Dynamics of SQG Vortices CECILY KEPPEL, STEFAN
LLEWELLYN SMITH, UCSD — The surface quasi-geostrophic (SQG) equations
are a model for low-Rossby number geophysical flows in which the dynamics are
governed by potential temperature dynamics on the boundary. The model can be
used to explore the transition from two-dimensional to three-dimensional mesoscale
geophysical flows. We examine the dynamics of SQG vortices and the resulting flow
in the entire fluid including at first order in Rossby number ($O(Ro)$). This requires
solving an extension to the usual QG equation to compute the velocity corrections,
and we demonstrate this mathematical procedure. As we show, it is simple to obtain
the vertical velocity, but difficult to find the $O(Ro)$ horizontal corrections. We then
consider the specific case of an exact SQG vortex solution developed by Dritschel
(2011). We examine the interaction of two such vortices in both the infinite and
doubly periodic domain.

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