Estimation of sailing speed through ice covered waters on the northern sea route

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Although sea-ice in the Arctic Ocean is decreasing due to global warming, sea-ice still exists on the Northern Sea Route (NSR) in the summer season. In order to evaluate reduction of the sailing speed by sea-ice along NSR, we compared ships navigation data along the NSR derived from Automatic Identification System (AIS) with ice condition data such as sea-ice concentration and sea-ice thickness estimated from satellite passive microwave radiometer AMSR2 [1] during 2014 to 2016.

As a result, most ship showed decreasing sailing speed with sea-ice condition being severe. Such tendency is the most significant for the ships having Polar Class 6 (PC6). Figure 1 shows hourly sailing speed for PC6 ships and sea-ice thickness estimated from ASMR2 in 0.1m thick interval. PC6 ships showed almost constant speed in the thinner ice area (<0.6m) and decrease with thickness in thicker ice area (>0.6m). This study can be expected to contribute to estimation of the navigable speed in ice covered seas in the future.

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Figure 1. Comparison between ice thickness estimated from AMSR2 and hourly ship speed for PC6 during 2014 to 2016. Red and blue dots mean the highest three points for sailing speeds in thinner ice (<0.6m) and in thicker ice (>0.6m), respectively.

References