Impact of tropical convections on cold air outbreaks in East Asia

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In winter (December-February), cold air outbreak (CAO) events dominate weather and climate in the extratropics. CAO is the equatorward outflow of cold air mass from the polar region. It is characterized by strong wind and sharp drop of temperature, and sometimes can lead to heavy snowstorms. East Asia, including Japan, is one of the regions where CAOs most frequently occur and thus can cause significant damages to the densely populated areas [1].

CAOs are basically driven by internal synoptic conditions in the extratropics. However, their variations are potentially affected by the tropical atmosphere. The tropics exhibit large formation of deep convective clouds whose abundant condensational heating excites the large-scale disturbances that may remotely control the extratropical atmosphere and thus the CAOs.

Our presentation will show how the tropical convections influence the occurrence of CAOs in East Asia. In short, the connection between CAOs and the tropics is prominent in the intraseasonal scale [2] and interannual scale [3]. In the intraseasonal scale, the CAOs are affected by the eastward-propagating Madden-Julian Oscillation (MJO). CAOs become particularly more active when the passage of MJO appears over the Maritime Continent. In the interannual scale, El Niño-Southern Oscillation plays a major role. The CAOs become less (more) active during El Niño (La Niña), respectively. A better understanding of tropical-extratropical interactions may improve the predictability of CAO events.

References
[1] Shoji et al., 2014: *J. Climate.* 27, 9337–9348, doi: 10.1175/JCLI-D-14-00307.1
[2] Abdillah et al., 2018: *J. Climate.* 31, 473–490, doi: 10.1175/JCLI-D-17-0147.1
[3] Abdillah et al., 2017: *J. Climate.* 30, 2989–3007, doi: 10.1175/JCLI-D-16-0152.1

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