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An analysis of OCN and EOCN methods of climate forecast of CPC

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The optimal climate normal (OCN) method and its variant, the EOF adjusted OCN (EOCN) method, are among the major tools for seasonal forecast in CPC. The OCN or the EOCN method takes the average of observations over some number of the most recent years as the forecast for the coming season. Thus the optimal averaging time, which gives the highest forecast skill over the training period, is the most important parameter of the methods. In the current operational OCN, the optimal averaging time (OAT) of 10-years was determined with the data before 1994 and has been kept in use thereafter. Similarly in the EOCN, the EOF dependent OAT was determined with the data before 2003 and also not changed. Some evidences showed that the climate record may not be stationary in terms of its statistics to some extent. We therefore conjecture that the OAT may vary with time as well. This study is intended to see if this is the case and how the variable parameter could affect the forecast skill. In our analysis, the training period for the OAT parameter is taken to be the 30 years immediately before the target year. As a result, the OAT is updated on a yearly basis, and we expect that a 30-year moving window will catch some secular changes in the statistics of climate data. With the temperature data over 102 US climate divisions available from 1931, the OCN and EOCN methods are able to generate hindcast from 1991. The variation of the OAT parameters is examined and their impact to forecast skill is assessed. In order to advance the understanding of the OCN and EOCN methods and their performance, we are also interested in pursuing some more issues. These include the sources of skill, factors determining their performance, the extent to which they can catch climate signals, and whether sloped linear extension could give better forecasts. We attempt to resolve these issues by making experimental forecast in various circumstances. The experiments use both observational data and synthesized data containing different signals and with different noise levels. We believe the clarification of these issues will be helpful to apply OCN and EOCN more appropriately.