Future Projections of Precipitation Characteristics around Japan in Early Summer Combining GPM DPR and CMIP5 Data: Analysis of multi-model variations

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Early-summer precipitation around Japan has different characteristics such as heavy rainfall in the later stage of Baiu. It is important to obtain information on how it will change in the future, but current climate models still have difficulties in simulating detailed precipitation characteristics. Recently, we developed a method to project future changes in precipitation characteristics by combining GPM satellite-borne Dual-frequency Precipitation Radar (DPR) and CMIP5 25 climate models (Yokoyama et al. 2019). In this method, we first classified rainfall events observed with the GPM DPR into “small”, “organized”, and “midlatitude” types according to their characteristics, and related each type of precipitation to the large-scale environment such as mid-tropospheric large-scale vertical velocity and sea surface temperature (SST). Using these precipitation-environment relationships, we then reconstructed precipitation distributions for each type with reference to large-scale environments in CMIP5 models for the present and future climates. In the presentation, we will introduce future projections of the reconstructed precipitation for each type and discuss their multi-model variations.

Consequently, future changes in precipitation are found to vary widely among the three types in association with the large-scale environments. More than 90% of models project an overall increase in small-type precipitation and northward enhancement of organized-type precipitation around Japan in the future. Multi-model variance of future projections of organized-type precipitation tends to be large corresponding to that of large-scale circulations such as the subtropical jet, while variance of small-type precipitation is affected by variations of both large-scale circulations and SST. It is revealed that the distributions of multi-model variations of future projections also differ among the three types in association with the large-scale environments.

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