On the use of stratospheric information in extended range forecasts of the near surface weather

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It has previously been shown that statistical significant correlations can be found between the stratospheric circulation and surface weather parameters when the stratosphere leads with 5-40 days. Although these correlations compare well to similar forecasts by a state-of-the-art dynamical ensemble prediction system they remain relatively small.

In this paper we investigate methods to improve these forecasts. To this end other tropospheric and stratospheric predictors, such as the phase of the QBO and the ENSO or the wave forcing at the tropopause, will be included. We also investigate if non-linear schemes based on neural nets and local methods improve the forecasts. Finally, we investigate the potentials of using stratospheric information in probability forecasts.

We have found that non-linear forecast schemes based on neural nets and local methods only improve the forecasts marginally.

Regarding the probability forecasts we have found that weak or strong lower stratospheric circulation is followed by anomalous probability distributions of the surface wind 5-20 days after. For the outer quintiles of the stratospheric circulation the sign of the anomalous surface wind can be predicted with 80 % confidence. The probability forecast based on stratospheric information has more skill (Ranked Probability Skill Score) than the probability forecast based on the surface wind itself and its skill score exceeds climatology with 10-20 % for lead times up to 10 days and with more than 5 % for lead times up to 30 days.