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Data assimilation in a model of the Kuroshio off the coast of Japan

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The Kuroshio south of Japan exhibits multiple stable paths, one with a meander centered at 138E, one, without the meander, following a straight path and a third with a large meander centered at 135E upstream of the Izu ridge. We have computed the bifurcation diagram of a limited area 2 layer quasi-geostrophic model of the Kuroshio south of Japan. The bifurcation diagram was computed for a wide range of Reynolds numbers. It shows multiple stable and unstable steady solutions. The three typical paths of the Kuroshio appear as stable solutions. The nature of the unstable paths, and their role in the transition from one stable solution to another, is investigated by analyzing the leading stable and unstable modes of perturbations about the steady solutions. The structure of the leading (i.e., slowest decaying) mode of growth of perturbations about at least one of the stable steady states evolves in a pattern similar to that of the observed sea surface height. Some results of a weak constraint variational assimilation of sea surface height data spanning the most recent transition from a non-large meander to a large meander state will be presented.