

Accuracy of lower stratospheric winds in ECMWF analyses and forecasts, assessed from superpressure balloon trajectories

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The accuracy of winds in analyses and reanalyses is assessed using superpressure balloon observations from past campaigns in the Southern polar cap and in the tropics. Our superpressure balloons drift on isopycnic surfaces as quasi-Lagrangian tracers, at altitudes between 17 and 20 km, and typically operate for two to three months. The pre-Concordiasi campaign in 2010, in the tropical belt, has revealed periods with significant and long-lasting errors in the TTL (Tropical Tropopause Layer) wind analyses (with more than 8 m/s errors during several tens of days, *Podglajen et al 2014*). This is in part due to the scarcity of wind observations in the tropics, and constitutes a persistent concern for operational weather centers. This is also a concern for all studies involving analysis-based Lagrangian trajectories in the TTL, whether for transport of constituents, for processes like cirrus formation and moisture reduction. In preparation of the Strateole2 superpressure balloon campaigns, the accuracy of TTL winds is revisited, with an emphasis on the possibility to forecast trajectories. The Strateole2 campaigns begin with a technological campaign in 2018-2019 (6 balloons), followed by 2 campaigns involving 20 balloons each (2020-2021 and 2023-2024). Novel instruments are being developed to investigate waves, cirrus, transport of water vapor and aerosols and turbulence in the upper troposphere and lower stratosphere of the tropics; all of these will be essential topics for the coming campaigns. An interesting path to explore will be the possibility of obtaining complementary, enhanced observations from tropical stations when a balloon will fly nearby. A first step is to estimate how accurate forecast balloon trajectories will be. Forecast trajectories from the pre-Concordiasi campaign were in many cases poor (as were the analysed winds), especially over the Indian Ocean and Eastern Pacific. For the Strateole2 campaigns, the situation will have changed due to improvement of the ECMWF data assimilation system and forecast model over the last decade, and because the winds measured by the wind observations from the balloons will be assimilated. Different experiments from the pre-Concordiasi period has been redone with an up-to-date version of the ECMWF Integrated Forecasting System. The results will be presented.

This presentation will also serve to present the Strateole2 campaigns and will invite cooperation in setting up coordinated measurement campaigns that may complement the superpressure balloon observations.

Key words: superpressure balloons, analyses, forecasts, TTL, Strateole2

References

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