doi:10.1038/nature10114

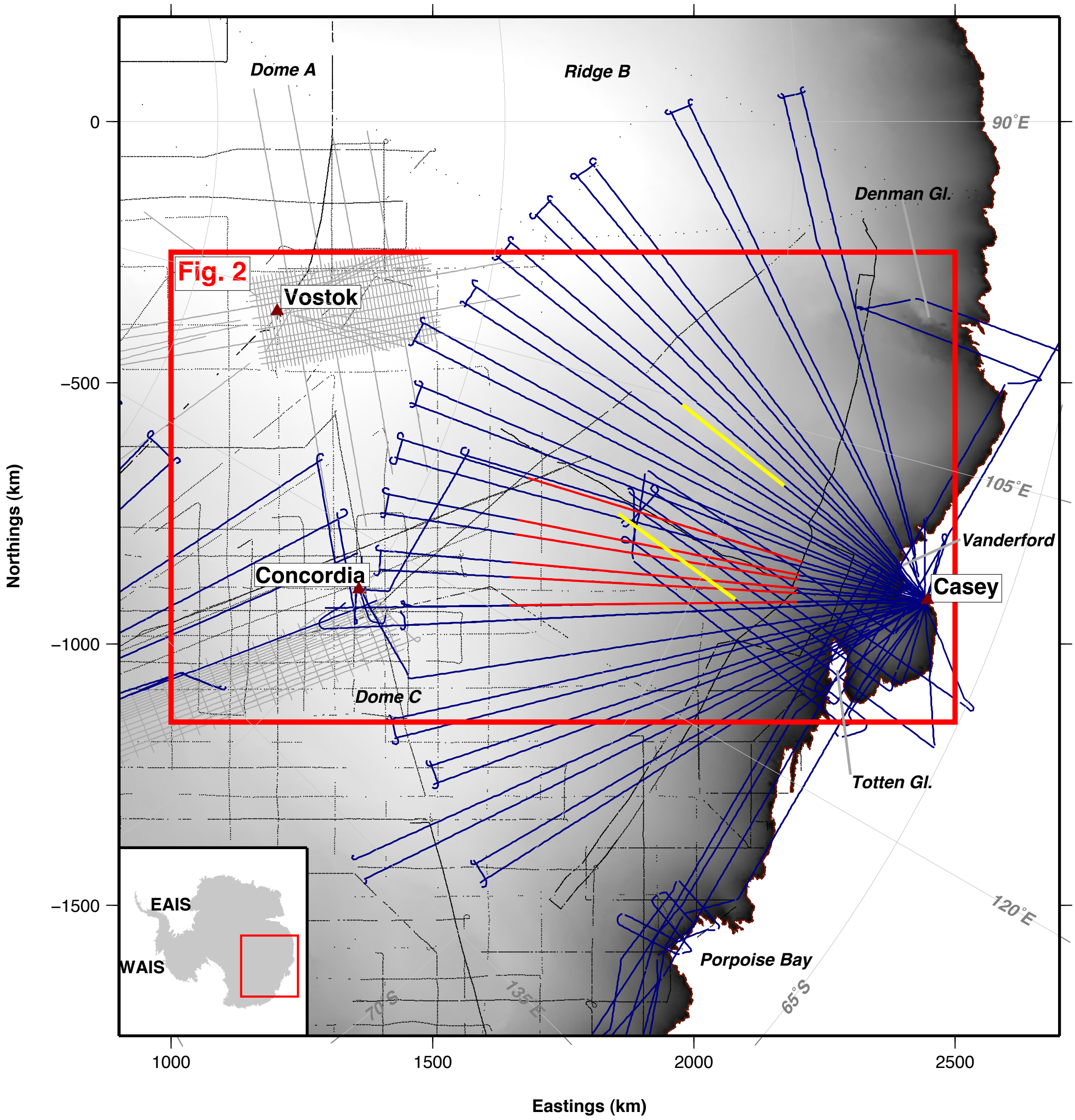

Figure S1: Aircraft flight lines. Flight lines of the ICECAP project (blue) in the Aurora Subglacial Basin sector during December and January of 2008/9 and 2009/10, shown on surface topography. Also shown in gray are aircraft tracks for the SOAR 1990's and SPRI/NSF/TUD radio-echo sounding[14] and Russian and Australian ground traverse data used to compile the new map of the ice sheet bed shown in Figure 2. The locations of the ICECAP radar profiles shown in Figure 2 and S4/S5 are shown in red and yellow, respectively.

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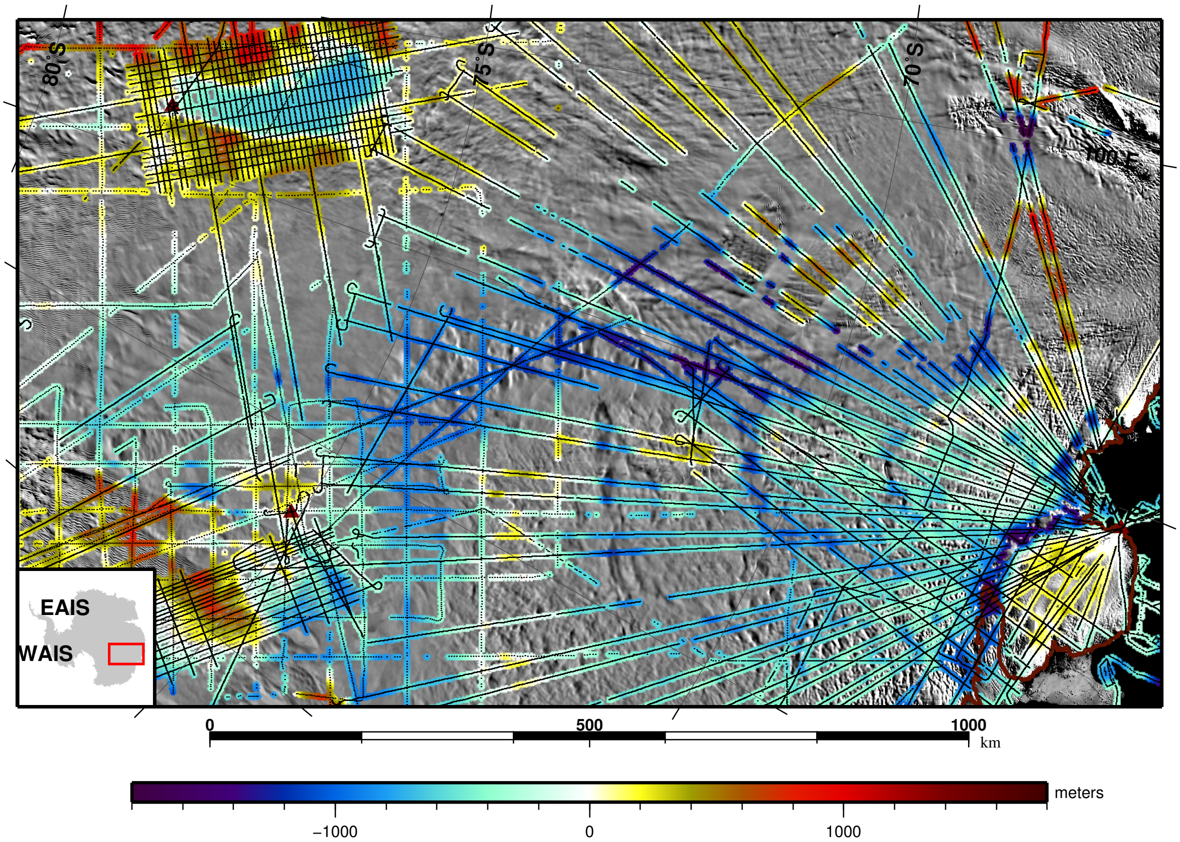

Figure S2: Ice thickness data distribution. Data used for compiling Figure 2 (shown in black) with bedrock interpolated (using the natural neighbor method) out to 5 km from each successful grounded ice thickness observation. Color scale is the same as used for Figure 2. The background is satellite imagery from the MODIS Mosaic of Antarctica[31]. The fjord features are generally sampled across their axis; textural variations in the satellite imagery strongly suggest that these deep regions are continuous between lines.

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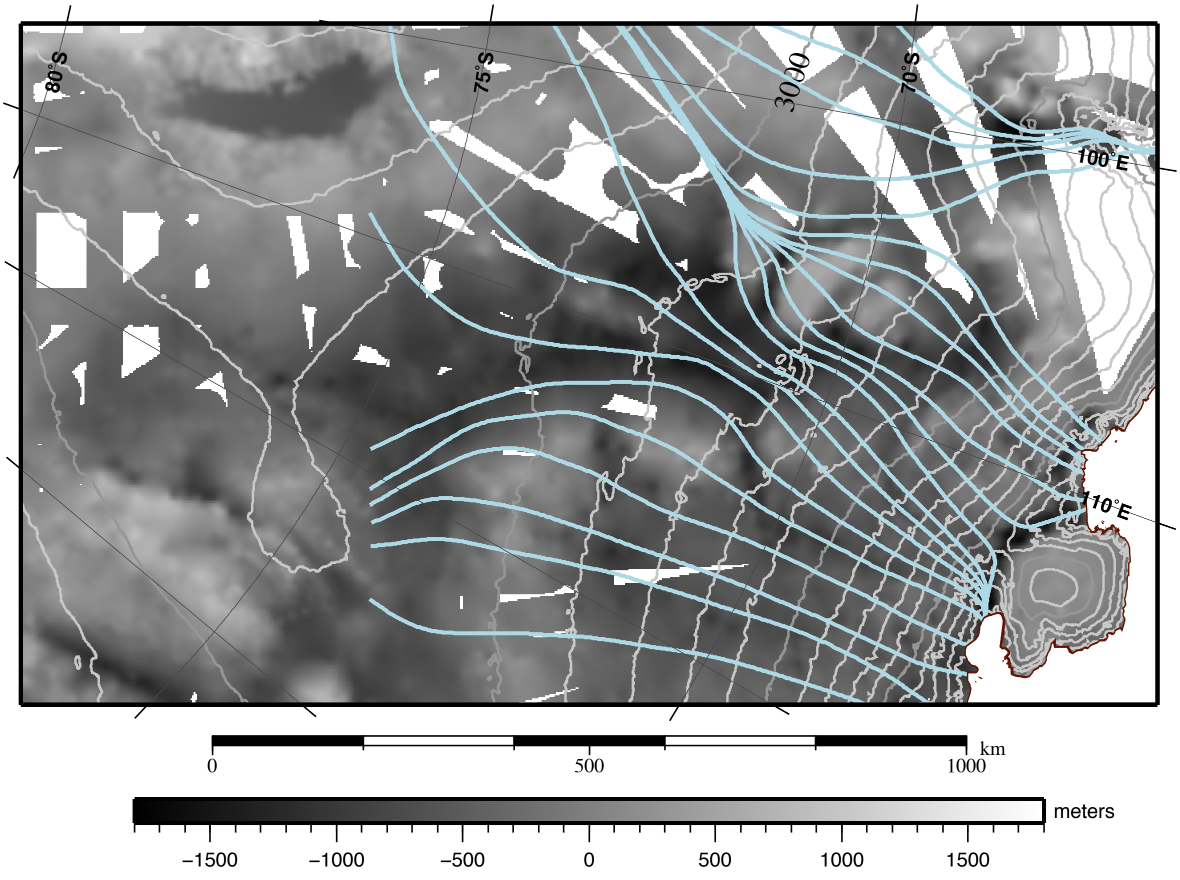

Figure S3: Ice flow in the context of bed topography. Inferred ice streamlines[15] (light blue) derived from surface slope shown on ice surface topography (gray contours) and ICECAP bed elevations (grayscale image), illustrates that the fjord orientations do not correspond to modern ice flow directions.

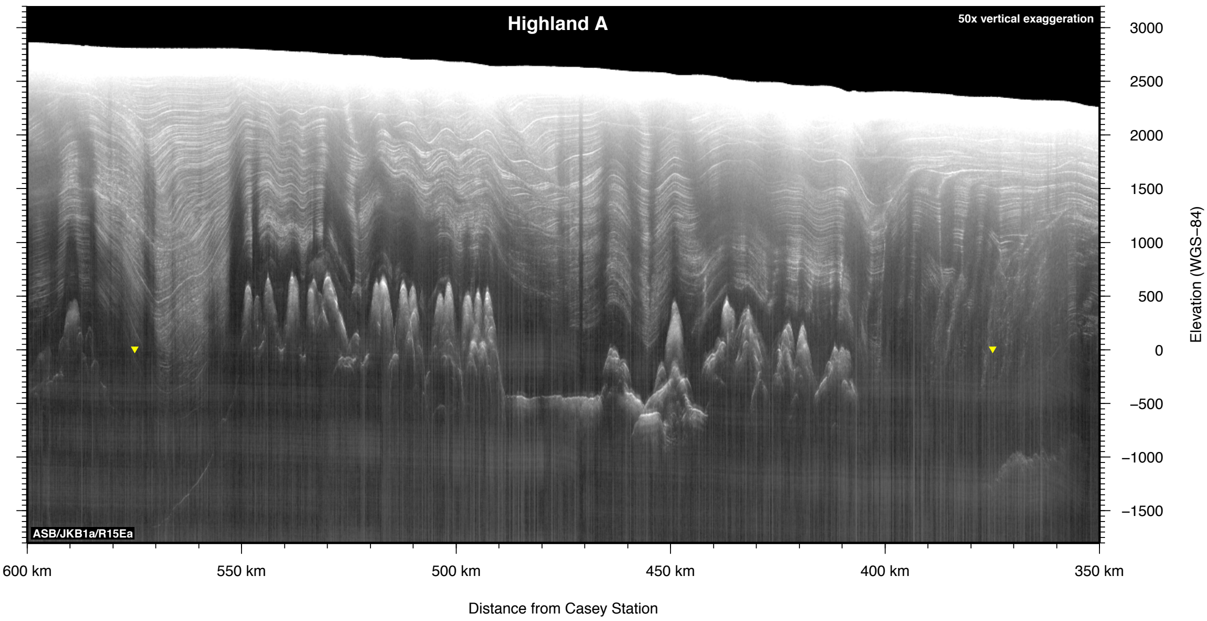

Figure S4: Expanded radar profile of Highland A. Depth corrected radar profiles across the deeply dissected terrain of Highland A, flown in January 2009 at the same time as the profiles in Figure 3. This profile corresponding to the upper of the yellow lines in Figure S1. Geographic south is to the left, similar to figures S1, S2 and S3. At top is the bright surface return, below that are layered reflectors within the ice due to episodic variations in ice conductivity. The ice layers indicated disruptions to ice flow by the underlying topography. Below the layers lies the bedrock reflection. Major overdeepened fjords are indicated by yellow triangles. At 570 km, a faint, 2200 m deep and 30 km wide smooth-walled valley is visible - even fully allowing for full isostatic uplift of the topography by removing the ice load would place its floor below sea level. A second order of topography is seen on the highland, with 500 m relief and 10˚ slopes preserved between fjords.

Sources of noise in the January 2009 data include horizontal lines due to a coupling with the surface reflection that in some places degraded the bed echo; this is also seen in some Figure 3 profiles. Bright vertical lines are partially filtered 10 MHz noise introduced by the digitizers. Dark lines in the layers are due to aircraft roll events.

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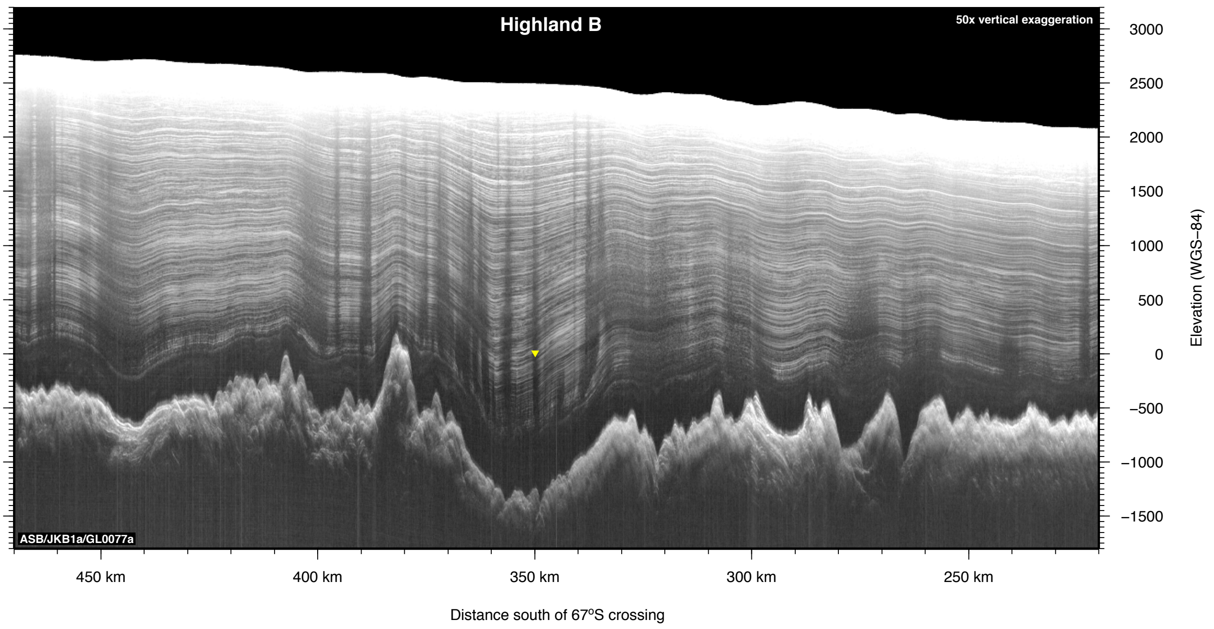

Figure S5: Expanded radar profile of Highland B. Depth corrected radar profile across Highland B, flown in December 2009, corresponding to the lower yellow line in Figure S1. Geographic south is to the left, similar to Figures S1. At top is the bright surface return, below that are layered reflectors within the ice due to episodic variations in ice conductivity. Below the layers lies the bedrock reflection. A major overdeepened smooth-walled U-shaped valley is indicated by a yellow triangle, representing an oblique transect across the valley at ~480 km in Figure 3. Dark lines in the layers are due to aircraft roll events.

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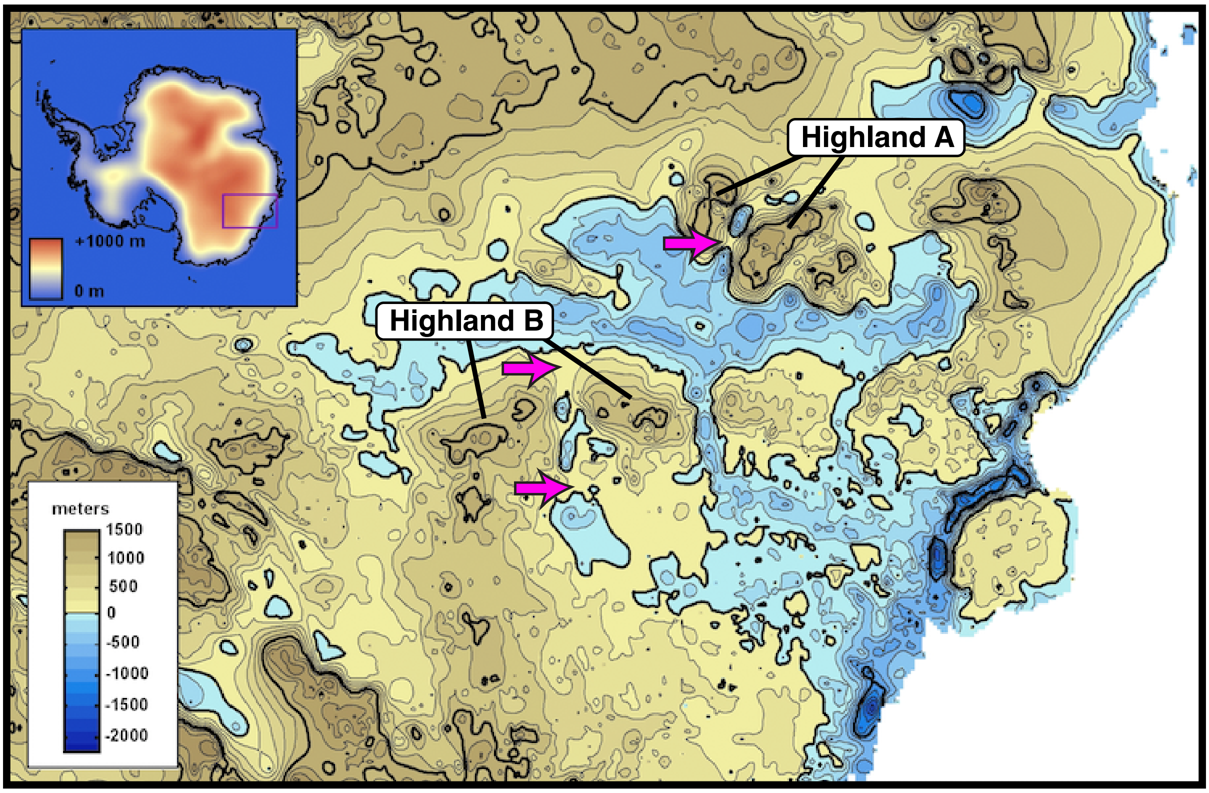

Figure S6: Model of bedrock topography after removal of ice sheet load. Isostatically uplifted bedrock topography over the area shown in Figure 2, emphasizing the WGS-84 'sea-level' after the removal of the entire Antarctic ice load, using a thin elastic lithosphere on an asthenosphere with a relaxation time constant of 4000 years, and run to equilibrium. Depths in the valleys cutting the highlands lie below the isostatically adjusted sea level, even without accounting for elevated ocean levels due to reduced global ice volume and past plate tectonic activity. Apparent bridges across these fjords, indicated by the purple arrows, are artifacts of the interpolator at points not constrained by the current dataset (see Supplementary Figure S2). The insert shows the predicted isostatic uplift across the entire continent.

Supplementary references

31. Scambos, T. A., T. M. Haran, M. A. Fahnestock, T. H. Painter, and J. Bohlander (2007), MODIS-based Mosaic of Antarctica (MOA) data sets: Continent-wide surface morphology and snow grain size, Remote Sensing of Environment, 111(2-3), 242–257, 10.1016/j.rse.2006.12.020.