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Is realistic Antarctic sea ice extent in climate models the result of excessive ice drift?

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For the first time, we compute the sea-ice concentration budget of a fully coupled climate model, the Australian ACCESS model, in order to assess its realism in simulating the autumn–winter evolution of Antarctic sea-ice. The sea-ice concentration budget consists of the local change, advection and divergence, and the residual component which represents the net effect of thermodynamics and ridging. Although the model simulates the evolution of sea-ice area reasonably well, its sea-ice concentration budget significantly deviates from the observed one. The modelled sea-ice budget components deviate from observed close to the Antarctic coast, where the modelled ice motion is more convergent, and near the ice edge, where the modelled ice is advected faster than observed due to inconsistencies between ice velocities. In the central ice pack the agreement between the model and observations is better. Based on this, we propose that efforts to simulate the observed Antarctic sea-ice trends should focus on improving the realism of modelled ice drift.