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Assessment of SRTM vertical accuracy and the effect of errors on landslide modeling

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The Shuttle Radar Topography Mission (SRTM) of 2000 produced the first near-global high resolution DEM of the Earth. Prior to the dissemination and use of the dataset by the Earth Sciences community it is important to assess the quality of the data. In particular, it is necessary to determine if the SRTM accuracy specifications have been met, especially in high relief terrain where geomorphic processes are most active, and to have an understanding of the effect of errors on hydrogeomorphic modeling. In this work a study site in the Cascade Mountains (Washington, USA) was selected to assess and quantify the vertical accuracy of the 1 arc-second SRTM C-band data. The results indicate that the dataset in this area contained errors larger than those predicted by the SRTM accuracy specifications and that data voids were present. A subsequent step had the aim of characterizing the error structure of the dataset. This was accomplished by comparing several subcategories of errors, including data voids, with numerous topographic attributes (elevation, slope, aspect, etc.). It was therefore possible to establish the effect of each parameter on the distribution of the errors within the study site. Not surprisingly, given the side-looking geometry of the radar instrument, the largest impact on error magnitude and location is produced by slope and aspect. Finally, a last phase was dedicated to assessing the impact of vertical errors on several hydrogeomorphic applications. A well-known landslide model was used to test the effect of variations in topography induced by errors on the triggering of shallow landsliding. The model was applied both to a SRTM DEM and to a higher resolution reference DEM while all geotechnic and pluviometric variables were held constant. Additionally, watersheds, drainage networks and other hydrologic features were automatically extracted using ArcInfo software from a SRTM-derived DEM and again from the reference DEM to examine and quantify the differences. For landsliding, the results

indicate that even small variations in topography can produce significant differences in the location of triggered landslides. Considerable differences were also encountered in the automatically generated hydrologic products.