Seasonal Outlook for winter 2009/2010 over Japan

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ABSTRACT

1. Oceanic conditions

In August 2009, the SST deviation from a sliding 30-year mean SST averaged over the NINO.3 region was +0.8 degree. The Southern Oscillation index for August 2009 was -0.3. In August, SSTs were above normal in the whole equatorial Pacific. Subsurface temperature anomalies were remarkably positive from the western to the central equatorial Pacific. During August, westerly wind anomalies were found in the lower troposphere over the eastern equatorial Pacific. The subsurface warm waters were migrating from the western to the central equatorial Pacific during August. The conditions mentioned above lead to the consideration that the positive SST anomalies in the eastern equatorial Pacific will be strengthened in the months ahead. The JMA's El Niño prediction model predicts that the NINO.3 SST deviations will be above normal during the prediction period.

Considering all the above, El Niño conditions currently prevail and are likely to continue until the coming winter (December-January-February). Since El Niño and La Niña events are the most important climate events as grounds for the seasonal prediction and these events are likely to develop during winter, high predictability of the coming winter season prediction is expected.

In recent years, positive SST anomalies have persisted over most of the world. In particular, from June to August 2009, the global averaged monthly SST anomalies consecutively set a new record for the month. As the El Niño condition will continue, it is likely that the global averaged SST anomaly will continue to be above normal during the coming winter.

2. Numerical Prediction

The SST anomaly pattern fed to the atmospheric global model is very similar to that of El Niño events (i.e., below normal in the western Pacific and above normal in the central and eastern Pacific, and in the Indian Ocean).

In association with the SST anomaly pattern, the predicted ensemble averaged atmospheric circulation anomaly pattern by the model is also very similar to that of El Niño events in the tropics and the sub-tropics as stated below.

In the lower tropospheric (850-hPa) stream function field, equatorially symmetric anti-cyclonic and cyclonic circulation anomalies are clearly predicted from the Indian Ocean to Indonesia extending to the south of Japan and over the Pacific, respectively. Anti-cyclonic circulation anomalies extending to the south of Japan suggest that warm and humid air is likely to flow into the south of Japan and create favorable conditions for the formation of cyclones.

In the upper tropospheric (200-hPa) stream function field, equatorially symmetric cyclonic and anti-cyclonic circulation anomalies are clearly predicted over East Asia and the South Indian Ocean, and from the equatorial central to eastern Pacific, respectively. Corresponding to the cyclonic circulation anomalies over East Asia, the subtropical jet streams are predicted to shift southward over China and northward over Japan, suggesting weak winter monsoon activity around Japan.

These anomaly patterns associated with an El Niño event have high prediction skill according to the hindcast (22 years from 1984 to 2005).

In the mid- and high-latitudes, the neutral phase of the Arctic Oscillation (AO) is predicted. The positive

(negative) phase of AO tends to cause weak (strong) winter monsoon, and above-normal (below-normal) temperature in Northern Japan. However, the spread among each ensemble member is large and the hindcast suggests that the model does not have enough skill to predict the AO.

3. Long-term trend and decadal variation

Long-term upward trends are clearly seen in the winter mean temperatures over Japan except for Northern Japan. In Northern Japan, the winter mean temperature has large year-to-year fluctuations, while the recent ten-winters-mean temperature is near normal partly affected by weak negative phase of AO decadal oscillation. The winter precipitation tends to be above normal on the Pacific side of Northern, Eastern and Western Japan from the end of 1990s.

The tropospheric thickness temperature averaged over the mid-latitudes of the Northern Hemisphere (30 N - 50 N), which is positively correlated with temperature in Japan, tends to be above normal from 2006. It is predicted to continue to be above normal because of positive global SST anomaly.

4. Conclusion

From the numerical prediction, in response to the El Niño condition, above-normal temperature is expected in the winter in whole Japan. However, considering the prediction skill of the AO and long-term trend, it is likely that temperature in Northern Japan will be lower than the result of the numerical predication. As for the precipitation, favorable conditions for the formation of cyclones over the south of Japan is expected to bring above-normal precipitation on the Pacific side and southern part of Japan.

5. Summary of the Outlook

The JMA's cold season outlook calls for above-normal temperature with a 60% probability in Okinawa/Amami, 50% probability in Eastern and Western Japan. It also calls for both near-normal and above-normal precipitations with 40% probabilities on the Pacific side of Eastern and Western Japan and Okinawa/Amami. The outlook of cold season snowfall amount on the Sea of Japan side of Japan calls for below normal with 50% probability in Eastern and Western Japan, both near-normal and below-normal with 40% probabilities in Northern Japan.

The atmosphere-ocean coupled forecast system (CGCM) is now being prepared to be introduced to the JMA’s seasonal forecast in February 2010. In the meeting, the results of the CGCM will be also presented.