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Recent Changes in the Thickness Distributions of Arctic Sea Ice

Peter Wadhams and Joao Rodgrigues

University of Cambridge, Applied Maths & Theoretical Physics, Cambridge, United Kingdom
(p.wadhams@damtp.cam.ac.uk)

The most recent complete transect of the Arctic Ocean in which detailed ice thickness distributions were measured by upward sonar was the voyage of HMS "Tireless" in March 2007. We focus on two regions in which unusual and important results were obtained:
1. In the Beaufort Sea the vessel conducted a detailed grid survey in the area surrounding the APLIS-07 ice camp. Probability density functions (PDFs) of ice thickness showed that the undeformed and ridged ice were both characteristic of an almost pure first-year ice regime. Given the observed bottom melt rate of 2 m during the following summer we conclude that more than 40% of the ice cover would have melted completely, leaving a fragmented and broken-up icefield. In fact the ice disappeared altogether from his region of the Arctic.
2. In the region north of Greenland and Ellesmere Island, at about 85°N and 20-70°W, the PDFs showed a mixed regime of first- and multi-year ice. However, comparison with 2004 data from identical tracks shows that the ice regime had made a large transformation, from mainly multi-year to mainly first-year, without any significant change in overall mean drafts. In other words, when younger ice replaced older ice, the amount of pressure ridging increased so as to adjust the overall mean thickness to remain the same. It is not clear whether this reflects some deeper aspect of ice mechanics.