Impact of the recant warming of the surrounding ocean on the heavy rain event of July 2018 in Japan

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The western North Pacific and the Asian marginal seas exhibit a rapid warming trend compared to the global average during the past century, and this trend is projected to continue toward the end of this century. Some recent studies suggest that the warming marginal seas in mid-latitudes plays a vital role in torrential rainfall events during a warm season, but the impact of the maritime warming is still debatable and thus under active research. A torrential rainfall that occurred from 28 June to 8 July 2018 caused widespread and devastating floods, landslides, and mudflows and they led to severe damages over wide areas in Japan, especially in its western part. We examine the impact of the recent warming of the surrounding ocean, including the marginal seas, on the torrential rainfall event, through the numerical simulations with a high-resolution regional atmospheric model. A fractional change of 3-day accumulated rainfall over land from 5 to 8 July, during which the most intensive rainfall was observed, is approximately 10%/K, which is consistent with a previous modelling study. This change cannot be explained quantitatively by the well-known theoretical argument based on the Clausius-Clapeyron relationship, i.e., change in precipitable water solely due to the atmospheric warming. Rather, our experiment suggests that the change in sea surface temperature can account for the rainfall change via the modification of convectively unstable air from the tropics. The specific mechanisms for the rainfall changes will be discussed in this presentation.

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