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Spatial patterns in glacier parameters and area changes in the eastern Himalaya (Kanghendzonga area) derived from remote sensing

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An increasing number of studies report high rates of glacier retreat in the central-eastern part of the Himalaya in the last decades. While it is commonly believed that these glacier changes are directly linked to 20th century climate changes, glacier fluctuations in the Himalayas are complex, and depend on a combination of larger climate patterns, local topography and glacier characteristics. Currently we lack a fundamental understanding of the magnitude of feedbacks between climate forcing and glacier characteristics in the monsoon-influenced part of the Himalaya, as well as spatio-temporal patterns of glacier distribution in this area. Declassified Corona imagery from the 1960's and 1970's is increasingly being used to fill temporal gaps in glacier parameters in India, as a baseline for glacier change detection. In this study we use remote sensing data from Corona, ASTER, Landsat ETM+, Quickbird and Worldview2 sensors combined with Geographic Information Systems (GIS) and statistical techniques to investigate spatial patterns of glacier parameters in the Kangchendzonga area of the eastern Himalaya at multi-spatial scales. Specifically, we present: 1) a new geospatial glacier inventory based on 2000 Landsat and ASTER imagery; 2) glacier changes in the last four decades based on topograhic maps and Corona imagery and 3) temperature and precipitation patterns in the last century from ground-based climate stations. The goal is to provide a new, comprehensive glacier inventory for this part of the Himalaya where data have been limited in the past.