Evaluation of Passive Microwave Sea Ice Concentration in Arctic Summer and Antarctic Spring by using KOMPSAT-1 EOC

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Session (Poster): Cryosphere:

Spaceborne passive microwave sensors such as the Special Sensor Microwave/Imager (SSM/I) and the Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-E) have been observing polar sea ice concentration (SIC) playing important roles in the global climatic and environmental studies. To evaluate the passive microwave SIC we observed sea ice with the 6 m-resolution, Electro-Optical Camera (EOC) sensor onboard KOMPSAT-1 satellite. A total of 72 cloud-free EOC images, 18 km x 18 km each, of arctic sea ice edges were obtained from July to August and 68 images across the antarctic continental edges from September to November, 2005. We classified arctic sea ice types into land-fast ice, pack ice, and drift ice according to ice distribution and movement characteristics, and compared with SSM/I SIC calculated from NASA Team (NT) algorithm. The correlations between EOC and SSM/I SICs were related to the spatiotemporal stability of sea ice in arctic summer showing high correlation for stable land-fast ice and low for less stable pack ice and drift ice. In case of pack ice, SSM/I SIC were lower than EOC SIC by 19.63% in average due to the underestimation problem of NT algorithm for ice ridge and new ice. For drift ice, SSM/I SIC showed 20.17% higher than EOC SIC in average partly due to the wider IFOV of SSM/I than EOC swath resulting in the insertion of pack ice nearby and partly due to the condition of wet snow on drift ice causing overestimation in NT algorithm. In the Antarctic spring, sea ice types in the EOC images, mostly of land fast ice or pack ice, were classified into white ice (W), grey ice (G), and dark-grey ice (D) and then compared with SSM/I NT and AMSR-E NT2 SICs. EOC SIC of W and G, excluding D, showed best fit to SSM/I NT SIC suggesting that the SSM/I NT algorithm responds to young ice in addition to multi-year ice and first-year ice while AMSR-E SIC responds to all types of sea ice.