Assessment of the Stability of a Satellite-Derived Snow Extent Using Station Snow Depth Observations

DAVID A. ROBINSON\textsuperscript{1} AND THOMAS L. MOTE\textsuperscript{2}

ABSTRACT

Station and satellite-based measures of snow cover extent produce complementary, but occasionally conflicting, climate data records (CDRs). A record of snow cover extent from visible satellite data is available on a weekly basis since the late 1960s, while a gridded station product for North America is available on a daily basis for the past century. We have documented several changes in the visible satellite record. The effects of these discontinuities in the satellite CDR — such as different sensors, overpass times, or mapping methodologies — have not been fully assessed. Here the gridded North American snow depth record is compared to the visible satellite record for different epochs within the satellite CDR. The average snow depths in the station product are identified for the 50th percentile probability of snow identification in the satellite product. The dataset is broken into three different time periods, 1965 to 1980 (Period 1), 1981 to 1998 (Period 2), and 1999 to 2009 (Period 3), corresponding roughly to periods of technological and processing changes in the NOAA snow charts used to generate the CDR. A logistic regression model is employed to determine the probability of snow cover detection in any satellite cell based on two variables: average snow depth reported from weather stations, and fraction of reporting stations reporting at least 1 cm of snow. The modeled results are used to adjust the earlier two periods based on the most recent period, and the adjustment indicates that most recent period shows 5.23\% greater snow extent than Period 1, and 2.75\% more than Period 2.

\textsuperscript{1} Rutgers University, Piscataway, NJ, USA
\textsuperscript{2} University of Georgia, Athens, GA, USA