Seasonal winter forecasts of the Northern stratosphere and troposphere: Results from JMA seasonal hindcast experiments

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Using seasonal hindcast (HC) experiments from 1979 to 2014 of the Japan Meteorological Agency, this study investigates seasonal forecasts in the stratosphere and troposphere for Northern winter. We focus on verifying the HC data initialized in late fall for the DJF mean NAM index using the ranked probability score as a verification measure.
Our verification shows that the HC data have a significant skill for the DJF mean NAM index only in the stratosphere. A further interesting feature is that the forecast skill depends on the phase of the QBO, with a higher skill during the QBO easterly phase in the equatorial lower stratosphere. Specifically, the HC data tend to well forecast the negative phase (weaker than normal polar vortex) of the NAM during the easterly phase, whereas they miss the positive phase of the NAM during some winters of the westerly phase.
The ranked probability score for the DJF mean NAM index tends to correlate, albeit weakly, between the stratosphere and troposphere from year to year. In some winters, the HC data are largely unsuccessful for both stratospheric and tropospheric NAM, whereas in other winters they have large errors only in the troposphere. The former case suggests a possibility that tropospheric NAM forecasts may be improved if poor stratospheric forecasts are improved in some winters.

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