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Aeolian sediments as archive of monsoonal changes on the northeastern Tibetan Plateau

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The Asian monsoon system is one of the most important atmospheric systems on earth. The intensity, timing and extent of the Asian summer monsoon (ASM) is critical for billions of people in Asia. Variations in the monsoon intensity can result in large-scale droughts or flooding. However, the Holocene development of the ASM is still poorly understood. The northeastern Tibetan Plateau (TP), at the present day limit of the ASM, was identified as a key area to study the development of the system. Despite several decades of research, considerable uncertainties still exist regarding the onset, timing and strength of the ASM in the area. These uncertainties are partly related to differences in the interpretation of the archives. Most of the proxies used for the studies are based on lake sediments, which represent an integrated signal of climate and catchment related processes. Furthermore, dating of lake sediments are mainly based on radiocarbon ages. Radiocarbon ages in the area are severely influenced by the hard water effect. Comparisons of different lakes on the northeastern TP showed considerable spatial and temporal differences in the climatic interpretation.
Aeolian sediments are an additional, widespread climate archive on the northeastern TP. They can be easily dated by optical stimulated luminescence (OSL). However, many sections in the area are discontinuous. Therefore, a large number of sections has to be analyzed. During the last decades, the number of dated sections from the northeastern TP has been increasing rapidly and now nearly 500 ages are available. The analysis of the dataset shows a time-transgressive onset of the ASM on the northeastern TP. The onset started at the eastern margin during the end of the late glacial and reached the central part of the northeastern TP at around 10.5 ka. In the western part of the study area, higher precipitation values were probably only reached during the mid-Holocene. During that time, the central and eastern part experienced fluvial erosional processes, while the aeolian accumulation nearly ceased. The reduced aeolian activity in the east and trapping of the sediments in the west reflect the maximum Holocene moisture period on the northern TP, e.g. the strongest ASM. During the late Holocene, all areas on the northern TP experienced the reactivation of aeolian sands.