Geophysical Research Abstracts
Vol. 18, EGU2016-10041-3, 2016
EGU General Assembly 2016

Simulations of The Extreme Precipitation Event Enhanced by Sea Surface Temperature Anomaly over the Black Sea

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In this study, we examined the extreme precipitation case over the Eastern Black Sea region of Turkey by using regional climate model, RegCM4. The flood caused by excessive rain in August 26, 2010 killed 12 people and the landslides in Rize province have damaged many buildings. The station based two days total precipitation exceeds 200 mm. One of the usual suspects for this extreme event is positive anomaly of sea surface temperature (SST) over the Black Sea where the significant warming trend is clear in the last three decades. In August 2010, the monthly mean SST is higher than 3 °C with respect to the period of 1981-2010. We designed three sensitivity simulations with RegCM4 to define the effects of the Black Sea as a moisture source. The simulation domain with 10-km horizontal resolution covers all the countries bordering the Black Sea and simulation period is defined for entire August 2010. It is also noted that the spatial variability of the precipitation produced by the reference simulation (Sim-0) is consistent with the TRMM data. In terms of analysis of the sensitivity to SST, we forced the simulations by subtracting 1 °C (Sim-1), 2 °C (Sim-2) and 3 °C (Sim-3) from the ERA-Interim 6-hourly SST data (considering only the Black Sea). The sensitivity simulations indicate that daily total precipitation for all these simulations gradually decreased based on the reference simulation (Sim-0). 3-hourly maximum precipitation rates for Sim-0, Sim-1, Sim-2 and Sim-3 are 32, 25, 13 and 10.5 mm respectively over the hotspot region. Despite the fact that the simulations signal points out the same direction, degradation of the precipitation intensity does not indicate the same magnitude for all simulations. It is revealed that 2 °C (Sim-2) threshold is critical for SST sensitivity. We also calculated the humidity differences from the simulation and these differences become more apparent over the eastern Black Sea.