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Independent component analysis of variability of the North Pacific High in summer

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There exists year-to-year variability of the North Pacific High or the Bonin High around the eastern part of the Eurasian Continent. The mechanism of the variability is still controversial. In order to clarify the cause of the variability, independent component analysis(ICA) is applied to the geopotential heights of several pressure levels over the Eurasian Continent in summer.

Recently, a new statistical tool, ICA, comes into use in many scientific fields successfully. In contrast to principal component analysis(PCA also known as EOF analysis), ICA assumes the statistical independence among the hidden original signals in addition to uncorrelatedness. In our previous paper, we have applied this method to Arctic Oscillation and got some implications.

The variation of the geopotential heights seems to be successfully separated according to the heat sources, though those results could not be obtained by PCA. One heat source is located near the North Africa and another source is located around the Tibetan Plateau. The heat source due to the cumulus convection over the Philippine Sea seems to be less effective for the variation. The advantage of the ICA over the PCA is also summarized along the results of this study.