

ACC023-05

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Validation of physically based snow albedo model using radiation budget and snow pit work data in Sapporo

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Physically based snow albedo model (PBSAM) is developed to calculate accurate snow albedo in earth system model. It calculates broadband albedos in visible and near-infrared spectra as functions of snow impurities, snow grain size, and downward radiation components for the snow consisting of any layer structure (multi-layer model). Accuracy of PBSAM is evaluated using the filed data of radiation budget observation and snow pit work including black carbon (BC) and dust concentrations performed in Sapporo, Japan during three winters from 2006 to 2009. It is confirmed that root mean square errors are 0.063, 0.083 and 0.066 for visible, near-infrared, and shortwave spectra, respectively, and the correlation coefficients (R^2) are 0.835, 0.670 and 0.777 for each spectrum. Using the same data with PBSAM, radiative forcing and albedo change due to BC and dust are estimated. Averaged values of radiative forcing (albedo change) during snow-covered periods in three winters are 3.8 and 0.90 W/m²(-0.035 and -0.008), respectively for BC and dust.

Keywords: snow, albedo, black carbon, radiative forcing