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Polar climatepPredictability seasonal to multi-decadal: Impact of the initialization method on the skill of decadal climate predictions in the Southern Ocean

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Recent studies using idealized model experiments showed that there is a high potential predictability for the sea surface temperature over the Southern Ocean on decadal time scale. Nevertheless, partly because of the lack of observations in this area, the predictive skill of real climate forecast remains poorly studied there. Indeed, performing accurate predictions on decadal time scale requires a model that represents relatively well the physical process in this region as well as an initial state compatible with both the available observations and the model used to perform predictions. Data assimilation methods can provide such an optimal initial condition given inaccurate and incomplete observations and imperfect model equations. The ocean state is often initialized using simple initialization method (e.g., the nudging) but more sophisticated data assimilation methods (e.g., a particle filter) may improve the quality of decadal predictions in the Southern Ocean. We therefore propose to compare decadal prediction skill arising from two data assimilation procedures: the nudging and the particle filter. The forecast skill is assessed thanks to hindcasts spanning the last 70 years. These simulations are computed using LOVECLIM, an Earth system model of intermediate complexity. Its low computational cost allows us to perform a large amount of systematic tests. Results obtained with LOVECLIM are also compared to the ones from similar studies using a general circulation model to perform hindcasts from initial states obtained with a nudging method.