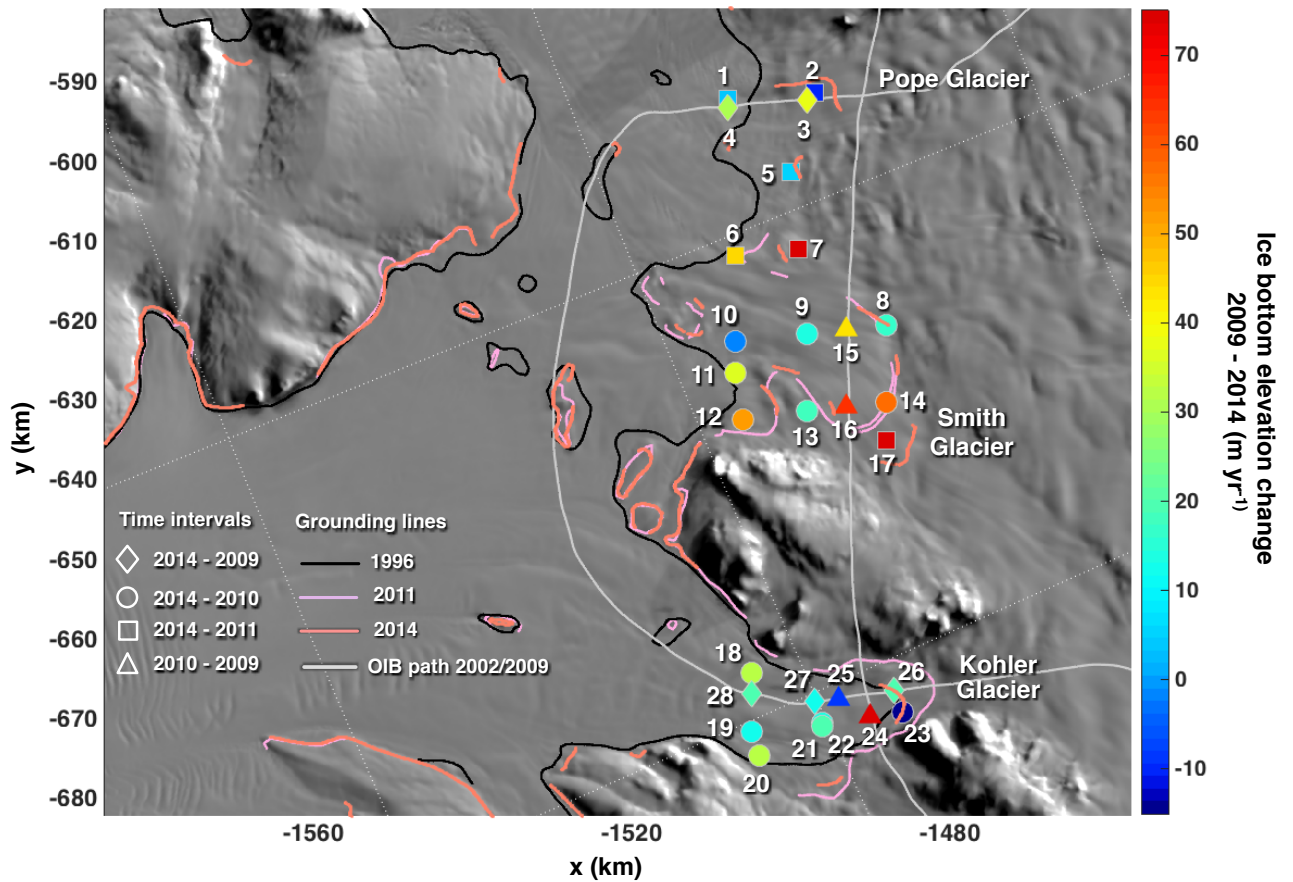


**Supplementary Figure 1 | Surface elevations and their changes in the surveyed grounding zones.** Top plot shows surface elevation change between 2002 and 2009 as measured by ATM swath laser altimetry on the across-flow transect spanning the grounding zones of Kohler, Smith and Pope glaciers in Fig. 1a, including the section delimited by S-S' in that figure and indicated here by the same letters. Bottom plot shows the 2002 and 2009 ice surface elevations (relative to the WGS84 ellipsoid), which were differenced to obtain elevation change, as measured by ATM nadir laser altimetry.



**Supplementary Figure 2 | Bottom ice elevation changes at crossover locations of non-repeating Operation IceBridge tracks between the years 2009 and 2014.** The white numbers label the points and are used in Supplementary Table 1, where the values of the average rates of change are given. Background image is from the 2008-2009 MODIS Mosaic of Antarctica<sup>1</sup>.

**Supplementary Table 1.** Post-2009 average ice bottom elevation changes at the locations shown in Supplementary Fig. 2. At each crossover location, the bottom elevation of the earlier year is subtracted from that of the latter, hence positive values indicate bottom ice loss. The differences found are then averaged over the length of the time interval to facilitate comparisons. Uncertainty varies between  $\sim 35 \text{ m yr}^{-1}$  for the 1-year interval to  $\sim 7 \text{ m yr}^{-1}$  for the 5-year interval (Methods).

Number of point on map	Bottom ice loss rate ( $\text{m yr}^{-1}$ )	Time interval	x (km)	y (km)
1	-3	2014 - 2011	-1508.3	-592.0
2	-10	2014 - 2011	-1497.0	-591.1
3	38	2014 - 2009	-1498.3	-592.2
4	30	2014 - 2009	-1508.2	-593.1
5	5	2014 - 2011	-1499.7	-601.1
6	44	2014 - 2011	-1507.3	-611.6
7	129	2014 - 2011	-1498.9	-610.8
8	16	2014 - 2010	-1488.4	-620.4
9	14	2014 - 2010	-1498.4	-621.5
10	-2	2014 - 2010	-1506.8	-622.4
11	37	2014 - 2010	-1506.7	-626.4
12	51	2014 - 2010	-1506.5	-632.2
13	18	2014 - 2010	-1498.1	-631.2
14	57	2014 - 2010	-1488.0	-630.1
15	44	2010 - 2009	-1492.8	-620.9
16	65	2010 - 2009	-1492.9	-630.6
17	83	2014 - 2011	-1487.8	-634.8
18	32	2014 - 2010	-1505.0	-664.1
19	13	2014 - 2010	-1504.6	-671.5
20	33	2014 - 2010	-1504.4	-674.5
21	19	2014 - 2010	-1496.4	-670.7
22	15	2014 - 2010	-1496.4	-670.3
23	-20	2014 - 2010	-1486.4	-669.0
24	109	2010 - 2009	-1490.0	-669.5
25	-9	2010 - 2009	-1494.1	-667.3
26	19	2014 - 2009	-1486.5	-666.3
27	13	2014 - 2009	-1496.5	-667.6
28	19	2014 - 2009	-1504.8	-666.7

## References

1. Haran, T., Bohlander, J., Scambos, T., Painter, T. & Fahnestock, M. MODIS mosaic of Antarctica 2008–2009 (MOA2009) image map. Boulder, Colorado, USA. National Snow and Ice Data Center. <http://dx.doi.org/10.7265/N5KP8037> (2014).