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Predictability of the Southern Ocean dynamics through ensemble simulation hindcasts

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The Southern Ocean (SO) dynamics, and the various fronts of the Antarctic Circumpolar Current in particular, are well known to display a very energetic variability covering a wide range of spatial and temporal scales. Since a substantial fraction of such variability is known to be intrinsic, and therefore basically chaotic, predictability in this part of the world ocean is particularly poor.

In this context, the YOPP-endorsed IPSODES project of the Italian “Programma Nazionale di Ricerche in Antartide” (PNRA) is aimed at improving process understanding concerning the predictability of the SO dynamics through ensemble simulation (ES) hindcasts analyzed by means of various statistical techniques supported by dynamical interpretations, with special focus on multiscale interactions linking high-frequency (up to seasonal) and low-frequency (interannual and larger) variability. IPSODES uses existing state-of-the-art eddy-permitting global ocean-sea-ice model ESs and coupled global atmosphere-ocean-sea-ice model ESs developed for decadal climate predictions. Moreover, new ESs performed with an ocean model specifically developed for IPSODES are carried out: sensitivity numerical experiments to assess model uncertainty are performed with these new simulations. The study of transport of marine debris provides an application of such modelling effort, and contributes also to model validation through the use of an available valuable data set.

This contribution illustrates advances achieved so far in IPSODES towards improving our understanding of the predictability properties of oceanic variability of the SO dynamics.