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Design and test of an aircraft deployable sensor for the Antarctic peninsula

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There remains large areas of scientific interest in the Antarctic that are not instrumented. These include highly dynamic ice sheets and glaciers that are difficult or impossible to reach by ground via overland treks, due to heavy crevassing, or through aircraft landing. We have developed an alternative strategy for instrumenting these regions: a sensor probe that can be dropped from aircraft , partially bury itself in the snow whilst protruding high above the surface to ensure a long operating life. Our probe is shaped like a 2.5m long missile that can be dropped through a standard sonar-buoy launch tube. In order to achieve a consistent impact depth in different snow densities the case is fitted with fold-out fins one metre from the nose cone. This ensures a large step-change in impact surface area when one metre of the device is embedded in the snow. A disk-gap-band parachute design reduces the impact speed, improves the angle of impact while damping probe oscillations. To prevent strong winds from knocking the sensor over the parts of the sensor that protrude above the snow are narrow, the parts of the sensor that are buried are much wider and the parachute separates from the sensor after impact. The sensor is cheap to make (approximately £ 500) and has a minimal environmental impact. An extensive series of tests conducted this season about the Rothera research station and the forward operating base Sky Blu have validated this sensor design in different snow and weather conditions. We intend to deploy a network of these sensors across Pine Island Glacier next year.