

Application of GNSS Atmospheric Sounding for Climate Studies in the Australian Region

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SUMMARY

This paper presents results of analysis of atmospheric characteristics (temperature and moisture) in the Australian region using Global Navigation Satellite System (GNSS) ground-based meteorology and space-based radio occultation (RO) techniques verified with in-situ radiosonde measurement. Ground-based GNSS and Global Positioning System (GPS) meteorology has long offered the prospect of complementing meteorological observations by providing integrated vertical column of Precipitable Water Vapour (PWV) profiles. One of the most valuable attributes of ground-based GPS-PWV is the ability to provide high temporal and accurate PWV estimates under all weather conditions, including cloud cover and precipitation. Here we present results of deriving PWV using Australian ground-based GPS reference stations network and investigate potential of ground-based GPS/GNSS technique for studying PWV trends for climate research. Space-based instruments provide even wider (potentially global) coverage than regional ground-based networks. One emerging satellite remote sensing technique for obtaining atmospheric temperature and moisture records is GPS RO which provides all-weather capability, long-term measurement stability, high vertical resolution and high-accuracy measurements in the middle to upper troposphere, stratosphere and ionosphere. High accuracy of the GPS RO methodology is of particular importance for reliable estimates of the atmospheric characteristics over regions where conventional meteorological upper air observations from radiosondes are sparse or not available. Here we present analysis of vertical distribution of atmospheric temperature over data space areas in the Australian region derived from GPS RO observations.