SnowEx 2017 Community Snow Depth Measurements: A Quality-Controlled, Georeferenced Product

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ABSTRACT

Snow depth was one of the core ground measurements required to validate remotely-sensed data collected during SnowEx Year 1, which occurred in Colorado. The use of a single, common protocol was fundamental to produce a community reference dataset of high quality. Most of the nearly 100 Grand Mesa and Senator Beck Basin SnowEx ground crew participants contributed to this crucial dataset during 6-25 February 2017. Snow depths were measured along ~300 m transects, whose locations were determined according to a random-stratified approach using snowfall and tree-density gradients. Two-person teams used snowmobiles, skis, or snowshoes to travel to staked transect locations and to conduct measurements. Depths were measured with a 1-cm incremented probe every 3 meters along transects. In shallow areas of Grand Mesa, depth measurements were also collected with GPS snow-depth probes (a.k.a. MagnaProbes) at ~1-m intervals. During summer 2017, all reference stake positions were surveyed with <10 cm accuracy to improve overall snow depth location accuracy.

During the campaign, 193 transects were measured over three weeks at Grand Mesa and 40 were collected over two weeks in Senator Beck Basin, representing more than 27,000 depth values. Each day of the campaign depth measurements were written in waterproof field books and photographed by National Snow and Ice Data Center (NSIDC) participants. The data were later transcribed and prepared for extensive quality assessment and control. Common issues such as protocol errors (e.g., survey in reverse direction), notebook image issues (e.g., halo in the center of digitized picture), and data-entry errors (sloppy writing and transcription errors) were identified and fixed on a point-by-point basis. In addition, we strove to produce a georeferenced product of fine quality, so we calculated and interpolated coordinates for every depth measurement based on surveyed stakes and the number of measurements made per transect.

The product has been submitted to NSIDC in csv format. To educate data users, we present the study design and processing steps that have improved the quality and usability of this product. Also, we will address measurement and design uncertainties, which are different in open vs. forest areas.

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