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Recent sea ice thickness trends in the Arctic Basin from submarine data

P. Wadhams, J. M. Rodriguez, and N. Toberg

University of Cambridge, Dept. of Applied Mathematics and Theoretical Physics, Cambridge, United Kingdom
(PW11@CAM.AC.UK, 44 1223 760372)

Detailed mapping of the underside of Arctic sea ice in the 21st Century is largely the result of two UK submarine cruises by HMS "Tireless", in April of 2004 and 2007, since the annual US cruises of the SCICEX program ended in 2000. The 2007 cruise reproduced part of the 2004 track, across the north of Greenland and Ellesmere Island, and went on to cover the Beaufort Sea, including a gridded survey of the region of the APLIS-2007 ice camp. Where the 2004 and 2007 tracks matched, the mean thicknesses of the ice cover were essentially identical, with no evidence of significant further thinning between 2004 and 2007. In the Beaufort Sea, there is a direct comparison possible with a cruise covering the same region in the same season (April) of 1976. Here a very significant thinning can be seen, with a much lower mean draft, less multi-year ice and less ridging. In all cases the ridge draft distribution falls away quickly in probability with increasing depth, with no ridges deeper than 30 m anywhere in the submarine profiles, whereas in earlier cruises such ridges were numerous in the multi-year ice zone with some ridges exceeding 40 m. The 2007 cruise had the added advantage of a multibeam sonar fitted to the submarine to give a 3-D view of the underside; the data reinforce the view that active melt and decay of pressure ridges is taking place.