

EXCITATION OF OCEAN BASIN MODES BY THE MEAN CIRCULATION

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Linear stability analysis of the large scale ocean circulation (filtered through planetary geostrophic equations) in realistic configurations is performed: Unstable modes with decadal to interdecadal time scales are found and their physical mechanism is described.

Surface boundary conditions have a tremendous influence for the positiveness of the modes growth rate, which is generally weak (of the order of cycles per year), although atmospheric stochastic forcing can easily excite the modes even if weakly damped. Some unstable basin modes are based on planetary waves slow propagation across the basin, resonating through fast boundary adjustment by Kelvin waves. Their physics can be tracked back and better understood through simplified quasigeostrophic and shallow-water dynamics.

Simple atmospheric couplings are then considered and their influence on the modes is discussed, while new unstable modes arise. Their relevance for explaining interannual to interdecadal climate variability found in observations and realistic models is discussed.