



Airborne Measurement of Sea-Ice Thickness

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The Naval Research Laboratory (NRL) is planning a major program of measurement and modeling of sea-ice thickness in the Arctic. The program will include in-situ, airborne and satellite measurements as well as development of coupled models of ocean, atmosphere and sea-ice. The authors' primary responsibility in this program will be the airborne measurement segment of the program utilizing the freeboard method for estimation of ice thickness (e.g. Hvidegaard and Forsberg, 2002). Essentially, the in-situ measurements of ice and snow thickness will be used to cal/val the airborne methodology, which will then be used to cal/val techniques of snow and ice-thickness extraction from satellite measurements. For the airborne program we plan to fly 10 and 18 GHz short-pulse (~ 3 nsec) radar altimeters and a scanning LiDAR altimeter as well as optical or thermal camera systems. The goal is measurement of free-board at leads in the ice, and snow-thickness by the differential penetration of the three altimeter systems to estimate ice thickness. All altimeters will have full wave-form recording for the analysis of mixed and spread returns. The optical/thermal instruments will be used to help differentiate leads from the ice. We plan to coordinate the NRL airborne field program with Navy ICEX submarine and ice-island programs as well as other opportunities for ground-truth and airborne programs of NASA (ICEBRIDGE) and ESA (CRYOSAT-2).