Water Vapor Flux Tool for Monitoring the Intensity and Duration of Land-falling Atmospheric Rivers along the West Coast

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Atmospheric Rivers (ARs) are long, narrow regions in the atmosphere (>2000 km and <1000 km, respectively) that are responsible for most of the horizontal water vapor transport outside of the tropics. ARs translate with extratropical cyclones and number four to six in the mid-latitudes at any given time. Pacific Atmospheric Rivers are key phenomena that are highly correlated to extreme precipitation and winter floods along the West Coast of the US. Although most major flooding along the West Coast can be associated with ARs, not all floods are caused by ARs nor do all ARs cause flooding. To be defined as an AR, the total column precipitable water has to be greater than 2 cm and winds in the lowest 1 to 2 km have to have a component normal to the terrain of at least 25 kts. On rare occasions , an AR does produce extreme rainfall leading to extreme runoff and flooding.

As part of the NOAA HydroMeteorology Tesbed (HMT) West, an Atmospheric River Observatory (ARO) was designed and installed at critical locations along the coast to identify and quantify the strength and duration of land-falling ARs. They consist of a boundary layer wind profiler, and a GPS sensor combined with a surface meteorological station to obtain total integrated water vapor. In 2009 these AR observatory's were incorporated into what has been called a Water Vapor Flux decision support tool for use by forecasters to improve situational awareness of potential extreme rainfall situations and provide guidance on short-term QPF expected utilizing the HMT 8 member WRF ensemble. The application of the tool in flood forecasting along the West Coast will be presented using several case studies from both Washington and California. Future installation of AROs as part of the HMT legacy project funded by the California Department of Water Resources will greatly enhance the utility of these systems.