

# Climatology of tornadoes accompanied by typhoons



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## 1. Introduction

Typhoon is one of major source of tornado in Japan. About 18 % of tornadoes occurred in Japan were caused by Typhoons.

The present study aims to clarify the environment of tornadogenesis accompanied by typhoon.

We compared the environmental indices between the case of typhoon with tornado (TR) and that without tornado (NTR).

## 2. Data and Methods

We employed the following data in this analysis. The period of the analysis is 1961 to 2012.

### \* Tornado data

Tornado database by JMA.

### \* Typhoon positioning data

Best track data by JMA.

### \* Objective analysis data

The Japanese 55-year Reanalysis data (JRA-55)  
grid space: 1.25 degree.

Totally 112 tornadoes accompanied by typhoon were analyzed. The composite of 58 typhoons causing tornadoes within 500 km from typhoon eye (near) and that of 20 typhoons causing tornadoes far from eye (far). These data were compared with the composite of 598 typhoons without tornadoes.

## 3. Results

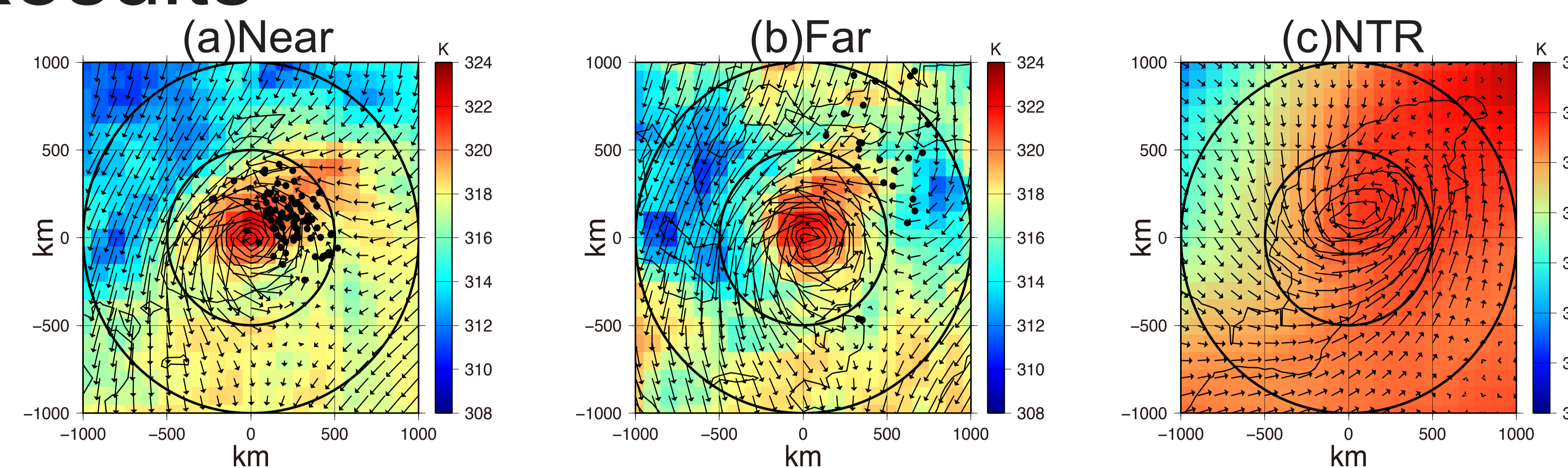


FIG. 1. Composite of wind (vector) and equivalent potential temperature (color shading) and vertical vorticity (contour) at 850hPa. Black dot shows tornado location. (a)Near case. (b) Far case.(c) typhoon without tornado.

Typhoon with tornado has large vorticity around eye but the wind velocity was slightly smaller around the righthand portion where tornado occurs. The gradient of potential temperature is also larger in typhoon with tornado.

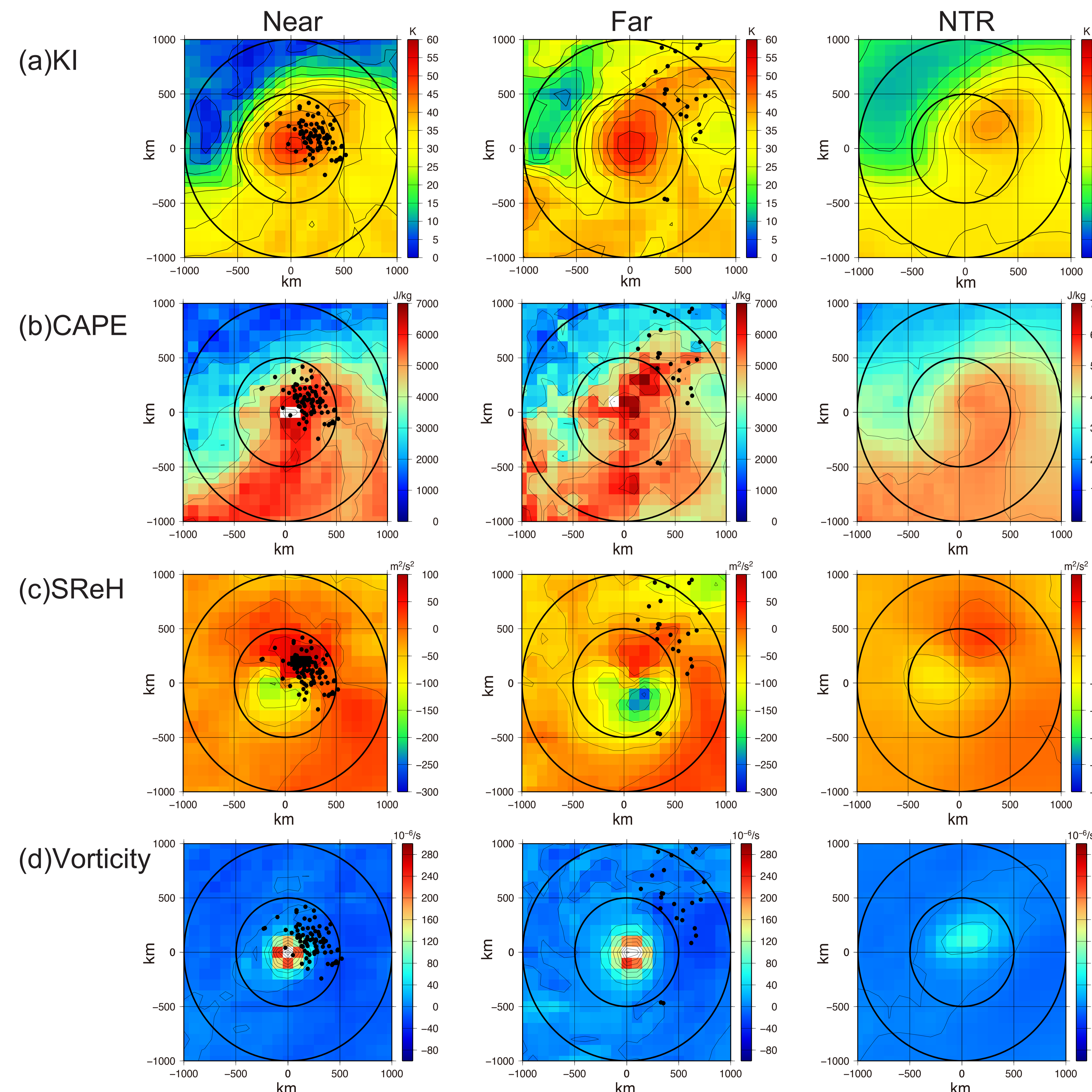


FIG. 2. Composite distribution of environmental indices (color shading). Black dot is tornado location. (a) K index. (b) Convective Available Potential Energy. (c) Storm-Relative Helicity. (d) Vertical Vorticity.

Typhoon with tornado has large KI, CAPE and SReH. However, the tornadoes occur in the region where these values are relatively low.

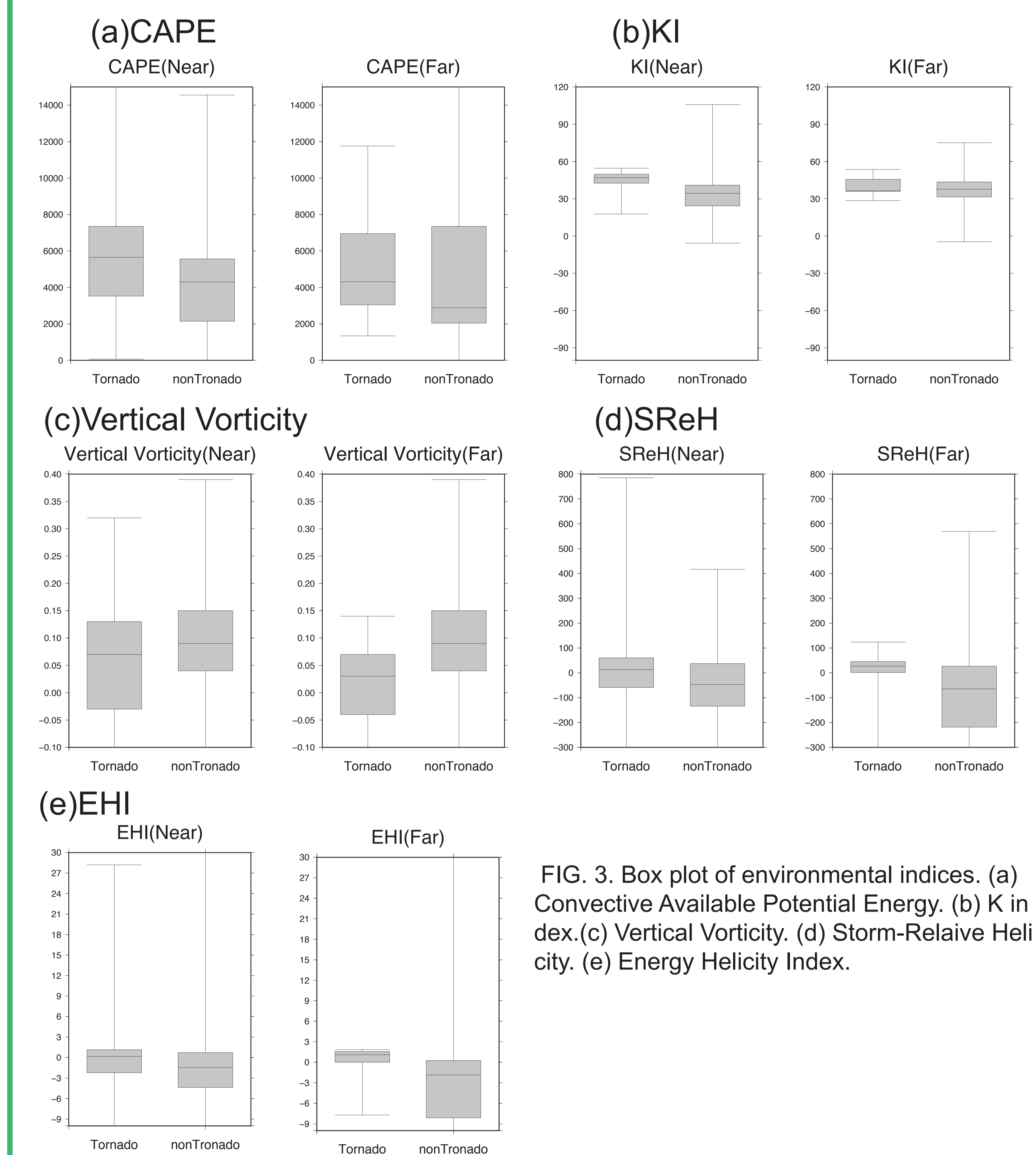


FIG. 3. Box plot of environmental indices. (a) Convective Available Potential Energy. (b) K index. (c) Vertical Vorticity. (d) Storm-Relative Helicity. (e) Energy Helicity Index.

Good environmental index is CAPE and KI for near case whereas SReH and EHI for far case.

## 4. Conclusions

Typhoon with tornado maintains warm core but baroclinicity is intensified in the surrounding area. The good environmental indices for tornado genesis are different between far and near cases.

In the future work, we will estimate these indices from more high resolution simulated data.

### Acknowledgement

The present study was supported by the Research program on climate change adaptation (RECCA) of the Ministry of education, culture, sports, science and technology, Japan.