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Formation and erosion of the seasonal thermocline in the Kuroshio Extension Recirculation Gyre

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Data from the Kuroshio Extension Observatory (KEO) surface mooring are used to analyze the balance of processes affecting the upper ocean heat content and surface mixed layer temperature variations in the recirculation gyre (RG) south of the Kuroshio Extension (KE). Cold and dry air blowing across the KE and its warm RG during winter cause very large heat fluxes out of the ocean that erode the seasonal thermocline in the RG. Some of this heat loss is replenished through horizontal heat advection. Enhanced diffusive mixing at the base of the mixed layer tends to transfer heat downward, potentially eroding and even modifying subtropical mode water. Diffusivity at the base of the mixed layer, estimated from the residual of the mixed layer temperature balance, has values of 3-5x10^{-4} m^2/s during the summer and values a couple of orders of magnitude larger during winter. The enhanced diffusivities appear to be due to large inertial shear generated by wind events associated with winter storms and summer tropical cyclones. The nature of the storms that result in strong inertial oscillations and enhanced mixing will be discussed.

Keywords: air-sea interaction, ocean heat budget, Kuroshio Extension, mixing processes, KEO, surface mooring