**Computation of Air-sea fluxes in Five Atmospheric Rivers over the Northeast Pacific using Dropsonde Observations**

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Draft abstract for submission to AGU session on atmospheric rivers

29 July 2014

Atmospheric Rivers (AR’s) play a dominant role in variability of precipitation on the US W. Coast. A major AR study field effort with three research aircraft and the ship RV Ron Brown are committed to a campaign in January–February 2015. In this paper we report on an ”early-start” deployment of the NOAA G-IV aircraft, which was conducted in February 2014 to test new flight modules and to work out key logistical and flight operations methods. In February 2014 the NOAA G-IV research aircraft sampled 10 ARs over the northeast Pacific Ocean. On five of these flights (Feb 08, 11, 13, 18, 21) dropsondes were deployed in a line crossing the AR so as to robustly sample the atmospheric structure. The sonde profiles yield gradients of wind speed, potential temperature, and water vapor mixing ratio in the surface layer over the ocean. Surface fluxes can be estimated from these gradients. If sea surface temperature (SST) is available, fluxes can also be computed using a bulk-flux algorithm. Conventional atmospheric sondes do not measure SST, but we developed a method to estimate SST by extrapolating the gradient to the surface. This was effective for temperature and water vapor profiles. A short iteration yielded reasonable estimates of SST and fluxes of momentum, sensible, and latent heat. The SST values were compared to satellite values. Five different satellite products were used: microwave, AMSR, wsat, TMI, and MODIS. A single satellite estimate was created as the median of these five. Standard deviation (std) of the five satellite estimates at each location is about 0.5 C. A grand comparison of satellite and sonde SST estimates for the five flights was made. For a total of 119 locations, the mean of Sonde-Satellite SST is about -0.02 C (std 0.76 C, correlation coefficient 0.983). For SST deduced from the humidity profile, the mean difference is 0.20 C (std 1.26, correlation 0.953). Surface fluxes were surprisingly small: sensible heat flux was typically negative and latent heat flux positive or negative. This implies that the bottom of the AR loses some heat to the surface and gains water vapor only modestly as it goes from the tropics to the W. Coast.