Geophysical Research Abstracts
Vol. 21, EGU2019-11795-3, 2019
EGU General Assembly 2019

The optimal ensemble size for subseasonal-to-seasonal (S2S) prediction

Sang-Wook Kim and Seok-Woo Son
School of Earth and Environmental Sciences, Seoul National University, Korea, Republic Of (spica557@snu.ac.kr)

The optimal ensemble size for effective subseasonal-to-seasonal (S2S) prediction is explored with the mean squared skill score (MSSS) metric. By construction, MSSS increases with increasing ensemble size. However, the skill improvement ratio, that is defined by the MSSS of varying ensemble size against the MSSS of infinite ensemble size, is independent of the individual ensemble member's prediction skill. Specifically, in an idealized prediction system with an unbiased reliable ensemble spread to observed variance, 10 or 20 ensemble members lead to 90% or 95% of the prediction skill of the theoretical maximum.
This theoretical estimation is applied to ECMWF (European Centre for Medium-Range Weather Forecast) real-time S2S prediction system that consists of 51 ensemble members. The tropospheric prediction skill is in good agreement with the theoretical estimation, indicating that about 20 ensemble members are needed to gain the 95% prediction skill of the maximum prediction skill. However, the stratospheric prediction skill is substantially lower than the theoretical estimation. This is particularly true in the tropical stratosphere where the model prediction skill is 20-30% lower than the theoretical limit. This result indicates that both model bias and ensemble spread need to be substantially improved in the tropical stratosphere. It is also found that changing model resolution at a certain lead time (either at 10 or 15 days) does not affect the prediction skill in the troposphere, but cause artificial skill jump in the tropical and northern extratropical stratosphere.