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## 3D imaging of subglacial lineations under the Rutford Ice Stream, West Antarctica

**Rebecca Schlegel**<sup>1</sup>, Adam Booth<sup>2</sup>, Tavi Murray<sup>1</sup>, Andy Smith<sup>3</sup>, Alex Brisbourne<sup>3</sup>, Ed King<sup>3</sup>, Roger Clark<sup>2</sup>, and Steph Cornford<sup>1</sup>

<sup>1</sup>Swansea University, Geography, Swansea, UK (967901@swansea.ac.uk)

<sup>2</sup>University of Leeds, School of Earth and Environment, Leeds, UK

<sup>3</sup>British Antarctic Survey, Natural Environment Research Council, Cambridge, UK

There are numerous theoretical descriptions of the subglacial conditions (water availability, subglacial geology, flow dynamics) required for the formation of subglacial lineations, such as mega-scale glacial lineations and drumlins, that are known to be indicative of fast ice flow. Traditionally, mapping in de-glaciated areas, both onshore and offshore, has been undertaken using bathymetric maps, satellite data and field observations; here, lineations currently beneath the Rutford Ice Stream (West Antarctica) have been mapped using ground-penetrating radar (GPR) and seismic methods.

The Rutford Ice Stream is more than 2 km thick, of which 1.4 km are located below sea level. The ice surface speed at the grounding line is >1 m per day, and satellite observations indicate a stable ice flow over the past 30 years. The ice-bed interface is assumed to be at the pressure-melting point, while the bed can be divided into a region of soft, deforming sediment, and one of stiff, non-deforming, sediment. Long, elongated lineations, up to ~14 km, up to 150 m high, and 50-500 m wide, are found aligned in the ice-flow direction in the area of the soft sediment, within which the deposition of a drumlin was observed over a period of <10 years. Together with local erosion occurring in the same timescale, this demonstrates the temporal variability of ice stream beds.

To study the detailed architecture of the lineations, 3D grids of GPR data were acquired during the Antarctic Summer Season 2017/18, enabling 3D-processing and imaging of lineations. Using this unique dataset, in conjunction with previous publications plus data from the paleo record, we hope to better understand the possible mechanisms of formation of subglacial lineations as well as subglacial conditions at the Rutford Ice Stream.