A record of weathering, hydrological and monsoon evolution in the Eastern Himalaya since 13 Ma from detrital and organic 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 onset 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 the regional and global 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 central Himalaya 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 eastern 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. A change in provenance of the sediments has been documented between 3-7 Ma and is interpreted as sediments brought from the Paleo-Brahmaputra, which had migrated northwards during this time (Chirouze et al., 2013).

Major elements were analyzed in order to calculate the Chemical Index of alteration (CIA) and to further see a first trend in the weathering intensity over the time span. Ratios of mobile to immobile elements show different trends of weathering, whereas the CIA remains relatively constant over time and values between 65 and 85 indicate a strong and stable weathering regime. In addition, in an ongoing analysis we use organic geochemical methods, such as lipid biomarker analysis, to decipher organic matter sources, alteration as well as possibly climatic and hydrological changes through time. Clay mineralogy should provide information on silicate weathering and possible diagenetic influence (Derry and France-Lanord, 1997).

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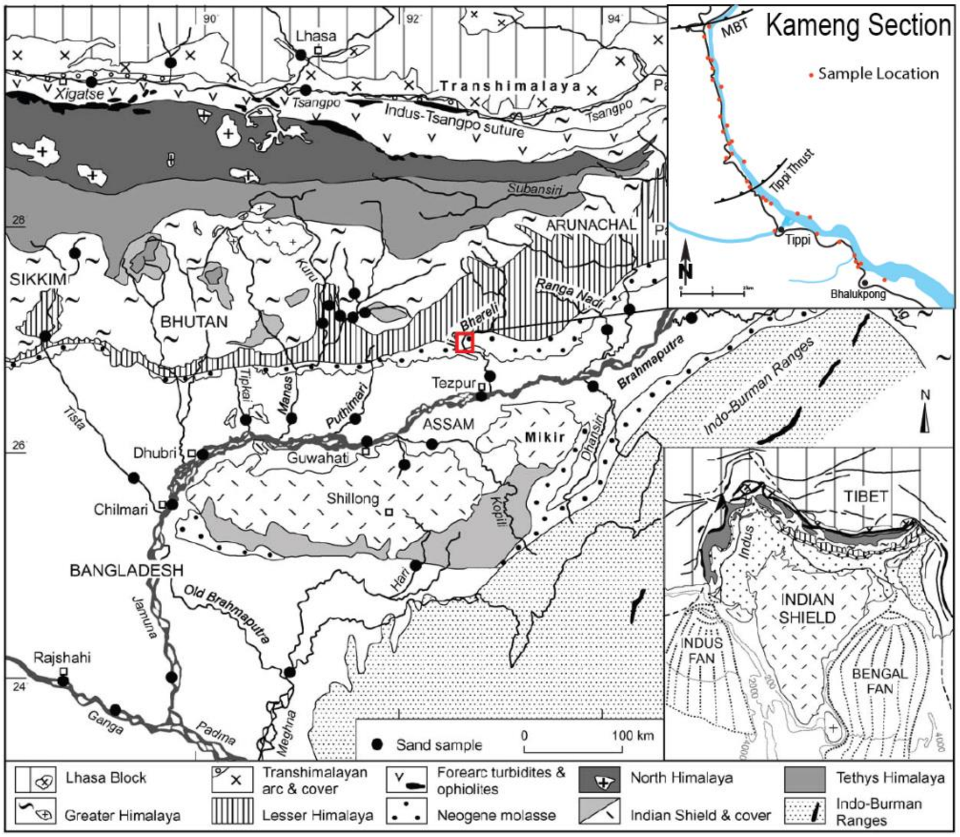

Figure 1. Geological map modified from Garzanti et al. (2004), Kameng river sampling region and locations are indicated.

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