

For HLWG or Examples of user requirements for fluxes.

Currently, my group and I are relying heavily on reanalysis data in connection with our interest in internal variability in the extratropical atmosphere, its driving mechanisms and expression in longer time-scale fields or climate and teleconnection patterns. We have recently found intriguing evidence that Rossby wave breaking (or irreversible large-scale deformation of potential vorticity (PV) contours on isentropic surfaces, hereafter RWB) is the primary driver of the interannual PDO. Quoting our paper (Strong and Magnusdottir 2008) “Composite analyses based on hundreds of RWB cases show that anticyclonic (cyclonic) RWB is associated with a warm, moist (cool, dry) column that extends down to a surface anticyclonic (cyclonic) circulation, and that the moisture and temperature advection associated with the surface circulation patterns force turbulent heat flux anomalies that are strong enough to generate the SST anomalies associated with the PDO.”

The two figures show composites of anticyclonic and cyclonic RWB, respectively. Panel c in each figure shows composites of the surface heat flux associated with each type of RWB (contour interval 10 W/m^2 , negative contours dashed) along with wind vectors at the lowest level. The relative latitude in the figures is centered at 40N for anticyclonic, 55N for cyclonic breaking. The two cross-sections are along the line in panel b and show temperature (water vapor) anomalies as a function of height in d (e).

A few notes:

- 1) Rossby wave breaking takes place in all seasons in certain dynamically active regions (that get displaced with the seasons) over the extratropical (including high latitude) ocean basins.
- 2) The results described above are based on reanalysis data where the surface flux is based on the parameterized turbulent heat flux that has been developed for conditions far from conditions that are normally encountered in the high latitude boundary layer.
- 3) We need consistent observations throughout the atmosphere including surface fluxes. We need assimilated fields for consistency. High time resolution (6 hourly).
- 4) Field campaign of tower measurements, possibly off of oil rigs (?), to improve parameterized flux estimation for high latitude conditions.
- 5) Followed by direct measurements from satellites.....