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VARIABILITY OF ICE-ALBEDO IN THE ARCTIC (2010-2012)

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ABSTRACT – Studies of albedo in the Arctic are essential because of the rapidly changing ice and snow cover in the region and the associated impact on the Earth's heat and energy balance. This study examined the large-scale variability of the narrow band albedo (NBA) in the Arctic using the EOS/Aqua MODIS data from 2010 to 2015. Seasonal and interannual changes in the different components of the Arctic cryosphere, including the sea ice cover, Greenland ice sheet, and the snow-covered and permafrost regions of North America and Eurasia, have been quantified. The data show a seasonal pattern indicating high albedo during spring, progressively declining towards low values during the summer season. The NBA varies considerably across the four sectors: Eurasia, Sea Ice, North America, and Greenland. Results show that the NBA for Eurasia, Sea Ice, North America, and Greenland ranged from 0.08-0.81, 0.23-0.75, 0.07-0.73, and 0.78-0.95, respectively. Generally, the correlations of NBA and surface temperature over Eurasia, Sea Ice, North America, and Greenland were weak, ranging from 0.07-36 in 2012 and 0.17-0.47 in 2014. Also, correlation analysis showed that NBA has a moderately high connection with SIC (r = 0.80), SIE (r = 0.80), and SIA (r = 0.61) based on sample years (2012 and 2015). The spatial variation of the NBA is mainly due to the regional variation in the mixture of ice types and their snow cover. The observed variability in NBA was a combination of a gradual evolution due to seasonal transitions and abrupt shifts resulting from synoptic weather events. Moreover, several factors affect the NBA in the Arctic, such as snow metamorphism, changing SIC, SIE, and SIA.

Keywords: ice surface temperature, narrow band albedo, reflectance. sea ice concentration, sea ice area, sea ice extent

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