



Attribution of an Extreme Summertime Drought in Northeastern China

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In the summer of 2015, most of northern China experienced severe droughts, partly due to the big El Niño event which looks a lot like that occurred in 1997-98. In particular, Liaoning Province suffered the most severe drought on record and the precipitation dropped to its minimum value since 1951. It brought massive damages to the growing crops and caused a direct economic loss of 2.3 billion RMB. Previous studies have indicated that the precipitation in Northeastern China (NC) is mainly dominated by the NC cold vortex in the early summer, and is also influenced by the variability of East Asia summer monsoon (EASM) accompanied with the northward jump of East Asia jet and the westward and northward advance of the West Pacific subtropical high in the late summer. Here, this study focuses on the attribution and predictability of this extreme summertime drought in Liaoning through in situ, reanalysis, CMIP5 long-term projection and National Multi-Model Ensemble (NMME) seasonal forecast datasets. From 2014 up to present, the eastern tropical Pacific continues a wide range of unusual warming and has developed a very strong El Niño event, which generally weakens the EASM and causes less precipitation in Liaoning. Diagnoses on whether there is a closer relationship between El Niño and the NC cold vortex, and whether the NMME ocean-atmosphere coupled models can capture the relationship as well as the drought at seasonal time scale, are being performed. In addition, the role of global warming on the risk of extreme drought over Liaoning will also be investigated via analyzing the differences among CMIP5 simulations with or without anthropogenic forcings. This study will provide a first look on the causes and seasonal predictability of the 2015 NC extreme summer time drought within the context of natural climate variability and anthropogenic forcings.