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New Findings concerning the Pleistocene glaciation of the Leh Basin

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As a part of the Upper Indus Valley the Basin of Leh is located between the northern lying Ladakh Range and the Stok Range in the south. Here, the bottom of the Upper Indus Valley is situated between 3200 and 3300 m a.s.l. Like for most parts of High Asia, researches concerning the Pleistocene landscape evolution of this Intramontane Basin have also left contradictions. To push the problem of extent and timing of the former glaciation three up to now unexplored valleys of the Ladakh Range, which are tributaries of the Leh Basin, have been investigated. U-shaped profiles, transfluence passes, glacial rounded ridges and peaks mantled with moraine material, roches moutonneés, glacial flank polishings and ground moraines document the former glaciation of the research area. The ice fillings of the tributaries reached a minimum thickness up to 540 m. Even at the valley outlets and on the orographic right side of the Leh Basin the glaciation was more than 350 m thick. Based on these empirically extracted results, theoretical snow line considerations lead to the conclusion that the whole Leh Basin was filled up by a former Indus Valley glacier. An ice injection limited to the nourishment areas of the Ladakh Range valleys couldn't have caused to the reconstructed ice cover (down to 3236 m a. s. l.), which is proved by extended ground moraine complexes. Only an Indus ice stream network, nourished by inflowing glaciers of the Ladakh- and Stok Range explain the widespread existence of the glacial sediments. The good preservation of moraine material, even at the valley flanks steeper than 30° seems to be inconsistent with the assumption of other authors that the ice streams accumulating these sediments occurred during the penultimate glacial cycle or earlier. Also in recent times the extreme climatic conditions of the investigation area are very favourable for frost weathering, solifluction and abluation. During the Pleistocene this frost and snow cover induced activity must have been much more intensive. This lead to the conclusion that the reconstructed ice filling of the Leh basin occured during the last glacial cycle (MIS 2-4).