
Satellite observations for detection and attribution of atmospheric temperature change

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Abstract

The atmosphere is a fundamental component of the climate system. The troposphere and stratosphere play an essential role in many climate aspects such as the global radiative balance, the transfer of energy, and the exchange of water vapor, ozone and other constituents. Atmospheric observations are crucial for understanding climate change and large efforts have been made by the SPARC ATC activity on establishing climate data records that span more than 40 years from e.g., microwave soundings. With almost 20 years of measurements available, the GNSS radio occultation (RO) record has become part of recent assessments on atmospheric temperature changes. RO observations have also been instrumental in quantifying the different sources of atmospheric variability with high vertical resolution from sub-seasonal to inter-annual timescales. We discuss the use of RO observations for the characterization of atmospheric variability, which is essential for detection and attribution studies at multi-annual to decadal time scales. We present results on the detection of short-term temperature signals from recent volcanic eruptions and wildfires and on the assessment of decadal atmospheric temperature trends discussing uncertainties and limitations. Results underpin the need for long-term atmospheric observations for climate monitoring and freely available data for climate research.

Keywords: atmosphere, temperature trends, satellite observations, radio occultation, atmospheric variability, detection and attribution

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