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New aerogeophysical surveys of ice stream flowlines, ice divides, and the grounding line over the Evans, Carlson, and Rutford systems, West Antarctica

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During the austral summer of 2006-07, an aerogeophysical team from the British Antarctic Survey (BAS) undertook $\sim$22 000 km of new ice-penetrating radar surveys over the West Antarctic catchments drained by the Evans, Carlson, and Rutford ice stream systems (traversing an approximate area of 250 000 km^2). Operating from a Twin Otter aircraft, equipped with dual-frequency carrier-phase GPS enabling $<$1 m navigation accuracies, the recently-developed BAS ice-sounding radar system PASIN (first used in the 2004-05 Amundsen Sea sector surveys) was deployed to image both the bed and internal reflecting horizons to depths $>$ 3 km. The surveys had three objectives: (i) To detect and record internal reflecting horizons (and the bed) directly along ice stream flowlines inferred from remotely-sensed surface velocities both along the active Rutford and Evans Ice Streams (and tributaries) and the stagnant Carlson system. Collecting such flow-parallel englacial data represents an attempt to improve the coherence of internal layers, which in turn will improve the information provided to ice flow models that are calibrated with internal layering geometry. Surveys were additionally flown transverse to ice flowlines to obtain flow-perpendicular layering, and along the ice stream edges to obtain marginal ice-thicknesses. (ii) To acquire internal layering data over a number of ice divides across the region, ranging from inter- ice-stream ridges, major catchment divides, and selected ice rises. These data will be examined for trends in layer separation due to accumulation variation or flow-dynamical effects, and for the occurrence, or otherwise, of 'Raymond bumps.' (iii) To measure ice thickness along the grounding line from Evans to Rutford Ice Stream to determine

ice discharge across this dynamic sector. This forms part of the wider International Polar Year (IPY) objective of calculating ice discharge from the entire Antarctic Ice Sheet. In this paper we present the survey geometry and provide some early insights gained from preliminary analyses of the data.