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Characteristics of networks in sea surface temperatures

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The climate of each nation is affected by meteorological factors such as rainfall, temperature, humidity, and wind. The sea surface temperature has played a crucial role in the climate change of continents. In IPCC report, when the temperature is increased by the climate change, it has influence on the earth's warming. The variation of sea surface temperatures is known to cause the atmospheric circulation, El Niño, and La Niña because the ocean comprises a large portion of the global surface. It is hence important for our research to simulate and analyze the change of sea surface temperatures on the Atlantic, Indian and Pacific oceans. In this paper, we firstly investigate the dynamical behavior of sea surface temperatures via the rescaled range analysis according to the season. Secondly, we analyze in detail the topological property of sea surface temperatures connecting to the network theory. We use the merged satellite and in-situ data global daily sea surface temperature data provided from the Japan meteorological agency and the data of sea surface temperatures are collected during five years from January 2005 to December 2009. In our method, we segment one region (a case of a restricted area among three oceans) into cells, each of which has the same area, viz. one cell area is 0.25 degree latitude $\times$ 0.25 degree longitude. The center of each cell is regarded as a node on the network, and the network is basically constructed as the values appertaining to the same ranges for the Hurst exponent values. By reconsidering a 4-by-4 cell (1 degree latitude $\times$ 1 degree longitude) as a new node, the number of links is counted as one node if the two (or more) links overlap between cells. We also can make up the topological property of the complex network in one region. Then we can extend it to the three oceans. Consequently, we find the hub points of the SST on the Atlantic, Indian and Pacific oceans, but it is necessary to analyze rigorously the network of the SST. In the future, we will extend our complex network to other meteorological fields.

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