Kathmandu Valley and Paleo-Kathmandu Lake during the last 700 kyr, and pursued the cause of paleoenvironmental changes.

As the results of observation and counting of ratio of four proxy (sponge spicule, plant fragment, phytoliths, pollen) in each smear slide and charcoal grain analysis, it was revealed that climate repeatedly changed seven times of cold-dry and warm-wet, which correspond to MIS15 to MIS12.

Sponge spicule can be used as a proxy of warm and wet climate, as they increase their number during the period of wet and warm climate. Their number seems to have decreased during the period of environmental deterioration in cold and dry climate, because they could have formed gemmule for survival. In the depth above 45m, however, changes in water-level seem to have controlled the population of sponges, because the change in their number correspond to those of benthic diatoms.

Number of sponge spicule and charcoal/plant fragment indicates reverse correlation in the core deeper than 45 m, on the other hand it shows positive correlation in the shallow level shallower than 45 m. This change could be ascribed to the lowering of lake-water. Both plant fragment and charcoal grain increase their number during the dry period, and it is due to the increase of natural fire. Thus, they are good indicator of dry climate. During the MIS12 and MIS6, number of charcoal grain drastically increased eight to ten times than average value. It corresponds to increase of global ice volume in both intervals.

Although tectonic event influenced depositional environments and vegetation in and around the lake after about 80 ka (45 m in depth), spectral analysis of change in number of each proxy clarified that orbital forcing, especially 100 kyr cycle (orbital eccentricity) played the most important factor for controlling environmental changes before 80 ka.

Keywords: Indian monsoon, Kathmandu Valley, lacustrine sediments, smear-slide, charcoal analysis, sponge spicule