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High resolution estimate of surface potential vorticity fluxes in the region of the separated Gulf Stream

Bruno Deremble[†]; Nicolas Wienders; William Dewar
[†] FSU, USA
Leading author: bderemble@fsu.edu

Air-sea interaction in general couples the ocean and the atmosphere. We here investigate its role in determining the properties of water masses, in particular the dynamically important potential vorticity. This is part of the broader CLIMODE effort and so we focus on the region of the separated Gulf Stream. Potential vorticity is created at the surface in two ways, ie (1) by heat exchange with the atmosphere and (2) by momentum flux due to winds in the presence of surface density gradients. Both heat loss and wind stresses are large in the vicinity of the Gulf Stream, particularly during winter storms, traditionally thought to be the dominant driver of the regional North Atlantic mode water, the18C water. We use a high resolution regional model, with subsequent downscalings, embedded within a realistic global model to study this problem. The model is forced using a simplified atmospheric boundary layer model in order to permit sea surface temperature feedbacks on the locations of the fluxes. Since this model resolves the meso- and submeso-scale, we are able to map the relative magnitude of the wind and buoyancy effects in the presence of eddies. We compare and contrast our results with the observations obtained during CLIMODE.