



## **Investigation on the variability of East Asia Boreal Summer Front Frequency and Linkage between Tropical Air Temperature**

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Summer time front is one of the most significant phenomena over East Asia including China, Korea and Japan. Many efforts have been established to understand the nature of front.

However, there was no research conducting identifying East Asia summer time fronts objectively. We have established objective front recognition method. The method follows next procedures : 1) We calculate vorticity on 850-hPa surface. 2) Any grid point that have horizontal gradient of equivalent potential temperature (EPT hereafter) on 850-hPa surface less than  $4 \text{ }^{\circ}\text{C} / 100\text{km}$  set to zero. 3) Next, we smooth this field using 9-point smoothing technique. 4) Finally we extract the main axis of closed contour correspond to vorticity of  $1.5 \cdot 10^{-5}\text{s}^{-1}$ . Voronoi diagram used to extract this axis. We define this axis as front on 850-hPa pressure surface.

We have applied the method on 1981-2010 ERA-Interim dataset. From the result, front frequency maximums are in around of East China Sea (34N, 122E), north (38N, 136E) and south (34N, 140E) of main island of Japan. Below 30N and above 40N, front frequency tends to decrease maybe due to decrease in the magnitude of gradient of EPT and the frequency of cyclonic weather disturbance.

Two main regions affect the variability of East Asia Front Frequency. One is equatorial positive region especially over Taiwan (25N, 120E). The other one is East Sea next to Korea (40N, 135E). Humid warm air transported from southern China (20N-30N, 100E-110E) and dry cold air transported from northern China (30N-40N, 100E-110E) compressed by clockwise high system over Taiwan and counter-clockwise low system over East Sea). This compressed precipitation-making system or front moves by extratropical westerly and transported out to north-western Pacific.

It looks like geopotential over Taiwan affected by tropical activity, especially vertical integration of temperature (VIT hereafter) over tropical region (30S-30N). When VIT is higher than normal, geopotential over Taiwan also higher than normal with correlation coefficient of 0.5 (1981-2010). Therefore, we can conclude that when VIT is higher than normal, front frequency is higher than normal. VIT is significantly related with ENSO variability. We will investigate how the tropical region activity affects the front frequency over East Asia.