

## **Seasonal forecast system of Japan Meteorological Agency: Physical basis of seasonal forecasting in the Asian region**

Yuhei Takaya<sup>†</sup>; Tamaki Yasuda; Tomoaki Ose; Masayuki Hirai; Shuhei Maeda

<sup>†</sup> Japan Meteorological Agency, Japan

Leading author: [ytakaya@met.kishou.go.jp](mailto:ytakaya@met.kishou.go.jp)

Seasonal forecasting in the Asian monsoon region remains one of the most demanding tasks. Climate in Asia is influenced by ENSO and the Asian monsoon. Therefore it is vital to better predict these two major variabilities for seasonal forecasting in this area. To this end, an atmosphere-ocean coupled seasonal forecast system (Yasuda et al. 2007) was developed at the Japan Meteorological Agency (JMA) and the Meteorological Research Institute. The system has been in operational use for seasonal forecasting at the JMA since February 2010. In this presentation, the performance of the system and the physical basis of the seasonal forecast in the Asian region are examined with a full set of hindcasts. Verification results show remarkable improvement of the forecast skill compared with the previous version using an uncoupled atmospheric model (JMA-GSM0703C). Forecast skill of ENSO and SST in the tropics is improved from the previous JMA coupled model for ENSO prediction. Forecast scores of precipitation are significantly improved compared with the previous uncoupled model. The better prediction of precipitation in the tropics contributes to increase the capability of the seasonal prediction in tropical and extratropical Asia. In particular, the coupled model has significant advantage in predicting boreal summer in East Asia. Our analysis indicates that the improved skill in the Asian region stems from better representation of the East Asian summer monsoon variability, which is related to the "Indian Ocean Capacitor Effect" (IOCE; Yang et al. 2007; Xie et al. 2009) and ENSO. The IOCE modulates the typhoon activity in the western North Pacific (WNP; Du et al. 2011), thus relates to the feasibility of the typhoon seasonal forecast in the WNP (Takaya et al. 2010). A case study of forecasts for the summer of 2010 will be presented as an typical example of the IOCE. In summer 2010, suppressed convective activity in the WNP and associated anomalous conditions including the 2010 South China flood, and westward extension of the North Pacific High that caused remarkable high temperature in Western Japan were well predicted. These successful predictions would be corroborating evidence of the seasonal predictability in the Asian region. We will also discuss our plans of the next seasonal forecast system. The next system is planned to have a sea ice model and a higher model top and higher vertical resolution. These upgrades would further improve the troposphere-stratosphere coupling and the atmospheric variability of the Arctic oscillation as well as the extratropical variability.