Internal structure and subglacial topography of the ice divide between Pine Island, Rutford, Minnesota and Institute Ice streams in West Antarctica

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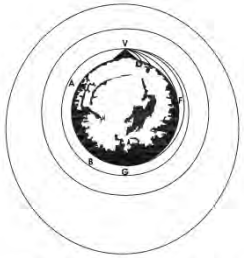

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Project Logo

The questions

- Are the changes taking place at PIG spreading upstream to the ice divide with Rutford and Institute?
- Can we see these possible effects on the glacial record at the continental ice divide?
- There is any evidence of ice divide migrations?
- How is the bedrock at the ice divide?
- There are more water bodies apart from SLE?

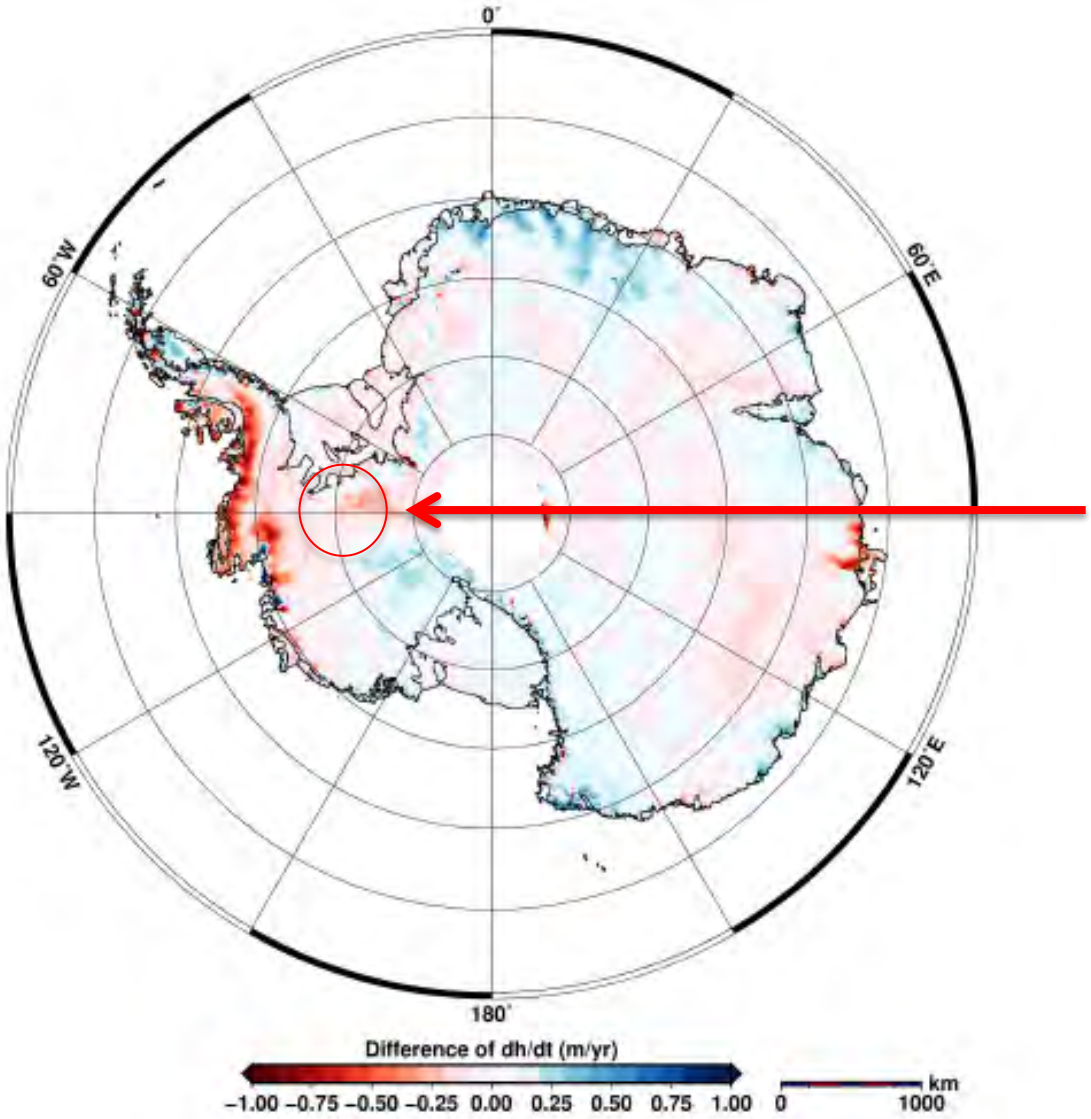

Figure 15. Difference of d*h* / d*t* between the period 2011 to 2014 and the period 2003 to 2009

Source: Helm et al, 2014, The Crysophere

Aims

- Studying potential instability of WAIS
- Mapping subglacial topography of the Ellsworth trough and associated region
- Detecting internal structure on the quadruple ice divide Exploring (Raymond Bumps)

Methods

- Dual frequency Lexon GD GPS Receivers

- VHF coherent pulse compression radar designed by CECs that transmit with a peak power of 200 W working at a central frequency of 155 MHz and a bandwidth of 20 MHz.

- Frequency-*Modulated Continuous-Wave* (FM-CW) radar also designed by CECs, that operates at frequency ranges between 203 and 1019 MHz (UHF).

- A Campbell AWS was installed on top of CECs caboose

- Mass balance studies (snow densities and composition), on shallow firn cores.


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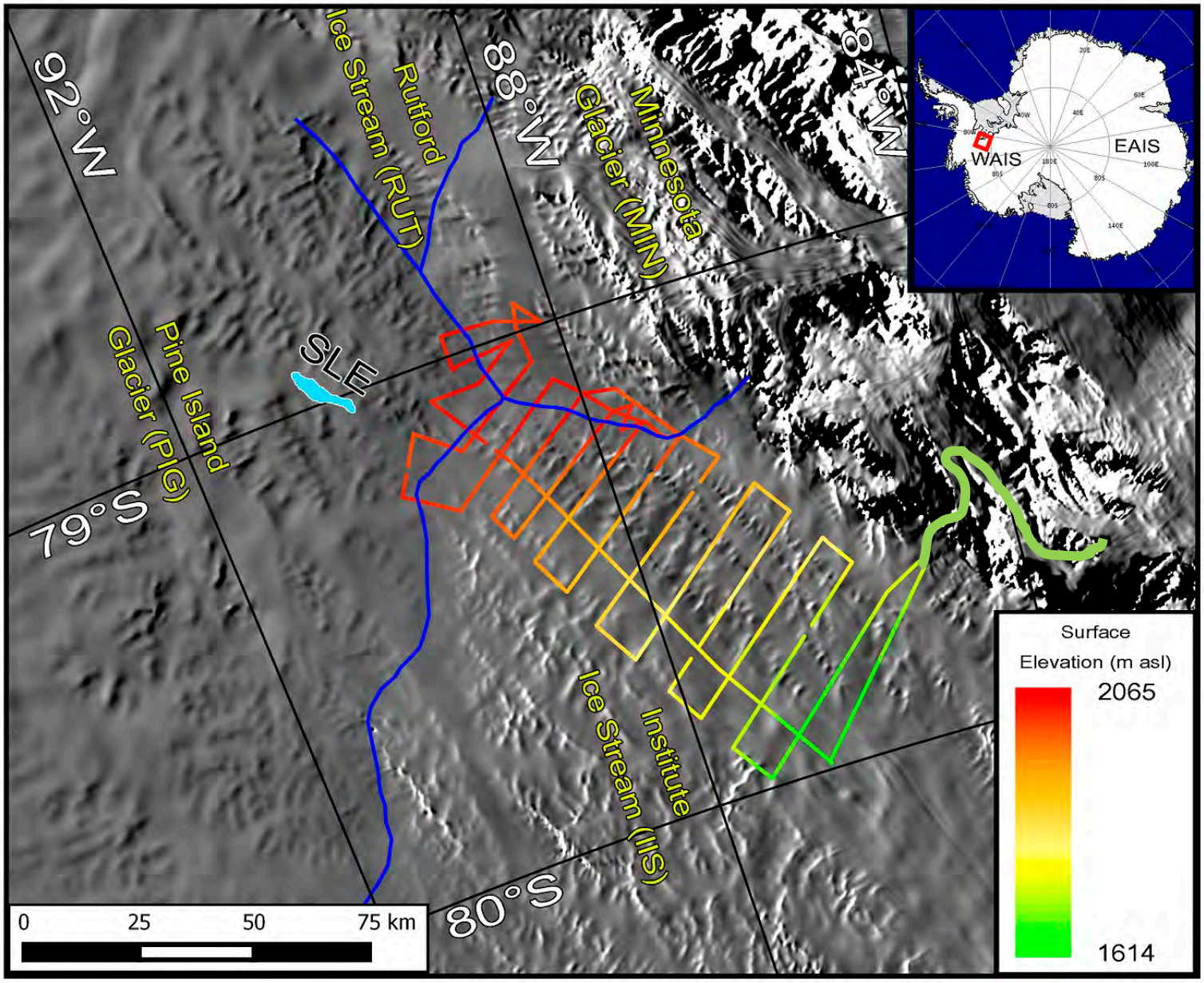
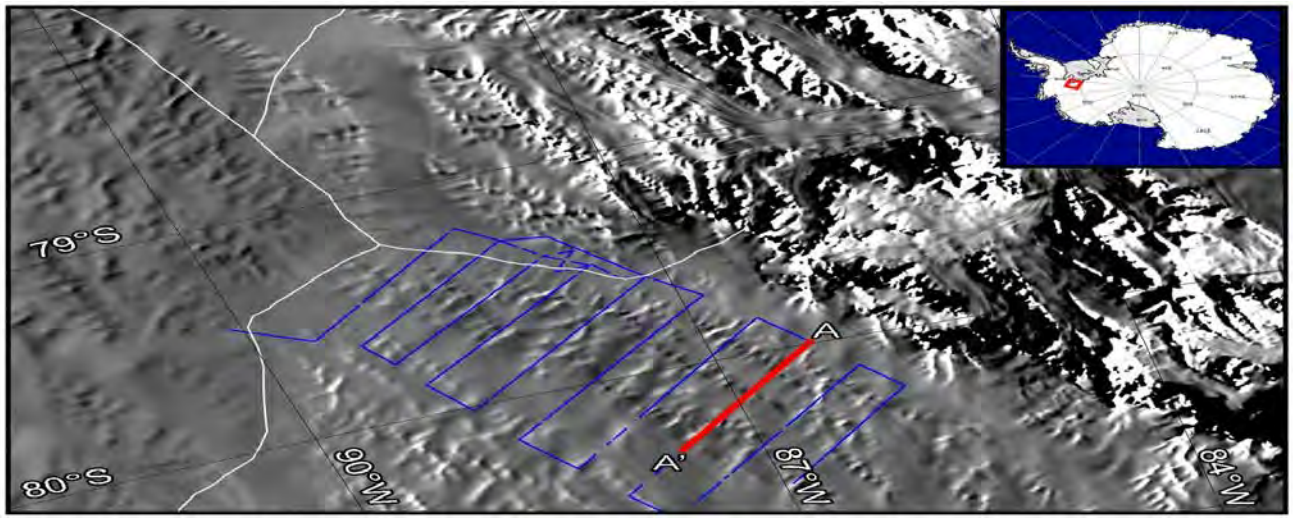
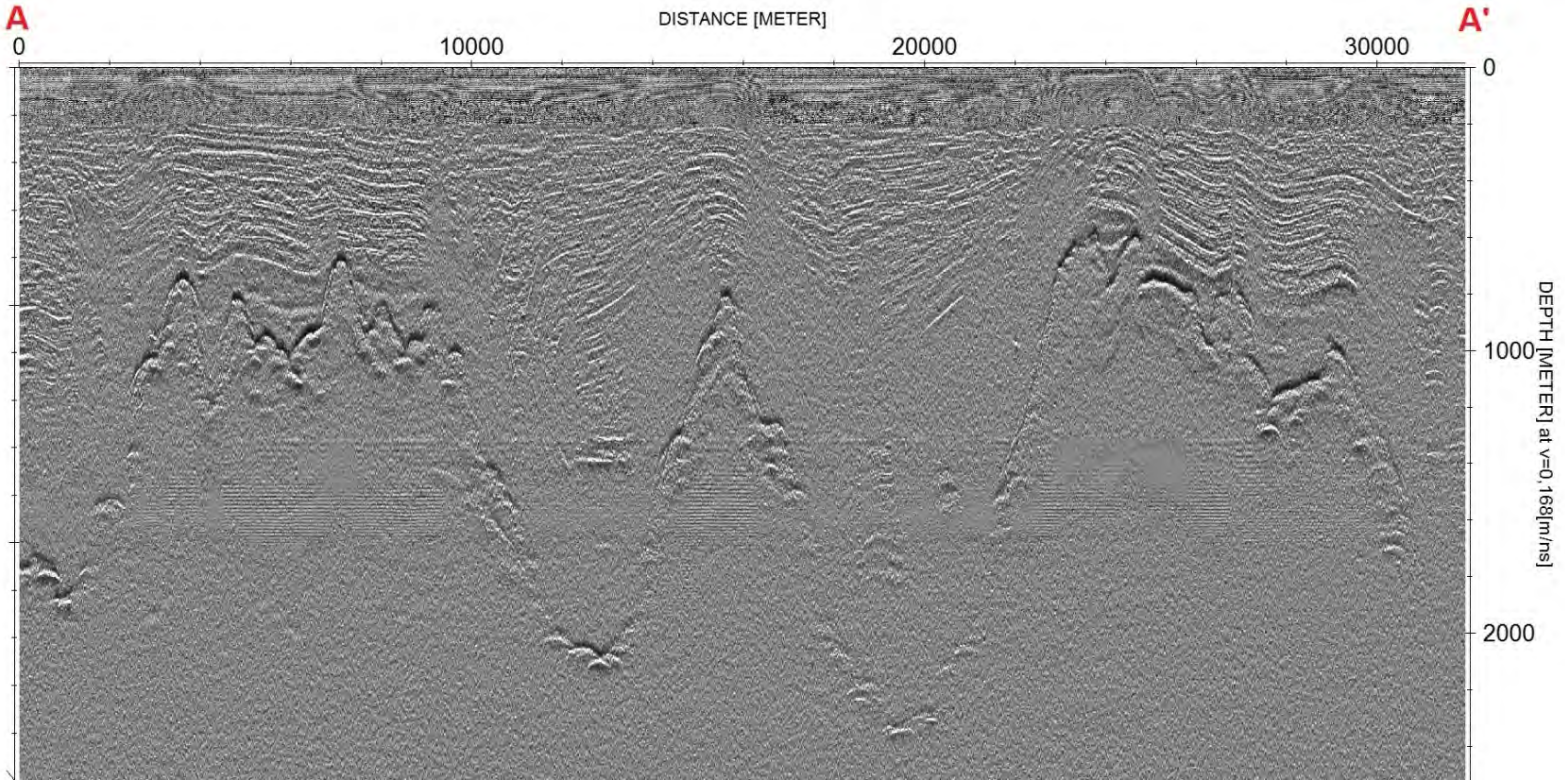
2014 survey


92°W
88°W
84°W
79°S
80°S
Rutford Ice Stream (RUT)
Minnesota Glacier (MIN)
Pine Island Glacier (PIG)
SLE
Institute Ice Stream (IIS)
WAIS
EAIS
0
25
50
75 km
Surface Elevation (m asl)
2065
1614

Radar results





Conclusions

- We surveyed more than 1100 km of almost uncharted Antarctic plateau including the collection of Radar, GPS, Met data and snow samples
- The maximum ice thickness was 3.1 km with vertical errors of ~5%.
- The upper 200 m of snow and firn layers were mapped with a vertical resolution of 0.2 m
- The Ellsworth trough was followed up to the ice divide with PIG
- Other very deep troughs and hanging lateral valleys were also mapped, all of them surrounded by very rough and steep flanks.
- The main troughs have flat beds, where we detected subglacial water like reflectors.
- Differences between BEDMAP2 and our GPS/radar survey on 701 km^2 compared points, were;
  - Surface topography: 3.5 ± 7.9 m
  - Ice thickness: 283 ± 646 m
- We are going back in December to survey in more detail part of the study area

Thanks

Acknowledgements:
Antarctic Logistic and Expeditions (ALE), Basal fund, CONICYT, CECs,