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Tree ring research in the Himalayas – a key resource for extending environmental records into the pre-instrumental period

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Original dendrochronological research has developed rapidly over the last few decades to cover a wide range of environmental reconstruction, not only mean climate conditions but also climate extremes (e.g. floods, droughts) and other environmental hazards (e.g. landslides, debris flows, sea-level rise, volcanic eruptions). Similarly, the focus has expanded its geographical coverage from the temperate and high latitudes to lower latitudes (e.g. the Himalaya, Tibet Plateau). Analysis of the two main dedicated dendrochronology journals (Dendrochronologia (2002-) and Tree Ring Research (2015-)) shows that the focus of the majority of published papers has been temperate and high latitudes and many fewer have considered lower latitudes such as the Himalaya. This may be due to the long-lasting controversy and doubt of the existence of tree-rings in lower latitude trees and the lower scientific acceptance of seasonal tree growth in such regions. However, such regions have some of the most preferred tree species (e.g. Larix griffithii, Abies spectabilis, Betula utilis, Juniperus polycarpos etc) for dendrochronological analysis making them suitable for tree-ring research and for answering questions regarding century-scale and longer environmental changes in regions with a relatively short history of instrumented recording of environmental parameters.

Perhaps the most interesting development in tree ring research is the realization that tree cellulose can be used to acquire information not only of climatic significance but also hydrological significance, by using environmental isotopes. To date, despite of being one of the most climate and geopolitically sensitive regions, the Himalaya has got very less or no attention for combined research of isotopes and anatomical analysis of tree rings. Based on its huge significance, it is critical to combine these two methods to allow us to make linkages between historical climate fluctuations and associated hydrological response. In this poster, we present the conception of a project to do this in a large catchment (4264 km^2) in the Sikkim Himalaya with the purpose to understand how climate change is simultaneously impacting both water-related risks and water-related resources and crucially how far downstream which is highly significant as millions of people living downstream get freshwater from the seasonal snow and glacier-melt in this part of the Himalayas.