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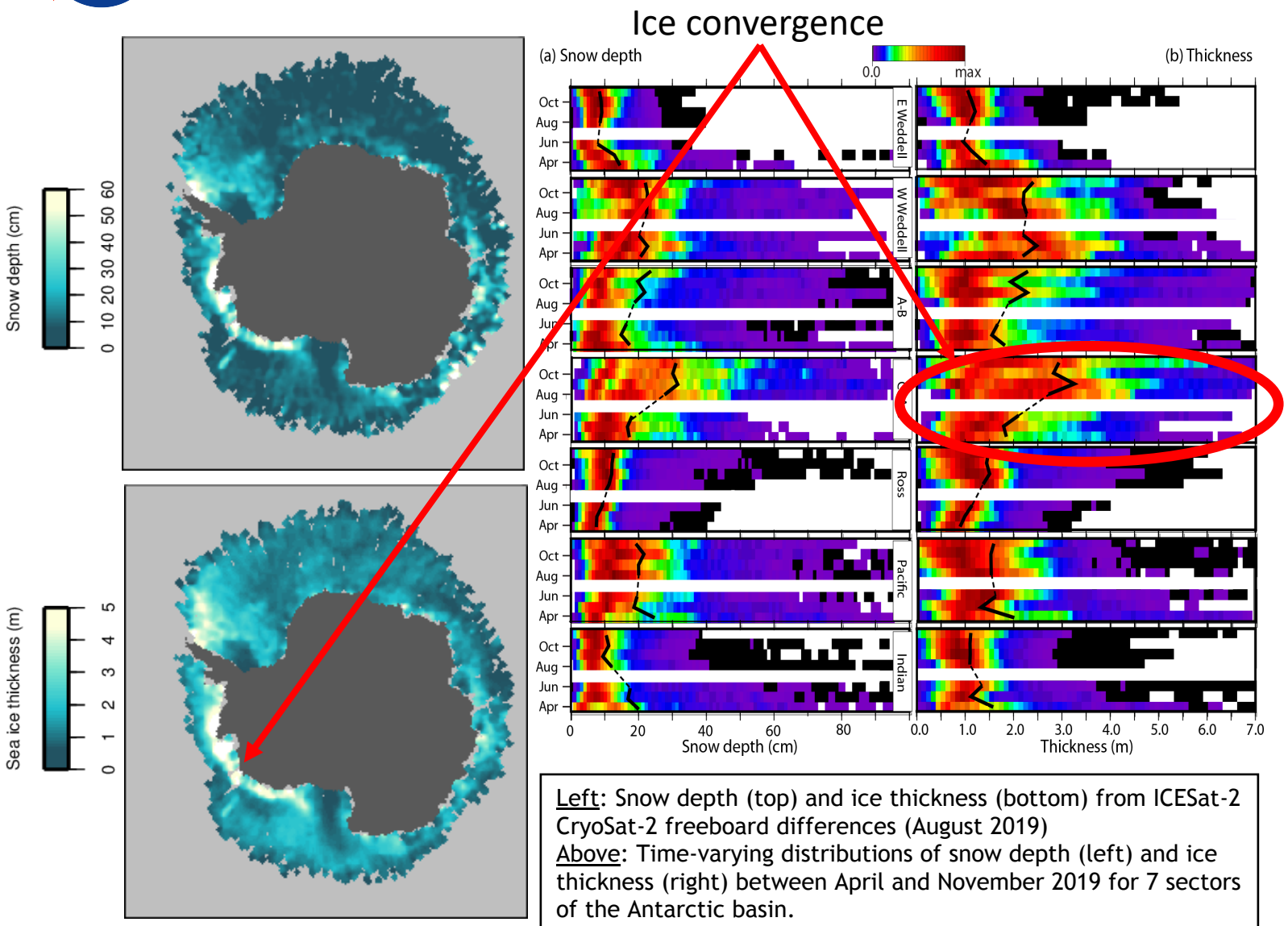
The Antarctic sea ice cover from ICESat-2 and CryoSat-2: freeboard, snow depth and ice thickness (Kacimi and Kwok (2020))



Left: Snow depth (top) and ice thickness (bottom) from ICESat-2 CryoSat-2 freeboard differences (August 2019)
Above: Time-varying distributions of snow depth (left) and ice thickness (right) between April and November 2019 for 7 sectors of the Antarctic basin.

Background: Estimates of sea ice thickness in the Southern Ocean come mostly from shipborne/airborne measurements or mechanical drilling, which limits our understanding of the observed trends in ice coverage. Using ICESat-2 and CryoSat-2 freeboards, we can, for the first time, infer snow depth from the freeboard differences, and subsequently ice thickness for the entire ice cover.

Findings: Over an 8-month period (April to November 2019), we show that the thickest ice is encountered in the Bellingshausen-Amundsen and Western Weddell sectors (>2m), while the thinnest ice is located in the Ross and Eastern Weddell sectors (<1.5m). A significant ice convergence event along the coast of the Bellingshausen-Amundsen seas (see plot) was captured both in our estimates and satellite ice drift.

Implications: These estimates are the first time-varying, basin-scale estimates of snow depth and ice thickness from satellite altimetry. Results emphasize the need to better understand the physical processes affecting the variability of the sea ice cover in the Southern Ocean. There is an urgent need for corroborative datasets for assessing these large-scale estimates. A longer time series will help improve our knowledge about the behavior of the Antarctic sea ice cover.

Kacimi, S. and Kwok, R.: The Antarctic sea ice cover from ICESat-2 and CryoSat-2: freeboard, snow depth, and ice thickness, The Cryosphere, 14, 4453–4474, https://doi.org/10.5194/tc-14-4453-2020, 2020.
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