Submitted Abstract

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Abstract

Surface albedo is an important component of the surface energy balance that influences glacier surface melt. This abstract presents a machine learning approach based on a random forest (RF) model for estimating daily surface albedo at the Fourcade Glacier on King George Island, Antarctica. We used surface albedo measurements from 2010 to 2015. Also, meteorological variables of downward shortwave radiation, downward longwave radiation, air temperature, relative humidity and wind speed from an Automatic Weather Station (AWS) and ERA5 reanalysis were used as predictor variables. Using a Randomized Search Cross Validation technique, the models were calibrated and validated. We found that both RF models built with AWS and ERA5 datasets matched relatively well with surface albedo observation with r-square of (r^2) 0.67 and 0.69, respectively. To evaluate model performance, RF models were built from 77% of total data randomly selected and the remaining 33% of total data was used to validate. Overall, root mean square errors between modeled and measured daily surface albedo were similar between AWS and ERA5 (0.080 and 0.085, respectively) datasets. Based on the composite RF model built for the entire time series, air temperature and downward shortwave radiation were found to be the most important predictors to estimate surface albedo using both AWS and ERA5 datasets. This study highlights the potential of performing a machine learning approach to improve the ability of surface albedo predictions using meteorological observations and ERA5 reanalysis data. This approach may be beneficial in capturing temporal variability of surface albedo as an important input for glacier surface melt and energy-mass balance modeling.