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1-8 Examining Global Precipitation Change and Variability during 1901-2010 Using Observations and CMIP5 Outputs

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This study explores how global precipitation specifically its spatial patterns might have changed/varied during 1901-2010. In particular, our focus is on how these changes/variations could be understood according to various physical mechanisms, including the effects from the anthropogenic greenhouse-gas (GHG) forcing and aerosols, and certain (internal) physical oscillations, for instance, the Pacific Decadal Variability (PDV) and the Atlantic Multidecadal Oscillation (AMO). A long-record land precipitation analysis from the Global Precipitation Climatology Centre (GPCC) and the NOAA/CICS reconstructed (RECONS) precipitation are applied, in addition to the outputs from the Fifth Phase of the Coupled Model Intercomparison Project (CMIP5).

Precipitation increases in the northern hemisphere (NH) mid-high latitude lands observed in GPCC can be found in RECONS and model simulations. Over tropical/subtropical lands precipitation reductions generally appear in all products, but with large discrepancies on regional scales. Over global ocean, consistent spatial structures of precipitation change exist between RECONS and model results specifically in the Pacific and Indian Ocean. Further comparisons suggest that long-term precipitation changes/trends during the time period might be affected by both anthropogenic GHG and aerosols.

Both PDV and AMO have influence on global precipitation. In the NH mid-higher latitudes, in addition to the effects from GHG and aerosols, PDV and AMO have played a role as well on interdecadal/multidecadal time scales. In several tropical/subtropical regions, their impacts may even become dominant for certain time spans. This poses a challenge for quantifying precipitation changes/variations on both the global and regional scales, especially when the time period considered and/or the observational data record available is relatively short.