



Variability and Changes of Arctic Sea Ice Cover from Submarine Sonar Measurements, 1975-2000

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Regional and seasonal variability of Arctic sea ice thickness and volume were examined from the sea ice draft data collected with submarine based upward looking sonars during years 1975-2000 (publicly available through National Snow and Ice Data Centre). Only the data recorded in spring (April-May) and autumn (September-October) were used because of the best sampling density and the possibility to examine the evolution of annual maximum and minimum thicknesses. Total study area covers roughly the central half of the Arctic Ocean and it was divided in six regions. Regional variability was quantitatively examined as standard deviation of regional means, and seasonal variability as a difference between spring and autumn mean values. In most of the regions mean ice thickness and volume clearly decreased in both seasons, but the decline was more pronounced in spring than in autumn which led to decreased seasonal variability. Also the regional variability decreased, since the strongest thinning and volume losses occurred in the regions with initially thickest ice, i.e. in North Pole, Canada Basin and Eastern Arctic. The most uniform and remarkable change in all regions was the loss of thick, mostly deformed ice, which was mainly responsible for observed volume losses. Fractional area and volume of first year ice increased in most of the regions, and were multiplied in Canada Basin, Beaufort Sea and Eastern Arctic. In Nansen Basin all the changes were remarkably small compared to all other regions, which we assume to be related to the changes in the ice advection that have balanced the changes in thermodynamics.