ATMOSPHERIC CLIMATE CHANGE DETECTION WITH RADIO OCCULTATION DATA

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The detection of climate change signals in rather short satellite datasets is a challenging task in climate research and requires high quality data with good error characterization. Global Navigation Satellite System (GNSS) radio occultation (RO) provides a record of high quality measurements of atmospheric parameters of the upper troposphere-lower stratosphere (UTLS) region. Due to characteristics such as self-calibration, long-term stability, and a good height resolution, RO retrieved parameters are highly qualified to investigate atmospheric climate change. We present a study aiming at the detection of a forced climate change signal by means of a monthly mean zonal RO data record using optimal fingerprinting. UTLS trends of RO refractivity, geopotential height, and temperature are investigated for different horizontal resolutions. Furthermore, characteristics of the data as well as the quasi-biennial oscillation and the El Nino-Southern Oscillation based variability within the record period are discussed. Resulting RO trend patterns agree with those of radiosonde data. First results show that a climate change signal consistent with the projections of three representative global climate models of the IPCC 4th Assessment Report (CCSM3, ECHAM5, HadCM3) can be detected for temperature at a 90 % confidence level. Lower confidence levels are achieved for the refractivity record. Changes for geopotential height are detectable at the 5 % significance level. However, the results in that case are robust only if only the large-scale aspects of the pattern are resolved.