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Mechanisms of intrinsic variability and teleconnection in the Antarctic Circumpolar Current

Giovanni Sgubin (1), Stefano Pierini (1), and Henk A. Dijkstra (2)

(1) Universita' di Napoli Parthenope, Dipartimento di Scienze per l'Ambiente, Napoli, Italy (giovanni.sgubin@uniparthenope.it, +39 081 5476515), (2) Utrecht University, Institute for Marine and Atmospheric Research, Utrecht, The Netherlands

The highly complex circulation and variability in the Southern Ocean are well known to strongly affect the global climate, yet their functioning is still far from being fully understood. In this presentation we focus on mechanisms of variability of the Antarctic Circumpolar Current (ACC) induced by intrinsic nonlinear effects over various spatial and temporal scales. These mechanisms are identified and analyzed through the results of primitive equation ocean models. A hierarchy of models forced with steady climatological wind forcing has first been implemented for a barotropic ocean with flat bottom, with an idealized topography and with a comparable realistic bathymetry that is able to prevent a total topographic steering: in this last case the role of the bottom form drag on the dynamical balance of the ACC could be assessed. Baroclinic effects have subsequently been modeled with the Princeton Ocean Model forced with both momentum and heat fluxes in more realistic configurations. The simulations show evidence of several phenomena of intrinsic variability that are strongly sensitive to the bottom topography, viscous parameterization and background stratification. Moreover, a preliminary statistical investigation of the dynamical relationship between different regions of the ACC indicates the existence of teleconnection mechanisms in the Southern Ocean dynamics