Accreted Paleoproterozoic eolian beds and dolerite sills in the Miocene Siwalik belt, central Nepal, and their origin

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The Siwalik belt distributed in the frontal hill of the Himalayan range has long been believed that the whole belt is composed of Miocene terrestrial deposits derived from the Himalaya. However, we first reported existence of Paleoproterozoic sediments (Bagmati Group) and dolerite sills (Dwar Khola dolerite; Sakai et al., 2000). They are sandwiched within the Middle Siwlik Group by thrusts, and we interpreted that they are accretionary prism formed by scraping of supra-crustal rocks of subducting Indian plate and succeeding accretion to the Siwalik belt after 10 Ma. In this paper, we report additional chronological data of the Bagmati Group and petrological data of the Dwar Khola dolerite, and discuss on their tectonic and depositional setting. Furthermore, we try to correlate them with the rocks of the Lesser Himalaya to the north and discuss on their differences and interrelationship.

Geological Outline: An accretionary belt, called the Bagmati Belt, is narrowly distributed 22 km to the north of the Main Frontal Thrust in central Nepal. Within the belt, tectonic slices of 400 m to 1 km in thickness are repeated three to five times by thrusts, sandwiching a thin slice of the Middle Siwalik Group. Total thickness of the belt is about 800 m and east-west extension is about 45 km along the frontal thrust. The Bagmati Group is composed of red-brown and pink orthoquartzite of eolian origin, rhythmite of micaceous shale and sandstone of lacustrine origin, and hematitic pisolite of paleo-soil. Many dolerite sills intrude into the orthoquartzite and quartzose sandstone beds and its maximum thickness attains 400 m in the Dwar Khola section.

Age: ^{40}Ar-^{39}Ar dating of detrital muscovite of micaceous shale gave 1742±23 Ma, and the youngest U-Pb SHRIMP age of detrital zircons is 1727±35 Ma. Whole rock ^{40}Ar-^{39}Ar ages of dolerite sills show 1723±19 Ma and 1656±8 Ma, and Sm-Nd model age of the dolerite ranges from 2110 to 1310 Ma. It is noteworthy that well-rounded detrital quartz grains originated from the orthoquartzite of country rock intrude into the cooling joints of the dolerite to form sand dykes. Those age data and occurrence of sand dykes indicate that the detrital zircon and muscovite were derived from granite bodies which were exposed immediately after the crystallization, and dolerite intruded into the Bagmati Group soon after the deposition.

Petrology: Major elements composition of 11 samples of dolerite commonly show they are plotted in the field of tholeiite in AFM diagram. The rare earth elements in spiderdiagram shows intermediate pattern between MORB and OIB, and similar to continental flood basalt like as the Deccan Trap. The petrological characteristics of the Dwar Khola dolerite are similar to those of the Rampur and Garhwal-Bhowai volcanics in northwestern Himalaya (Bhat & Le Fort, 1992).

Correlation: The Bagmati Group and the Dwar Khola dolerite can be safely correlated with the Naudanda Formation (Fagfog Quartzite) and associated meta-dolerite, meta-gabbro and metabasite in the Lesser Himalaya. Because both formations are composed of very similar eolian beds and commonly intruded by dolerite with affinity of continental flood basalt, mentioned below. In addition, depositional age of the Naudanda Formation is estimated to be about 1.77 ~ 1.7 Ga (Martin et al., 2010, Sakai et al., 2013), nearly same age of the Bagmati Formation.

Tectonic and depositional setting: Depositional environment of the Bagmati Group is interpreted to be desert and ephemeral lake on supercontinent Colombia, and Dwar Khola dolerite is probably produced by volcanic activity caused by mantle plume which brought about rifting of the supercontinent as discussed in Sakai et al. (2013).

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