Radio Occultation criterion as applied to location of inclined layers

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An analytic technique based on the relationships detected among the derivatives of the phase, eikonal and Doppler frequency over time and the intensity of GPS transmitted radio waves through the Earth' atmosphere is introduced. This technique is applied to the identification and location of the plasma layers in the lower ionosphere by use of GPS radio occultation (RO) data. A criterion for the location determination of atmospheric and ionospheric layers is formulated. The displacement of an ionospheric or atmospheric layer from the RO ray perigee can be assessed both, qualitatively and quantitatively using this criterion. RO data from the CHAllenge Minisatellite Payload (CHAMP) is used to validate the criterion introduced when significant variations of the amplitude and phase of RO signals are observed at RO ray perigee altitudes below 80 km. The new criterion opens a new avenue in terms of measuring the altitude and slope of the atmospheric and ionospheric layers. This is important for the location determination of the wind shear and the direction of internal wave propagation in the lower ionosphere, and possibly in the atmosphere. The new criterion provides an improved estimation of the altitude and location of the ionospheric plasma layers compared with the back-propagation radio-holographic method previously used.