

Mean Surface Air Temperatures in Japan - Regional Classification and Interannual Variability

*Pascal Oettli¹, Masami Nonaka¹, Swadhin Behera¹

1. Japan Agency for Marine-Earth Science and Technology

Back to the year 1886, several divisions of the climate of Japan into homogeneous climatic regions have been proposed, following different approaches of the question. This includes the Köppen climate classification (Fukui in 1933; Sekiguchi in 1949), the new Thornthwaite climate classification (Isozaki in 1933; Fukui in 1957) or the similarities of weather conditions. The latter is performed either throughout the year (Nakagawa in 1899; Sekiguchi in 1959; Yoshino in 1980) or during specific seasons (Iwakiri in 1967; Murata and Yoshino in 1988), sometimes with the help of statistical techniques, such as principal component analysis and the cluster analysis (Mikami in 1975; Koizumi and Kato in 2012.)

Using a type of artificial neural network called Self-Organizing Map, or SOM, we propose another division of the climate of Japan, solely based on the mean areal surface air temperature anomalies. SOM has been successfully employed in climate studies for more than a decade and has showed its ability to extract simple features from high-dimensional data. Here, SOM is applied to group 762 AMeDAS stations, taken throughout Japan for the last 30 years, into homogeneous clusters (=regions). Clustering is performed seasonally, with a focus on boreal winter (December to February) and boreal summer (June to August). As a result, eight regions are defined and associated time series of temperature anomalies (=indices) are computed.

Subsequently, possible source(s) of the interannual variability of mean surface air temperature anomalies are explored, for a better understanding of the regional differences. For this, correlation coefficients between indices previously defined and different climatic variable anomaly fields (sea-surface temperatures, outgoing longwave radiation, geopotential height...) are calculated. Hopefully, this work would also lead to a better seasonal forecast, taking into account the specificity of each region in regard to their link to the large-scale variability.

Keywords: Japan, Air temperature, Classification, Interannual variability