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Elevation Comparison of ICESat Altimetry and Digital Elevation Models on the Himalayas and Tibet Plateau

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The mountainous region of the Himalayas and Tibet Plateau has an area of more than 4 million square kilometers. Including the Karakoram, the Hindu Kush, and the Pamir Knot, the Himalayas have more than one hundred separate mountains with elevations greater than 7,200 m above mean sea level. They form a climatologic boundary between the westerlies, and the southern Asian monsoon patterns. The Himalaya – Tibet Plateau region is home to thousands of glaciers, snowfields, tarns, i.e. glacier lakes, and lakes. The region also includes discontinuous and sporadic permafrost. The headwaters of the rivers of the Indo-Gangetic system are fed by seasonal glacier melt. The glacier-fed river discharge provides the commerce and livelihood for more than 1.3 billion people. Groups of glaciers that have been investigated show rapid wastage, on average, since the 1960s, and this wastage appears to have accelerated during the late 20^{th} century. Regionally, the pattern of wastage is non-uniform, with some glacier showing growth, suggesting sensitivity to local meteorological influences and regional climate patterns from west to east. Recent studies suggest that the many of the low elevation glaciers may only survive into the middle of the 21^{st} century, under the exacerbation of wastage from effects by increasing ablation and seasonal temperatures. A region-wide assessment of glacier wastage and the impact to seasonal river discharge is called for. As a preliminary-phase of the investigation, we will present an assessment of land elevation data from, 1) the Ice, Cloud and land Elevation Satellite (ICESat), 2) digital elevation models (DEMs) produced by the U.S. National Geospatial-

Intelligence Agency (NGA, formerly Defense Mapping Agency) derived from cartographic maps produced from air photography acquired in 1960s (digital terrain elevation data, DTED), 3) the Joint NASA – DLR – NGA Shuttle Radar Topography Mission interferometric synthetic aperture radar (InSAR)-derived DTED from C-band and X-band acquisitions in Feb. 2000, and 4) NASA-Terra Advanced Spectro-Thermal Radiometer (ASTER)-derived DEMs acquired seasonally from 2000 to 2007. Our first step in the analysis is to assess and evaluate vertical systematic biases of the datasets at local and regional scales, prior to estimating glacier-area elevation changes.