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Poster

Recent high-resolution (e.g. $1/4^\circ$ and finer) Ocean General Circulation Models (OGCMs) simulate the observed low-frequency sea surface variability with appreciable skill. In addition, mesoscale eddies are resolved and no longer parametrized in such highly non-linear models: a substantial amount of the simulated low-frequency variability appears spontaneously (i.e. without direct forcing by atmospheric variability) and imprints several observed quantities (SSH, SST, QNET, MOC, etc). Penduff et al. (2011) showed that this intrinsic part may account for most of the low-frequency SSH variance in eddy-active regions. Several idealized studies have been conducted with academic process-oriented models (e.g. Berloff et al., 2007, Dijkstra and Ghil, 2005, etc), but the structure, scales, and origin of low-frequency intrinsic variability remain poorly-known in the global eddying ocean.

A 327-year seasonally-forced global ocean simulation (no interannual forcing) is compared to its 50-year counterpart driven by the full range of atmospheric timescales (with interannual forcing). Outputs are band-passed filtered in time and space. Our results suggest that the low-frequency SSH variability at small scales ($< 6^\circ$) is largely intrinsic and colocated with mesoscale (short time and space scales) activity. We are currently examining whether this may result from inverse energy cascades towards large spatial and temporal scales, as suggested in Arbic et al. (2012). Over most of the global ocean, large-scale ($> 12^\circ$) low-frequency oceanic variability is mostly driven by atmospheric variability. However, this variance is largely intrinsic in three hotspots (Gulf Stream, Kuroshio, ACC) where it reaches 50 – 80% of the total SSH variance. We argue that such OGCM-based investigations may provide useful information on the intrinsic fraction of low-frequency variability in the real ocean, which is mostly interpreted as directly responding to the atmospheric forcing.

OSTS session

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