Using CryoSat-2 sea ice thickness distribution to constrain the CICE sea ice model

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What can we learn from the recent CryoSat-2 sea ice thickness measurements for sea ice modelling? Are the CryoSat-2 thickness data accurate enough to derive sub-grid scale ice thickness distribution (ITD)?

For the first time the ITD is derived from the along track CryoSat-2 individual thickness measurements for 5 winter periods October to April from 2010 to 2015. The monthly mean ITD is calculated with respect to 5 CICE ice categories used in e.g. HadGEM3 simulations: (1) ice thickness $h < 60$ cm, (2) 60 cm $< h < 1.4$ m, (3) 1.4 m $< h < 2.4$m, (4) 2.4 m $< h < 3.6$ m, (5) $h > 3.6$ m. We perform stand-alone CICE simulations initialized with CryoSat-2 ITD in November 2010 to 2014 and April 2011 to 2015. Winter sea ice growth is underestimated applying the default CICE setup during all years. An increase in ice and snow conductivity can match the mean simulated ice growth with the CryoSat-2 ice growth and also improves the simulation of summer ice extent. The width of ITD is generally wider in CICE than in CryoSat-2. A reduction of ice strength and of the area participating in ice ridging can reduce the width of ITD within CICE. Impacts of these changes on longer CICE simulations are discussed.