

**Seasonal forecast system of Japan Meteorological Agency: Anomalous hot summer 2010 in Japan and its relationship to the tropical SST anomalies**Tamaki Yasuda<sup>†</sup>; Tosiya Nakaegawa; Yosuke Fujii; Yuhei Takaya; Masafumi Kamachi; Tomoaki Ose<sup>†</sup> Meteorological Research Institute, JapanLeading author: [tyasuda@mri-jma.go.jp](mailto:tyasuda@mri-jma.go.jp)

In the boreal summer 2010, Japan and the East Asian region experienced the anomalous hot summer. We examine the causes of this abnormal season using an ocean-atmosphere coupled general circulation model (CGCM). The CGCM used in this study is the seasonal forecast system developed at the Japan Meteorological Agency / Meteorological Research Institute (JMA/MRI-CGCM) and now used for the operational seasonal forecast at JMA. We carried out a seasonal forecast experiment that is a part of the Climate-system Historical Forecast Project (CHFP) in WCRP/WGSIP. The experiment is the 10-member ensemble hindcast initiated at 00Z and 12Z in the last five days of April. The experiment successfully reproduced the hot summer of 2010 in Japan. In order to understand the different impacts of the sea surface temperature (SST) anomalies in various regions on the prediction of summer 2010 in Japan, the CGCM experiments forced by the observed SST anomalies in the specific regions are also conducted. Observed data show the transition from the El Niño to La Niña in the tropical Pacific occurred from winter to summer of 2010. These events could directly and/or indirectly induce the positive air temperature anomalies in the mid-latitude troposphere. In spring, SST warming in the tropical Indian and Atlantic Oceans occurred. It has been well known that El Niño events are usually followed by the SST warming in the Indian Ocean. Recently, the role of the Indian Ocean on atmospheric fields in the western North Pacific in summer has been emphasized. The seasonal forecast experiments well represented the mechanisms of the SST warming in the Indian Ocean and the related atmospheric circulation following El Niño proposed by studies based on the observed data. The CGCM experiments forced by the observed SST anomalies in the tropical Indian/Pacific Ocean indicate that the hot summer 2010 in Japan is partly attributed to the SST anomalies in the Indian Ocean rather than the Pacific Ocean. Furthermore, the experiment suggests the remote impact of the anomalous SST in the Atlantic Ocean on the hot summer 2010 in Japan. It should be noted that SST anomalies in the tropical Atlantic Ocean were remarkably high in the spring 2010. The CGCM experiments forced by the observed SST anomalies in the tropical Atlantic Ocean can predict the high temperature and sea level pressure in Japan. The remote influence of the tropical Atlantic Ocean is to be addressed in detail.