FUNDAMENTALS OF THE OPEN LOOP TRACKING OF RADIO OCCULTATION SIGNALS IN THE LOWER TROPOSPHERE

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Radio occultation signals undergo strong fluctuation after propagation through the moist troposphere with severe refractivity gradients. Tracking signals with the complicated dynamics in the closed loop mode, when the phase model is generated in real time by use of the feedback from the received signal, may result in errors. An alternative, open loop tracking, uses the phase model calculated in advance by use of the predicted orbits and refractivity climatology, and does not allow a feedback from the received signal. The received signal is downconverted with the phase model, low-pass filtered, sampled I and Q, and transmitted for the post-processing. The post- processing includes the additional downconversion (if necessary) and the extraction of the phase. The presentation will discuss the accuracy of the phase model for the open loop tracking and the effect of mismodeling, the requirements for the sampling frequency, and the effect of noise. The discussed effects will be demonstrated by closed loop simulations including: modeling radio occultation signals by use of high resolution radiosondes, tracking such signals, and their inverting by use of radio holographic method.