Maximum extent of the Paleo-Kathmandu Lake in the late Pleistocene on the basis of piedmont gentle slope formation and lacustrine distribution in the Kathmandu basin, Nepal

Kiyoshi Saijo†* and Kazuo Kimura‡

† *Division of Social Studies Education, Miyagi University of Education, Sendai 980-0845, Japan*
‡ *Department of Social Science Study, Naruto University of Education, Naruto 772-8502, Japan*

* *To whom correspondence should be addressed. E-mail: saijo@staff.miyakyo-u.ac.jp*

The Kathmandu basin is an intradeep located in the southern slope of the Nepal Himalaya. The basin, surrounded by ridges hanging around 2000 m asl, extends between the altitudes of 1200 and 1400 m asl and is filled by a thick sequence of lacustrine sediments deposited in the Paleo-Kathmandu lake during the Pliocene and Pleistocene. Several terrace surfaces, which occupy the basin floor, have been formed in response to the disappearance of the Paleo-Kathmandu lake, that was drained due to southerly erosion by the Bagmati river. This paper attempts to estimate theage and paleogeography in which the Paleo-Kathmandu lake was maximized and drained in terms of geomorphological investigation of the marginal area of the basin. In particular, characteristics of piedmont gentle slopes, lacustrine distribution, and the relationship between them are examined.

The piedmont gentle slope is well developed at the junction of the basin floor and the surrounding mountains. The piedmont gentle slope, dipping 7 to 15 degree towards the basin, shows a smooth surface with a slightly concave or almost linear vertical section. This slope coincides with alluvial and talus cones by Yoshida and Igarashi (1984), colluvial slope by Saijo (1991), and alluvial cone by Sakai et al. (2001). The piedmont gentle slope successively changes into the Gokarna surface in the direction of the basin in many places, and fades into narrow valleys in the back slopes. Surficial part (mostly less than 10 m deep) of the piedmont gentle slope is composed mainly of poorly sorted subrounded/subangular gravel or coarse sand with angular gravel. These sediments, tentatively called piedmont gentle slope deposit in this paper, are regarded as being of colluvial or fluvial origin. On the basis of their morphological characteristics and geomorphic settin integrated with the piedmont gentle slope deposit, it was determined that the piedmont gentle slope had been formed by debris supplied from the surrounding mountain slopes.

The organic clayey sediments were found at both northern and southern margins of the basin, and the piedmont gentle slope deposit overlies or interfingers with them. It is estimated, therefore, that these organic clayey sediments are considered to be lacustrine deposited near the shoreline of the lake at the foothills in a rising trend of lake level. Such deposits are recognized up to an altitude of between 1420 and 1440 m asl Several radiocarbon dates obtained from these lacustrine indicate that the uppermost part of them was deposited between 37100 and 29200 yr B.P. We can therefore conclude that the maximum level of the Paleo-Kathmandu lake reached at least 1420 to 1440 m asl and the lake occupied almost all of the basin around 30000 yr B.P. Judging from the relationship between the piedmont gentle slope deposit and the lacustrine, the debris derived from the surrounding mountains was frequently transported and flowed into the lake.

These estimates suggest a possibility that the Paleo-Kathmandu lake was drained not by the Bagmati river but another river. However, the cols on the divide of the surrounding mountains occur at the altitudes between 1465 and 1500 m asl. If we ignore tectonic movement, it is apparent that the altitudes of the cols were higher than the estimated maximum level of the Paleo-Kathmandu lake. In addition, the red weathered bedrocks are observed in topsoil of the cols on the divide. This also suggests that those cols were not covered by the lake water and overflow from the cols did not occur. It is estimated that the drainage of the lake by the Bagmati river occurred just after 30000 yr BP and the lake has been gradually reduced. The Gokarna surface emerged in conjunction with the drainage of the lake. Supply of the debris from the surrounding mountains continued even after the recession of the lake and resulted in the piedmont gentle slope formation.

References

Yoshida M and Y Igarashi. 1984. Neogene to Quaternary lacustrine sediments in the Kathmandu Valley, Nepal. *J Nepal Geol Soc* **4**: 73-100

Saijo K. 1991. Slope evolution since latest Pleistocene time on the north slope of Chandragiri, Kathmandu valley in the middle mountains of Nepal. *Science Reports of the Tohoku University, 7th Series (Geography)* **41**: 23-40

Sakai T, AP Gajurel, H Tabata and BN Upreti. 2001. Small amplitude lake level fluctuations recorded in aggrading delta deposits of the lower parts of the Thimi and Gokarna Formations (upper Pleistocene), Kathmandu Valley. *J Nepal Geol Soc* **25**: 43-51