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Increasing the probability of long-range (1 month) SPI index forecasts based on SL-AV model for the Russian territory.

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Precipitation predictions for long-range period could be done with a numerical weather prediction model. Often, results after running the model are not so high. So, it is typically feasible to use post-processing methods producing the long – range precipitation forecast. For this purpose the SPI index was used. First of all it is necessary to test SPI index using statistical techniques. Different parameters of SPI frequency distribution and long-term tendencies were calculated as well as spatial characteristics indicating drought and wetness propagation. Results of analysis demonstrate that during previous years there is a tendency of increasing intensity of drought and wetness extremes over Russia. There are fewer droughts in the northern regions. The drought propagation for the European territory of Russia is decreasing in June and August, and increasing in July. The situation is opposite for the wetness tendencies. For the Asian territory of Russia, the drought propagation is significantly increasing in July along with a decreasing wetness trend. Then synoptic analysis has been conducted to describe wet and drought events. Synoptic conditions favorable for the formation of wet and drought extremes were identified by comparing synoptic charts with the spatial patterns of SPI. For synoptic analysis, episodes of extremely wet (6 episodes for the APR and 7 episodes for the EPR) and drought (6 episodes for the APR and 6 for the EPR) events were classified using A. Katz' typology of weather regimes. For European part of Russia, extreme DROUGHT events are linked to the weather type named "MIXED", for Asian part of Russia – the type "CENTRAL". For European part of Russia, extreme WET events associated with "CENTRAL" type. There is a displacement of the planetary frontal zone into southward direction approximately for 5-25 degrees relative to normal climatological position during WET extreme events linked to the «EASTERN» classification type. The SPI field (data was taken from CPC_CAMS archive) was integrated with MSLP atmospheric pressure field (from ERA Interim achieve) to create special type of SPI combined maps. As a basic seasonal forecasting model we took the SL-AV (Semi-implicit semi-Lagrangian vorticity-divergence dynamical core) model (Tolstykh, 2010) which runs in Hydrometcentre of Russia and has ALADIN/LACE parameterization. Skill scores of SPI calculation based on SL-AV hindcasts showed that it is necessary to use statistical methodology which can increase one month SPI index predictability. Calculations showed that for a new scheme the best predictors are pressure fields on the H500 and MSLP levels. This data was taken from SL-AV model hindcasts for all North Eurasian territory. The main idea of cross-correlation analysis between SPI data and pressure was to show interconnections between precipitation and pressure in different areas and detect the informative prognostic predictors (areas) for each SPI. Then using all information which was extracted before the regression analysis was done. This analysis helped to reconstruct forecasting SPI for the territory of Russia in two ways – deterministic and probabilistic. The resulting forecasts skill scores for both types of predictions are acceptable and scheme can be used in operational precipitation forecasts with one month in advance.