# Determination of local slope using photon-counting laser altimetry

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The greatest changes in elevation in Antarctica are happening along the margins of the ice sheet, where the surface frequently has significant slopes. For this reason the Ice, Cloud, and land Elevation Satellite-2 (ICESat-2), which is a photon-counting laser altimeter scheduled to launch in 2016, will utilize pairs of beams that are perpendicular to the flight direction in order to determine across-track slope. An airborne instrument, the Multiple Altimeter Beam Experimental Lidar (MABEL), was developed to provide data needed to, among other things, simulate this sampling strategy. We present local slopes as determined by MABEL and compare them to those determined by the Airborne Topographic Mapper (ATM) over the same flight lines on the Greenland Ice Sheet, through a range of slopes comparable to those of the margin of the West Antarctic Ice Sheet. Results from MABEL suggest that the ICESat-2 beam geometry is appropriate for the determination of slope on ~90 m spatial scales, a measurement that will be fundamental to deconvolving the effects of surface slope from the ice-sheet surface change derived from ICESat-2.