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The effects of AR landfalls on precipitation and temperature in Korea

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Atmospheric rivers (ARs) are elongated filaments of intense water vapor transport that occur mostly in the warm sector of an extratropical cyclone. ARs play crucial roles in the global as well as regional atmospheric water budget. Globally, ARs occur in less than 10% of the Earth's circumference but are responsible for nearly 90% of the total poleward water vapor transport in the middle latitudes. The intense water vapor fluxes of ARs are frequently related to the occurrence of hydrologic extremes in the region of AR landfalls. Because of their large impacts on the occurrence of extreme hydrologic events as well as on the atmospheric water budget, ARs have become a topic of intense research in recent years. Most of previous studies focus on the coastal regions of the eastern Pacific and the eastern Atlantic in winters because AR landfalls often cause massive flood damages in heavily developed regions in the west coast regions of North America and Europe.
Recent progresses in identifying ARs using gridded data allow us to objectively analyze the relationship between water vapor fluxes and regional hydrologic characteristics, especially extreme events around the world. This study analyzes the climatology of AR and its impacts on precipitation and temperature in Korea using an IVT-based AR identification method. It is found that the East Asian coastal regions including Korea are among the most intense AR hot spots in the world. The AR frequency and the AR-related precipitation amounts in Korea undergo large seasonal cycles with the maximum (minimum) in summer (winter). The interannual variability of the AR frequency over Korea, measured in terms of the coefficient of variation, is slightly less than 1, about the same as in the west coast of the North America. The effects of ARs on temperature over Korea also vary according to seasons. AR landfalls are generally associated with anomalously warm days over Korea. The warm anomalies are larger for winter than for summer and increase towards the north.