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The contribution of occultation data added to ground-based GPS observations in 3D

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During the last decade Ionospheric Radio Occultation (IRO) experiments have successfully been realised onboard different Low Earth Orbiter (LEO) satellites. The occultation slant Total Electron Content (TEC) observations are of important and growing scientific interest for ionospheric imaging. Especially, enhanced global data coverage is provided through the assimilation of TEC occultation data into multi- dimensional ionospheric models. Improved input of information on the vertical electron density gradient is also expected. In this paper we present an experimental evaluation of the contribution of occultation data added to ground-based GPS observations in 3-dimensional (3D) ionospheric imaging. Therefore, occultation data from the CHAMP LEO satellite mission have been applied. For these studies, we will present ionospheric imaging results of a Multiplicative Algebraic Reconstruction Technique (MART) iterative method. Here, the ground- and space-based GPS observations are assimilated into a combination of the International Reference Ionosphere and the Global Core Plasma Model (IRI/GCPM) above the North Polar Region and Europe. These results are compared with in-situ electron density records onboard the CHAMP satellite, as well as with European ionosonde measurements of NmF2 and hmF2. The potential of improving the electron density values, NmF2 and hmF2 is discussed for the CHAMP data. Hereby, it was found that the contribution by CHAMP data for absolute electron density values as well as for NmF2 is more important than for hmF2. It is suggested that the effectiveness of occultation data is dependent on the amount of near- occultation ground-based observations. Furthermore, we like to address concerns of grid point data coverage and MART convergence behaviour when including the CHAMP occultation data in the assimilation process.