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Detection of thin sea-ice region from brightness temperature of 18GHz

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The results from the study on concurrent measurements of sea-ice thickness from a ship and passive microwave radiometry from an over-flying aircraft over the Sea of Okhotsk indicate that both the brightness temperature and emissivity increase with thickness within the thin ice category. This relationship was observed for a frequency range of 10-37 GHz. The relationship was more pronounced at lower frequencies and at the horizontal polarization. In this study, on the basis of this relationship we estimate sea-ice thickness (different ice categories) for the Sea of Okhotsk. For the estimation we used brightness temperatures of 18 GHz H and V from AMSR-E, and sea ice concentration using bootstrap algorithm. R18, the ratio of 18GHz V-pol to 18GHz H-pol was computed and compared with grand-truth data taken from the ship in the Sea of Okhotsk. This comparison provided a basis for a classification scheme for three ice thickness categories, representing sea ice of approximately <10cm, 10-20cm, and >20cm thickness. Applying this classification method, daily maps of sea ice thickness for seven winter seasons (2002-2009) were constructed for the Sea of Okhotsk.

Keywords: sea ice, brightness temperature, 18GHz, thin sea-ice