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Prospects for the numerical monthly and seasonal weather forecasting

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The modern turbulence theory indicates that the real-world apparently chaotic flows (turbulence) usually consist of a mix of truly chaotic and ordered (mutually self-adjusted) motions. Moreover, the scale of the flow motion considered is larger the order usually becomes to be stronger. For example, a kind of order can be already seen within the direct enstrophy cascade of the atmospheric macroturbulence (the periods less than one week). This order consists f the well-known properties of quasi-hydrostaticity and quasi-geostrophicity. The motions within the inverse energy cascade (the periods from a week up to one-two months) are ordered even more. In addition to quasi-hydrostaticity and –geostrophicity these motions are prominent by synchroneity of the planetary wave propagation in the extratropical westerlies. Basing on this property, a specifically filtered model called quasi-synchronous has been developed in the dynamical-stochastical laboratory of the Hydrometeorological Research Centre of the USSR at the beginning of 1990s. Despite this model is a toy-model in fact (it is based on a spectral form of the barotropic vorticity equation with a very low spectral resolution -105 spherical harmonics) it is used for monthly weather forecasting with a certain success now.

As concern prospects for the seasonal weather forecasting, it seems to be important to stress that the lower-frequency end of the inverse energetic cascade (the one-two month periods coincided well with the periods of some subtle spectral peaks in the spectra of the Earth's angular momentum and the Madden-Julian Oscillation as well) is an obstacle for the higher-frequency atmospheric fluctuations to propagate to the seasonal and longer time scales. One encouraging conclusion may be derived from

the existence of this obstacle. This obstacle must also prevent to the incessant upscale propagation of forecasting errors contrary the famous Lorenz's chaoticity paradigm. Indeed, the existence of any invariant probability measure in the forecasting model phase-space is questionable for the seasonal and longer time scales by this reason, and so no probabilistic formulation seems to be possible for the seasonal forecasting problem. Instead, a possible way to solve the seasonal weather forecasting problem can consist of either the creation of a filtered atmospheric model like the above quasi-synchronous toy-model or an artificial synchronization of the planetary wave motions like the artificial damping of gravity waves in the primitive equation model.