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Weathering and monsoonal evolution in the Eastern Himalayas since 13 Ma from detrital geochemistry, Kameng River Section, Arunachal Pradesh

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The link between tectonics, erosion and climate has become an important subject to ongoing research in the last years (Clift et al. (2008), amongst others). The young Himalayan orogeny is the perfect laboratory for its study. The Neogene sedimentary foreland basin of the Himalaya contains a record of tectonics and paleoclimate since Miocene times, within the so called Siwalik Group. Therefore several sedimentary sections within the Himalayan foreland basin along strike in the Himalayan range have been dated and studied regarding exhumation rates, provenance and paleoclimatology (e.g. Quade and Cerling, 1995; Ghosh et al., 2004; Sanyal et al., 2004; van der Beek et al., 2006). Lateral variations have been observed and changes in exhumation rate as well as climate change in the past especially the strengthening of the Asian summer monsoon is still debated. Several paleoclimatological studies in the western Himalaya were conducted (Quade and Cerling, 1995; Najman et al., 2003; Huyghe et al., 2005), but the eastern part of the mountain range remains poorly studied.

The Himalaya has a major influence on global and regional climate. The major force driving the evolution of this mountain belt is the India-Asia convergence, nevertheless it has been suggested that the monsoonal climate plays a major role for the erosion and relief pattern (Bookhagen and Burbank, 2006; Clift et al., 2008; Iaffaldano et al., 2011). Exhumation rates in the central Himalayas are more or less constant over last 13 Ma in the order of 1.8 km/myr, whereas exhumation rates in the eastern syntaxis increased post 3 Ma (Chirouze et al., 2013) to reach up to 10km/myr in the recent past.

In this study we use a multidisciplinary approach in order to better understand the interplay of monsoon and weathering regime during the Mid Miocene to Pleistocene in the Himalaya. Therefore a sedimentary section in the eastern Himalaya was sampled. Pairs of fine and coarse grained sediment samples were taken in the Kameng section, Arunachal Pradesh (Fig. 1), which was previously dated by magnetostratigraphy by Chirouze et al. (2012) and ranges from 13 Ma to 1 Ma.

Major elements were analyzed in order to calculate the Chemical Index of Alteration (CIA), to identify a trend in the weathering intensity over the time span. Ratios of mobile to immobile elements showed different trends of weathering, whereas the CIA remained relatively constant over time and values between 65 and 85 indicate a strong and stable weathering regime. Results of organic geochemical analyses of lipid biomarkers show substantial diagenesis during burial affected the organic material. Specifically, chain length distributions of n-alkanes showed that sediments were subjected to temperatures within the oil window (Hunt, 1996). Chirouze et al. (2013) provided the provenance of the sandstones of the Kameng section, where they defined a zone of the Paleo-Brahmaputra between 3-7 Ma. Clay mineral measurements and analysis of heavy minerals and petrography give further insight of a possible climatic change during this time.