The Effect of Upper-tropospheric Jet for Atmospheric Rivers and Precipitation in Pacific Region

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In the Pacific region, moisture transports from tropics to mid-latitudes are often associated with Atmospheric Rivers (ARs), in some cases causing heavy rain events (e.g. the heavy rainfall event of July 2018 in Japan). Some of these ARs accompany upper-tropospheric troughs, and extend eastward along the jet stream. The goal of this study is to clarify how AR transport events and precipitation from ARs are affected by the upper-tropospheric jet stream and its meandering (trough) depending on these seasonality or regional distributions in the Pacific region.

First, to see the degree of the upper-tropospheric jet meandering, a “Sinuosity” index is calculated daily at each longitude grid, using potential vorticity (PV) obtained from the JRA-55 reanalysis data. The region where PV on the 350K isentropic surface is around 2 PV Unit (PVU) approximately consistent with the subtropical jet axis. In the Northern Hemisphere, the sinuosity is larger in summer than in winter, as well as larger over the ocean than over continental region. Maximum values of the sinuosity index are located over the western Pacific Ocean in summer and over the eastern Pacific Ocean in winter, respectively. A large effect of ENSO on the sinuosity is also found.

Next, ARs are detected using precipitable water (PW) data, referring to Guan and Wailser (2015). In the Pacific region, many ARs are tapped to the western Pacific warm pool or the eastern Pacific ITCZ. In this workshop, the relation among ARs, AR-related precipitation, and upper-tropospheric troughs or “sinuosity” will be reported.

Key words: Upper-tropospheric jet, Atmospheric Rivers, heavy rain event

References

(Guan,B.,andD.E.Waliser (2015), Detection of atmospheric rivers:Evaluation and application of analgorithm for global studies,J. Geophys. Res. Atmos.,120,12,514–12,535)