Predicting Snow-to-Liquid Ratio (SLR) Across the CONUS

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Winter precipitation poses a major challenge for operational weather forecasting and frequently leads to snow- or ice-bound traffic, air-travel disruptions, vehicle accidents, power outages and infrastructure damage. During winter storms, the difficulties of quantitative precipitation forecasting are compounded by the need to also consider factors such as precipitation type, snow-to-liquid ratio (SLR), snowfall rate and amount, snow level, and wind transport.

This talk examines one of the factors above, SLR. Using 15 years of Community Collaborative Rain, Hail, and Snow Network (CoCoRAHS) manual snowfall observations and European Centre for Medium-Range Weather Forecasts Reanalysis v5 (ERA5) vertical profiles, we have been producing machine learning (ML) models for predicting SLR across the CONUS based on random forest (RF) and multiple linear regression (MLR) frameworks. Regional and CONUS-wide verification statistics based on use with the HRRR indicates that RF and MLR produce improved SLR forecasts over existing operational methods. The RF has the advantage of greater accuracy, whereas the MLR is more computationally efficient. We are currently producing CONUS wide SLR and snowfall forecasts based on the application of the RF to the RRFS (see http://weather.utah.edu and click on RRFS-Snow in the left-hand navigation bar). These will be provided for the WWE.