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Glacier and climate changes in the Western Indian Himalayas (Ladakh and Lahul-Spiti): remote sensing, field techniques and adaptation techniques

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Anecdotal evidence from glacier termini observations in the Himalayas suggest that these glaciers have been in a state of general retreat since the last century, and point to "alarming" rates of retreat in the past decades. Concomitantly, local communities in the Western Himalayas have reported changes in glacier extents, snow cover and weather patterns. In response to "alarming" rates of glacial retreat, some indigenous cultures in the Himalayan area have begun a number of adaptive responses such as meltwater harvesting to construct "artificial" glaciers, which store the water during the dry season. There is urgency in: a) scientifically evaluating whether such practices of glacier regeneration can help provide water in a timely manner and 2) developing glacier datasets to assist such local efforts to ensure water supply in these data-scarce mountainous areas.

Here we compare and contrast scientific and indigenous perspectives on spatial patterns of glacier changes in the dry areas of Ladakh (34.10ºN and 77.34ºE) and Lahul-Spiti district (31.11ºN and 77.15ºE) in the Western Indian Himalaya. A new glacier inventory of Lahul-Spiti was constructed using a combination of data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) sensor with Shuttle Radar Topography Mission (SRTM), GPS field data and ground photography. Glacier changes were quantified by comparison with older ASTER inventory and topographic maps. We present changes reported by local communities and recorded in video, oral testimonies and ground photography. We focus on two indigenous practices of water harvesting for glacier regeneration: a) artificial glaciers and b) kul irrigation systems. Field data of artificial glaciers was acquired at Sabu, Stakmo and Phuktsey glaciers using a differential GPS system. Kul irrigation systems were documented in Spiti valley (Lara and Kibber villages). We will present the results of mapping these water harvesting systems with the goal of helping local communities plan future water resources in "at risk" glacierized areas.