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## A reduced-order model of the zonal jets problem in the Southern Ocean

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We introduce a reduced-order model of the underlying dynamics of zonal jets in the Southern Ocean. The model is based on multi-scale decomposition in the vorticity equation and explains how large-scale forcing breaks down into mesoscale eddies and alternating zonal jets. In this reduced-order model, we average the vorticity equation both in time and in the zonal direction and utilize eddy viscosity parametrization for turbulence closure. For verification, we compare our results with two high-fidelity models: i) the quasi-geostrophic model of a shear-driven periodic channel flow and ii) primitive equation HYCOM (HYbrid Coordinate Ocean Model) simulations of the Southern Ocean.

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