Pine Island Glacier and basin - initial interpretation of AGASEA/BBAS radar data

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We present topographic grids of bed elevation for the Pine lsland Glacier basin produced from the data collected as part of the 2004/05, AGASEA/BBAS survey. Alongside the gridded data, we present a heuristic classification of bed-reflection and location of lake-like reflectors. We will discuss some preliminary interpretations of these data. When compared to the bed elevation it is clear that the inland tributaries of Pine Island Glacier lie in topographic troughs and have some of the smoothest and continuous ("ice-shelf-like") basal echoes we have seen. These types of echo are continuous for considerable distances and extend into some of the deepest parts of the Byrd Subglacial Basin. We assume that they represent areas underlain by smooth sedimentary material. However, it is not clear that the distribution of this material is constrained by simple factor (e.g., a palaeo-sea level), and many rough areas lie at similar elevations. We discuss the possibility other interpretations are possible. The apparent surfaces of the many new lake-like reflectors in the interior of the basin will be compared to test for hydraulic connection. Finally, the distribution of a single bright reflector, which appears, at mid-depth in the ice sheet, over a wide area in the region of the Hudson Mountains, is investigated, and hypotheses concerning its origin will be discussed.

Higher-resolution grids of the lower part of Pine Island Glacier will also be presented, and discussed with reference to the recent thinning of the grounded glacier, and of its ice shelf, acceleration of the glacier. In particular, the potential for the glacier to undergo a rapid and catastrophic retreat, will depend on the basal topography and conditions near the grounding line. And while the inland, a smooth and flat bed underlies slow-flowing tributaries of Pine Island Glacier, the lower reaches of the glacier (within 70 km of the grounding line) are underlain by a comparatively rough bed. We will provide some assessment of the length and height-scales of this roughness, as well as evidence for potential pinning points that might impede a rapid retreat of the grounding line of this glacier, and a prediction for the most likely route that grounding line retreat would follow, based on a detailed map of the existing hydrostatic overburden.