Linear horizontal gradients from ECMWF for GPS and VLBI analysis

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Since mapping functions are independent of the azimuths of the observations, asymmetries of the delays at constant elevations and varying azimuths have to be taken into account with appropriate models. E.g., these asymmetries are due to passing weather fronts or the higher extension of the troposphere above the equator. Davis et al. (1993) developed a gradient model for the radio refractivity of air which is based on the assumption of linear horizontal gradients of refractivity above the sites. Thus, taking the refractivity gradients for the vertical profiles above the VLBI or GPS station from a numerical weather model, the corresponding north and east gradients can be determined without using information about the atmosphere at the line-of-sight. Additionally, linear horizontal gradients - both hydrostatic and wet - can easily be derived from pressure level data of the ECMWF (European Centre for Medium-Range Weather Forecasts) for each IVS or IGS site and can then be used in GPS and VLBI analyses as a priori values. We compare these gradients with gradients estimated from VLBI analysis and show their influence on geodetic parameters. It is discussed whether such an extended model can improve VLBI and GPS analysis.