IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observations to address Earth's Environment and Climate Challenges (7)

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UPPER TROPOSPHERE AND LOWER STRATOSPHERE CHARACTERIZATION FOR EXTREME SURFACE CLIMATE

Abstract

Historically, observations from the upper-troposphere/lower-stratosphere (UTLS) have been limited due to a lack of suitable measurements. Strong vertical gradients or insufficient spatiotemporal coverage introduced at this altitude have substantially difficulted UTLS's characterization.

The Intergovernmental Panel on Climate Change (IPCC) 6th assessment highlights an improved confidence in the UTLS vertical structure regarding humidity and temperature changes thanks to global navigation satellite systems. However, there is still large uncertainty in the fine details of its vertical structure and composition due to restrictions in the satellite data resolution. These details are key for the occurrence and downward propagation of stratospheric extreme events and its uncertainty limits the predictability of their regional tropospheric impact. In 2018, after one of these stratospheric extreme events, a cold air outbreak took place in Europe that caused more than 95 deaths in less than one week. It also cost more than EUR 1 billion per day only in the U.K.

Under these circumstances, a public/private initiative arises, as a result of the European Space Agency's "Space for Sustainability Award" winning project idea in 2022, to address major UTLS climate challenges. The present initiative aims at deploying a combined space and stratospheric service to enhance subseasonal to seasonal forecast models predictability with an unprecedented set of in-situ and spatiotemporal data. Technological advances and capabilities of a High-Altitude Pseudo-Satellite (HAPS)/lighter-than-air (LTA) airship, with a current TRL7/8, are suggested as added value solutions to Earth Observation (EO) space satellite needs. Results from this approach should support effective policy making for quicker reactions against the aforementioned events.