WORLDWIDE CLIMATOLOGY TO SUPPORT RF PROPAGATION

Fast, S. A., Saunders, K. E., Valentine, C. G.
Remcom, Inc.

The long term climatology of ducted radio waves by atmospheric anomalies has long interested researchers and communications system and RADAR users. Several global climatology data sets have been investigated for use in the Electromagnetic Integrated Resource Environment (EMPIRE). The climatology data sets investigated produced sufficient data but did not contain all the required climate data needed to extract a duct profile or refractive index for RF propagation predictions. For example, the Historical Electromagnetic Propagation Conditions (HEPC) climatology data set that is a product of the Oceanographic and Atmospheric Master Library (OAML) contains acceptable data with climate data available for every 2 x 2 degree marsden square for night and day for each month. However, there are several caveats when estimating a ducting profile or refractive index for RF propagation predictions. In addition, the HEPC data only contains data over water. While ducting does not often occur over land, in certain strategically located areas, nocturnal ducting is prevalent. The National Oceanographic and Atmospheric Administration (NOAA) Cooperative Institute for Environmental Sciences (CIRES) together with the National Center for Environmental Protection (NCEP) and the National Center for Atmospheric Research (NCAR) conducted reanalysis using all weather measurements taken since 1948. This NCEP/NCAR reanalysis data contains all required data to produce atmospheric profiles for RF propagation predictions by supplementing surface and vertical level reanalysis data with Monin-Obukhov theory.

The NCEP/NCAR reanalysis project uses the latest weather forecast models and all historical measured data taken since January 1, 1948 to generate a global weather data set every 6 hours since 1948. The NCEP/NCAR reanalysis data consists of 2 meter air temperature, 2 meter specific humidity, surface pressure, surface roughness, 10 meter U and V wind at 10 m, latent and sensible heat net flux, and temperatures and specific humidity at 28 sigma levels. Monin-Obukhov theory can be applied to this data to derive atmospheric profiles for use in EMPIRE. Therefore, by applying statistical analysis techniques using the NCEP/NCAR reanalysis data, climate data can be generated for multiple sigma levels along with supporting surface data yielding high quality climate data with excellent resolution. Further, the integration of NCEP/NCAR reanalysis derived climate data was a straightforward extension of EMPIREs Monin-Obukhov based MetOc functionality. Thus by using the NCEP/NCAR reanalysis data, a reliable physically based climate data set was derived to support RF propagation loss predictions.

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1. (a) Stephen Fast
315 S. Allen St
Suite 222
State College, PA
16801 US
sfast@remcom.com
(b) 8148611299 ext 260
(c)

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