

Annual minimum exposed snow and ice changes in Tibet plateau during
2000-2012 from MODIS observations

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Abstract: Snow and ice are sensitive to climate changes, and their variations also affects regional climate through their influences on radiation and hydrology processes. The Tibet plateau is one of the critical global snow and ice areas. Due to its specific topographical characteristics, the snow and ice in Tibet plateau are highly sensitive to climate change, and their variations affect the atmospheric circulations and precipitation in East Asia. Variations in annual minimum exposed snow and ice in Tibet plateau are evaluated for the period 2000-2012 based on MODIS observations. The land surface reflectance with minimum reflectance in red band is composited for each year to exclude the clouds and seasonal ice or snow. Based on these reflectance, annual minimum exposed snow and ice are extracted with Normalized Difference Snow Index (NDSI) from reflectance in green and shortwave channels. The extracted snow and ice covers are evaluated by compared with high resolution satellite observations. The permanent snow and ice covered regions are identified, and the sensitive regions with variation of snow and ice cover among years are also separated. The results show that the center of the large snow-covered areas are almost covered with snow and ice during 2000-2012, while variations of snow and ice cover are found for the edge and small snow-covered areas among year, especially in southeastern Tibet plateau. The area of annual minimum exposed snow and ice decreased notably in southeastern Tibet plateau during the period from 2000 to 2012.

Keywords: Snow, ice, Tibet plateau, change, MODIS