Identify different patterns of sea surface temperature using a cluster analysis

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Abstract

Sea surface temperature (and ocean) is considered as one of the indicators to measure the oceanography and meteorology playing an important role in the areas of oceanography, meteorology, fisheries, policy making and marine planning. The water area of the Caspian Sea, on the other hand, is considered as the most important one for some of its neighboring countries including Iran which also plays a significant role in ecosystem functioning, food security, employment opportunity, military security to name a few. The extent from north to south which is about 1200 km in length would cause the Caspian Sea to experience different temperature levels. The purpose of this study is to cluster different temperature patterns based on monthly and annual statistics from 1985 to 2009 namely the 25-year statistics retrieved from NOAA website. Accordingly, six major clusters were extracted from 300 months from which cluster no.1 containing 101 months and cluster no.5 containing 95 months were ranked in first and second place respectively in terms of frequency. Generally speaking, the southeast of southern Caspian and the middle Caspian identified as being the hottest and coldest areas respectively. It appears as if the temperature by passing from northern and southern Caspian to middle Caspian is decreased. It is also worthy to be mentioned that the middle Caspian has the highest coefficient of variation and standard deviation as well. Therefore, in this study, for the first time we use the clustering method to cluster the temperature in the analysis of Caspian sea surface temperature, for a whole period, rather than monthly mean temperature so as to identify the pattern of monthly temperature mainly because the results derived suggest that the monthly mean temperature cannot serve as a good model for analyzing the Caspian sea surface temperature.

Key words: Cluster analysis, Monthly pattern, Caspian Sea surface temperature, Climate oscillation.