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Evaluating the Decadal Prediction Skill of the Sea Ice Concentration in the Southern Ocean

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Several studies have shown that the Southern Ocean presents a high potential predictability at decadal time scale. Nevertheless, this region remains poorly studied, partly because of the lack of observations and understanding of physical processes that occur there. An analysis of hindcasts simulations performed following the CMIP5 protocol have revealed an artificially introduced variability of Southern Ocean sea ice in some models. Depending on the initialization method used, as well as on the model dynamics, a destabilization of the oceanic convection may occur, resulting in a perturbation of the sea ice. The footprint of this destabilization appears as a strongly biased annual cycle of the sea ice extent. It it is caused by an incompatibility between the initial state (constrained to be close to observations) and the model equilibrium state. A deeper analysis of available data provides clues to understand why some initialization strategies perturb the ocean stability. It also highlights the link between this instability and the mean state (e.g. the strength of Southern Ocean stratification) of the different models. Finally, our analysis allows to point out regions in the Southern Ocean which are more likely to exhibit such anomalies and which, therefore, need to be initialized with caution.