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Airborne ice thickness measurements in the western Ross Sea as basis for satellite validation

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Reliable determination of Antarctic sea ice thickness over large areas is urgently needed as any change will significantly modify the heat exchange between ocean and atmosphere. Satellite-based estimates of sea ice thickness around Antarctica are confounded by the challenge of thin ice covered by relatively thick snow, or fast ice underlain by ice crystals in the vicinity of ice shelves. We measured various types of sea ice and ice shelves in the western Ross Sea using airborne electromagnetic induction sounding as a basis for satellite validation.
The instrument we use is suspended either below helicopters or fixed wing aircrafts (EM-bird). A combination of EM and lidar technology is applied to measure the thickness of consolidated ice plus snow, and indicates in some areas the existence of subice platelets as a consequence of the outflow of very cold (super-cooled) ice shelf water. Our time series of measurements span from 2009 to 2017, and airborne data have been partly validated by ground measurements, characterizing sea ice conditions near ice shelves and coastal polynyas. Our latest measurements from a Basler BT67 fixed wing aircraft are also suitable to characterize pack ice conditions and ice thickness gradients in the Terra Nova and McMurdo Polynya, along the Victoria Land coast, and over thin ice shelves. Several flight lines have been conducted along CryoSat-2 satellite tracks. We showcase our results in comparison with satellite and airborne imagery, a work which is basis to interpret variability of freeboard and ice thickness from satellite.