Variations of paleoclimate and paleoenvironment during the last 50 kyr recorded in clay minerals in the Kathmandu Basin sediments

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In order to reconstruct the paleoclimatic variation during the last 50 kyr recorded in the Kathmandu Basin, the amount of the clay size fraction, the crystallinity of illite and the relative amounts of clay minerals in the Kathmandu Basin sediments were estimated by using the decomposition procedure of X-ray diffraction (XRD) patterns and the MIF methods.

The variations of the two illite crystallinity indices, Lanson index (LI) and modified Lanson index (MLI), for the upper part of the drilled sediments were in harmony with the pollen analysis results of the same samples. The increasing hydrolysis condition expected from the results of illite crystallinity indices corresponded to the pollen zone in which some pollen as warm and wet climate indicators increase, while the decreasing hydrolysis condition corresponded to the pollen zone showing the increase of pollen as cold and dry climate indicators.

However, the variations of the illite crystallinity indices and the amount of the clay size fraction show roughly mirror image of that of the smectite/illite ratio. In the Kathmandu basin sediments, illite is the main constituent of the clay size fraction and the amount of smectite is very low relative to the other clay minerals. Therefore, the smectite/illite ratio depends strongly on the amount of illite. It is predicted that, in the Paleo-Kathmandu Basin, the weathering of mica formed illitic minerals but did not advance up to the ample formation of smectite, because of the rapid erosion and transport of sediments.

The variation of the hydrolysis condition inferred from these indices were also congruous with the variation of d18O obtained from planktonic foraminifers of deep sea sediments in the Arabian Sea. These results show that the major climatic variations in the Kathmandu Basin during the last about 50 kyr were closely related to global climate.