

Significant progress of seasonal prediction on summer monsoon rainfall of Central East China through 43 recent years (1968- 2010)

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Significant Progress of Seasonal Prediction on Summer Monsoon Rainfall of Central East China Through 43 Recent Years (1968- 2010) Xu Qun (Jiangsu Meteorological Institute, Nanjing 210008, China) Using the teleconnections between the characteristic indices of a group pentad 500hPa circulation in January- mid March and the summer rainfall of the mid-lower Yangtze Basin (MLYB) with the consideration of preceding temperature anomaly of above region, preceding monthly SOI and monthly Sunspots, the author had gained moderate success in seasonal predicting (SP) the summer monsoon rainy trend of MLYB during 1968- 1987 (Xu, Long-range Forecasting Research Report Series, No.6, Vol.2, 807- 824,WMO/TD. No.87; Xu, Scientia Atmospherica Sinica, 14(1), 93-101, 1990); skill scores (SS) of above 20 years reaching 0.32, if the additional SP (ASP) issued before 10th June can be considered, so the SS can be reached to 0.40, then in following 8 years (1988-1995), possibly due to the increasing global climate anomalies, the SP of 3 years (1990, 1992, 1994) had met failure, however the great flooding of the MLYB and in the Huaihe River Basin occurred in summer 1991 had been fully successfully predicted in early April (Xu, Advances in Atmospheric Sciences, 12 (2), 215- 224, 1995). In late 1995, the author established a new method of SP on the main distribution of summer flooding/drought trend of Central East China (CEC, east of 110 E, 27- 41 N) through statistically searching the high correlation predictors from 4 preceding monthly (Jan.- Mar.) data fields, they are the preceding monthly 500hPa height fields (576 grid points) of the Northern Hemisphere, the preceding monthly SST fields (286 grid points) of the North Pacific (10 S- 50 N), the preceding monthly temperature and monthly precipitation fields (160 stations) of China. For reducing the rainfall chaos of single station, the regional averaged rainfall from 5-10 stations were taken as the main predictands. All predictors are selected from above monthly data fields based on some criteria; the selected predictors were then combined to form multivariate linear regression equations (MRE). This is the main tool of SP, data periods used for establishing MRE have been examined and it was found that the 20-year length is the best for minimizing the effect of inter-decadal variability and climate change on the MRE. Generally 3-5 predictors are equipped in these MREs with very high complex correlations ($R > 0.80$) between predictors and observations in these base periods (20 years), the high F value also should be achieved for each MRE. Cross-validation of this method was performed during 1970-1996 (while a real time SP had been made in mid April 1996 with full success); practical experiment indicates that predictors and MREs should be reformed per year. Significant progress has obtained by using this method (Xu & Yang, Experimental Long-Lead Forecast Bulletin, 6 (2), 74- 79, 1997) in SP on the summer flooding/drought trends of CEC for 15 recent years (1996- 2010). The skill scores (SS) of SPs with the consideration of ASP in 15 recent years reached 0.43,if considering the first SP only,then the SS of above 15 summers dopped down to 0.34. Although the SS nearly the same magnitude as verified in 1968-1987,however the sample of predictands of each recent summer is nearly 5 times larger than the former stage, for the area covered by predictands has expanded from the MLYB to the whole CEC, the SS of only 2 years (2000,2004) dropped down to negative or near zero; a significant portion of summer climate anomalies had been correctly predicted at 1-3 month