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The Antarctic sea ice concentration budget of an ocean-sea ice coupled model

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The Antarctic sea ice concentration budget of the NEMO-LIM ocean-sea ice coupled model is computed and analyzed. Following a previously developed method, the sea ice concentration balance over the autumn-winter seasons is decomposed into four terms, including the sea ice concentration change during the period of interest, advection, divergence and a residual accounting for the net contribution of thermodynamics and ice deformation. Preliminary results from this analysis show that the geographical patterns of all budget terms over 1992-2010 are in qualitative agreement with the observed ones. Sea ice thermodynamic growth is maintained by horizontal divergence near the continent and in the central ice pack, while melting close to the ice edge is led by sea ice advection. Quantitatively however, the inner ice pack divergence and associated sea ice freezing are much stronger, as compared to observations. The advection of sea ice in both the central pack and the marginal areas are likewise stronger, which corroborates the findings of a previous study in which the same methods were applied to a fully coupled climate model. Nonetheless, the seasonal evolution of sea ice area and total extent are reasonably well simulated, since enhanced sea ice freezing due to larger divergence in the central pack is compensated by intensified melting in the outer pack owing to faster advection. Those strong dynamic components in the sea ice concentration budget are due to ice velocities that tend to be biased high all around Antarctica and particularly near the ice edge. The obtained results show that the applied method is particularly well suited for assessing the skills of an ocean-sea ice coupled model in simulating the seasonal and regional evolution of Antarctic sea ice for the proper physical reasons.