

AN OVERVIEW OF THE UNIVERSITY OF ARIZONA ATOMS PROJECT

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Results from the now well known GPS/MET experiment have demonstrated the capabilities of radio occultation techniques for remotely sensing certain atmospheric properties. The GPS/MET experiment was designed to provide vertical atmospheric profiles of temperature, density, pressure, and geopotential height. Indeed, for altitudes from a few km above the surface to about 40km extremely accurate profiles were obtained with very good vertical resolution. At altitudes below 5 to 7 km an ambiguity exists however when using just the GPS frequencies due to the presence of water vapor. Water vapor as well as dry air affects the refractivity of the atmosphere, and the two variables cannot be separated without additional assumptions, or additional information. In polar regions where water vapor amounts are generally quite low, accurate temperatures can usually be retrieved by assuming the water vapor to be zero. In tropical regions, where low tropospheric temperature profiles are quite constant from day to day, water vapor profiles may be recovered from the refractivity profiles by assuming the temperature profile is known. It is in mid-latitudes where this ambiguity is most important. Techniques have been developed to overcome some of this difficulty, but uncertainties still exist, especially in data sparse regions. The ATOMS project was conceived in order to provide a totally independent measurement to use for water vapor retrievals. A preliminary study indicated that the use of phase measurements as in the GPS/MET experiment, but near a water vapor absorption line where the refractivity undergoes rapid variation, would not provide the necessary sensitivity due to the small mixing ratio of water vapor. However, amplitude measurements at various frequencies within and near the band would provide a method to retrieve vertical profiles. This paper will report on the progress we have made to date. Studies of various frequency combinations in the 22 Ghz and 183 Ghz absorption bands will be presented which give a large range of height through which useable profiles may be recovered. A similar study will be presented for ozone retrievals using the 195 Ghz ozone absorption line. Sensitivity studies as well as error analyses will also be presented.