Steven
Jayne
Woods Hole Oceanographic Institution
Breck Owens, Woods Hole Oceanographic Institution
Bruce Cornuelle, Scripps Institution of Oceanography
Oral
We present an extension of the statistical mapping technique, optimal interpolation, based on the Guass-Markov theorem that incorporates additional constraints beyond simple geostrophy to compute the surface velocity field. In particular, we include additional covariances that allow the estimation of the equatorial velocities from the observed sea surface height. Near the equator, the traditional estimation of the geostrophic velocity from the pressure field using relations becomes ill-defined as Coriolis parameter goes to zero. However, using our technique the resulting velocity field is continuous and smooth between the off-equatorial geostrophic velocity and the equatorial beta-geostrophic velocity. This is uniquely different than method that is currently used by AVISO which also provides an operational velocity field derived from the sea surface height field, however, they apply beta geostrophy over the band of 5°N/S that is discontinuous with the higher latitudes, and results in distinct change in the eddy kinetic energy at those latitudes. Our methodology overcomes this disadvantage and can be combined with other constraints, such as no flow through topography, to create a dynamically-constrained, mapped surface velocity field.
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