Session: C9 Poster: M167B

Oceans and climate: Surface turbulent fluxes from extreme mid-latitude cyclones

Mark Bourassa[†]; Joel Scott
[†] Florida State University, USA
Leading author: bourassa@coaps.fsu.edu

Warm seclusions are large midlatitude storms that have the potential to substantially influence the turbulent heat fluxes and global energy budget. These storms have not been previously investigated from an energy and flux perspective. They have very large areas of strong surface winds and rapidly moving cold fronts which are associated with large air/sea differences of temperature and humidity, and hence with large air/sea fluxes of latent and sensible heat. Therefore, errors in model representation of warm seclusions may introduce significant bias and uncertainty to the energy budget. The turbulent heat fluxes associated with three specific warm seclusions in different ocean basins are examined through an intercomparison of satellite-derived flux data and numerically derived flux data. The satellite data includes the SeaFlux version 0.75 data derived from SSM/I (Special Sensor Microwave/Imager), and model-derived reanalysis data includes CFSR, ERA-Interim, MERRA, and NCEP-R2 reanalysis data sets. Latent and sensible heat fluxes are computed in a physically consistent manner though the use of a bulk flux parameterization A single warm seclusion, which typically lasts between three and seven days, is responsible for approximately one quarter of the total time-integrated monthly fluxes for the ocean basin containing the warm seclusion, depending on the storm and data set under consideration. The large area of extremely large fluxes is associated with the mature phase of the cyclone; proper representation of these fluxes is critical to determining accurate monthly-averaged, basin-wide fluxes. On sub-monthly scales, the fluxes from these storms cool the ocean, and transfer a great deal of energy from the ocean to the atmosphere, providing a richer environment for following storms. The wind forcing and the energy transfer also contribute to a deepening of the ocean's mixed layer. Warm seclusions involve tremendous North/South transport of energy which could contribute Arctic and Antarctic ice. The couple of the climate systems through these storms requires much more investigation. The results presented here demonstrate that the surface turbulent fluxes associated with these storms can be observed, demonstrating that we can begin to study the interaction with confidence.