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Monitoring of the predictability loss in the medium-range H500 forecasts, and conclusion about the lack of prospects for the further complication of the present-day weather forecasting models

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One of the most important goals of the verification of the weather forecasts is to know what kind of defects is inherent to the weather forecasting model being verified, and then to decide is it possible to exclude the defects, and so to improve the model. Here I present some results of my monitoring of the dynamics of the predictability loss in the medium-range H500 forecasts of ECMWF. It turned out the planetary waves in the H500 fields of the Northern Hemisphere lose their predictability by an unexpected manner. The first waves that lose the predictability are the synoptic scale waves with the zonal wave numbers M=6 - 10. Then the long waves with the zonal wave numbers M=4, 5 also lose their predictability. At last, the ultra-long waves with the zonal numbers M=1 – 3 lose their predictability still later. But, the very short waves with the zonal wave numbers M$\sim$20 and more preserve their certain predictability over the entire time range of the medium forecasts (up to 6 days) without any loss of predictability!

The explanation of this unexpected phenomenon consists in the following. The present-day world-wise net of meteorological observations remains to be based on radiosondes as before. Contributions of the satellite data and other special observing systems are very limited. As a result, the only planetary waves in meteorological fields are observable in reality that corresponds the largest zonal wave number M<20. But the spectral resolution of the present-day weather forecasting models is enormous (up to M=1000 and more). On the other hand, the present-day systems of the meteorological observation assimilation use forecasts of such very high-resolution models as the first guess. In result, the output product of the assimilation systems turns out to be combined from two heterogeneous parts. One part corresponds to the ultra-long, long, and synoptic waves. These waves change in the course of the data assimilation, and so its presentation in the initial data fields for new forecasts contains some real information extracted from the real meteorological observations. But, the second part contains an artificial information obtained from the first guess only because the short waves with M>20 are unobservable completely, and so they can not be corrected according to real data. Both parts form the initial data fields used to forecast weather for a next time interval. In the course of these forecasts the short waves vary in conformity with the forecasting model used for both procedures: data assimilation and forecasts. Therefore, it is not a surprise that the verification of such forecasts reveals a unlimited predictability of the very short waves. But, the really observable waves lose their similarity with reality because of their coupling with the artificial short waves. There is a hard contradiction between limited possibilities of the present-day world-wide net of meteorological observations, and the unlimited complication of the present-day weather forecasting models. The models are more complicate, the coupling feedback of the unobservable waves limits the predictability more! The only way to solve this dilemma can consists in an appropriate parametrisation of the unobservable wave dynamics instead of an explicit presentation of this dynamics in the very complicated weather forecasting models. Thus, the recently voiced concept of the so-called seamless prediction seems to be false, instead a new generation of the so-called filtered models must be developed to overcome the weekly limit of predictability!