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A new moraine surface exposure chronology from the eastern Kunlun Shan (Lake Donggi Cona catchment, NE-Tibet): Early last glacial ice maxima and the 'missing' LGM

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Recent advances in obtaining reliable age control for late Pleistocene glaciations on the Tibetan Plateau and adjacent mountain areas have been critical for reconstructing past regional climate dynamics and long distance glacial correlations. In this debate, the analysis of mountain glacier records from the vast area of central and High Asia is particularly interesting as this region is influenced by several major atmospheric systems including the Siberian-Mongolian anticyclone, the mid-latitude Westerlies and the Asian Monsoon systems. During the late Quaternary, changes in the complex interplay between these systems caused substantial climatic variability, specifically in hydrological conditions, with major effects on the extent of regional glaciation. Pioneering studies from NE-Tibet (Anyemaqen Shan, Qilian Shan) have suggested significant late Pleistocene ice advances during MIS 3 and MIS 2 indicating that in some phases glacial mass balances responded strongly positive to increased monsoonal precipitation (during MIS 3) and at other times to insolation minima (during MIS 2). More recently, however, results from other areas of NE-Tibet (Bayan Shan) have shown that glaciation during MIS 2 was extremely limited or even missing, while the timing of the largest late Pleistocene glaciation remains unclear.
To address this problem we collected a set of 23 rock samples from moraines in four glacial valleys of the eastern Kunlun Shan near Lake Donggi Cona on the northeastern Tibetan Plateau for in-situ 10Be exposure age dating. All samples were prepared and measured at the AMS laboratory of the Scottish Universities Environmental Research Centre (SUERC). Our results indicate that mountains in the northern part of the Donggi Cona catchment (up to 5000 m a.s.l.) experienced extensive glaciation between 100-90 ka (MIS 5) and between 60-50 ka (MIS 4) when valley glaciers advanced up to 20 km. By contrast, we find no evidence for any significant glaciation during MIS 2 or the LGM. In fact, results from a high resolution study conducted in one of the valleys where the entire up-valley directed moraine sequence was sampled, demonstrate that deglaciation had occurred by 40 ka and that the range remained essentially unglaciated since. We will present study details and discuss paleoclimatological implications.