

Blending Surface Layer, NWP Model and Climatological Refractivity Profiles: Methods and Issues

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Surface layer models are needed to characterize the evaporation duct with the required resolution for accurate low-level radio frequency propagation modeling. These high-resolution surface layer modified refractivity profiles must then be blended onto the bottom of the numerical weather prediction (NWP) model or climatological database profile. A variety of methods for performing this blending have been proposed. One of the major differences between these methods is whether the modified refractivity profile should be blended directly, or should the temperature, humidity and pressure profiles be blended before computing the modified refractivity. The Naval Postgraduate School (NPS) approach uses the former method, so that the blending can be performed without distorting any existing trapping layers in the NWP model refractivity profile and to ensure that no erroneous refractivity features are introduced as a result of the blending. Another question is how much precedence should be placed on preserving the shape of the surface layer model refractivity profile, versus preserving the shape of the NWP model or climatological profile. For example, when the NWP model or climatology database indicates the presence of a strong surface duct, when the surface layer model instead indicates a weak evaporation duct is present, which profile should be given precedence? These questions will be examined and different approaches evaluated. Issues particular to blending with climatology databases will also be discussed, including if and how to blend climatological refractivity profiles derived from coastal and island radiosonde station data with surface layer profiles from nearby ocean areas. In addition, in certain cases and scenarios blending may be unnecessary, and sometimes it may even be beneficial to not perform any blending at all.