

PROPAGATION LIMITATIONS ON THE ACTIVE MICROWAVE OCCULTATION REMOTE SENSING

D. Feng*(1), A. Marathay (2), B. Herman (1), and M. Beran (3)

(1) Institute of Atmospheric Physics, University of Arizona, Tucson, AZ, U.S.A.

(2) Optical Sciences Center, University of Arizona, Tucson, AZ, U.S.A.

(3) Catholic University, Washington D.C., U.S.A.

Because of the success of GPS/MET, since the mid-90s active satellite atmospheric radio occultation remote sensing has gained ever-growing interest in the atmospheric remote sensing communities. New projects, such as COSMIC, ATOMS, and ACE+, have been in planning and preparations for years. ATOMS and ACE+ will utilize amplitudes (intensities) and phases of the atmosphere-occulted wave fields in the 10 GHz - 200 GHz range to directly sense water vapor and ozone distributions in the atmosphere, as opposed to the phase only measurements utilized by GPS/MET and COSMIC. Although not explicitly stated, these projects use coherent transmitters as the active radio sources and the under-lying theory is built upon the assumption of coherent wave fields. The atmosphere is, however, not a quiescent medium, but a turbulent one. Atmospheric turbulence causes random fluctuations in phases and amplitudes of the waves propagating through it. Consequently, depending upon the operating frequencies, the originally coherent waves, after propagating through the atmosphere, could become partially incoherent. The departure from the total coherent state is more pronounced for higher frequency waves. Those effects are looked at and their relevance to high frequency active radio occultation experiments will be examined.

Theoretical analysis and relevant existing lab and field experiments will be presented to illustrate the possible problems imposed on high frequency (10 GHz 200 GHz) active occultation remote sensing.