Elemental profiles of Rabhibhawan core and the implication on environmental change of the Paleo-Kathmandu Lake, Central Himalaya

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The Kathmandu basin is an intermontane basin located in the Central Himalaya and is surrounded by mountains of 2,500 to 3,000 m above sea level. The Kathmantsu valley has a diameter of 25-30 km and the catchment area of the river water is limited to the inside slope of the valley. It means that the basin-fill sediments are supplied only from the mountains surrounding the valley. The northern slope of the valley is mainly composed of gneiss, schist and granite, but the other slopes and the central part of the valley are composed of weakly metamorphosed sedimentary group. A long continuous core was drilled at Rabhibhawan district in the western part of the Kathmandu basin for academic purpose in 2001-2002. It was penetrated over 200m thick of lacustrine sediment, which was deposited in Paleo-Kathmandu Lake. The columnar section was reported by Sakai (2001).

Inductively Coupled Plasma atomic emission spectrometer (ICP-AES) and Instrumental neutron activation analysis (INAA) were performed on sediment samples taken from the muddy section of the core at 25 cm or 50 cm intervals. The ratios among immobile elements (Al, Ti, Hf, Th, and Sc) are useful for distinguishing the changes of source materials. A sharp decrease in Ti/Al ratios is observed at the depth of ca. 170 m and it suggests the change of the source at the depth. A significant change in Th/Hf ratios is also demonstrated at the depth of 13 m.

Time series of phosphorus contents in the muddy parts below 50 m depth of the core is seem to be synchronized with glacial-interglacial climatic changes estimated by pollen assemblage analysis. Warm and wet climate generally accelerate the supply of the organic matter from the land to the pelagic areas of the lake through the river water and then phosphorus loading increased in the zone. While, the correspondence is not clear in the upper muddy zone between 10-50 m. The phosphorus contents are controlled also by sedimentation rate. The difference is probably is because the sedimentary condition during the upper muddy zone was under littoral area of the lake, while lower muddy parts (50-80 m and 90-170 m) were under pelagic parts of the lake.

The Th/Sc ratio is also synchronized with phosphorus contents in the muddy parts. Power spectrum analysis of both phosphorus content and Th/Sc ratio indicate periodic signals of 100 ka. The increase of Th/Sc in core samples is caused by the delivery of high Th/Sc clay fraction in granitic debris. High frequency of heavy rain during warm and wet period had induced higher accumulation rate of Th-rich clay minerals from the area around the lake. Vertical distribution pattern of Th/Sc ratio of the core shows a slow and intermittent increase of the ratio and reflects the tectonic movement.