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Linking ocean surface fluxes and cyclone variability over the Northern Hemisphere

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Midlatitude cyclones are known to be generated and intensified over the areas of high sea-air surface fluxes due to diabatic heating from below resulting in the enhancement of the low-level baroclinicity. In turn, cyclones per se contribute to the development of extreme turbulent fluxes providing locally high winds and air-sea temperature gradients. This makes it difficult to directly associate cyclone activity and surface flux anomalies on long-term scales and to handle the chicken/egg problem.
We attempt to link the Northern Hemisphere (NH) cyclone activity with the anomalies of the surface turbulent heat fluxes by considering extreme surface fluxes on the ocean side and specific characteristics of the cyclone life cycle on the atmospheric side. Surface flux statistics were derived from the fluxes recomputed for the reanalyses state variables for 1979- onwards and cyclone tracks were derived for the same period from modern era reanalyses using state of the art numerical tracking algorithm. The main questions addressed in this study are (i) in how way mean and extreme surface fluxes influence cyclone activity and which time scales? (ii) which parameters of the cyclone lifecycle are most sensitive to the surface flux signals? and (iii) whether the response of cyclone characteristics to surface fluxes is local (as e.g. in WBCE regions such as Gulf Stream and Kuroshio) or non-local and which mechanisms are responsible to the two? To answer these questions, we look on the surface flux statistics and cyclone characteristics over the North Atlantic and North Pacific and analyze responses seen in cyclone deepening rates, propagation velocities, life time to the locally high surface turbulent fluxes.