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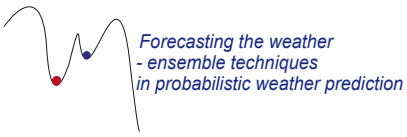

Towards turbulence-based turbulence forecasting

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Traditionally, turbulence forecasting has relied on developing empirical correlations between certain large scale atmospheric features and turbulence experienced by aircraft. Over the last few years turbulence forecasting has evolved so that these features are routinely derived automatically from operational NWP model forecasts to provide gridded turbulence forecasts. But they are still based primarily on empirical relations. For example the product of deformation and wind shear is often computed from the NWP model –generated winds to produce turbulence forecasts, without really understanding how these large scale features contribute to aircraft-scale turbulence. Further, since such diagnostics are empirically-based, there is no theoretical guidance for assigning thresholds for light, moderate, and severe turbulence.

However, there have been recent advances in routine observations of turbulence which provide an aircraft-independent atmospheric measure of turbulence (EDR= $\varepsilon 1/3$ where ε is the eddy dissipation rate), and our understanding of the downscale cascade processes from large scales (which the NWP model resolves) to aircraft scales (which are not resolved) that allow us to start developing turbulence metrics which are derived from turbulence theory rather than from empirical correlations. Such metrics output turbulence intensity (EDR) directly. Other metrics can be converted to an EDR intensity scale by using an assumed log-normal probability distribution function (consistent with aircraft turbulence measurements) to map from the diagnostic units/scales to EDR.

These techniques and preliminary statistical evaluations of their EDR predictive performance will be presented.