

Application of Empirical Orthogonal Function Analysis on the Salinity of the Bay of Bengal

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ABSTRACT

Empirical Orthogonal Function (EOF) is a well-accepted statistical method which is very much used to analyse long-term datasets. Mostly when the data series is dealt in environmental aspects, temporal and spatial variations of the datasets become very much relevant. These three-dimensional datasets (spatial (longitude, latitude) \times temporal) mostly belong to different parameters or variables in meteorology and oceanography. These variables are very crucial to be analysed for interpreting the atmosphere-ocean phenomena. All these variables as time series are constituted with stable and fluctuating components. These fluctuating components are responsible for intrinsic features which are related to many transient processes in weather and climate. So, all such stable and fluctuating components can be identified by EOF which generates different modes from the datasets and the contributions of all such modes determine dominating features varying in time and space in the original dataset. Therefore, this study has considered one such variable ‘salinity’ for EOF application. The area has been chosen as the Bay of Bengal (BOB). BOB is known for high thermohaline variability subjected to huge freshwater discharge from some major rivers in India, reversing monsoon wind and remotely coming Kelvin waves from the southern side. There is significant difference in salinity distributions between northern and southern BOB. In addition to that, seasonal distributions of salinity are very prominent. Wind induced mixing also attributes to these variations. Therefore, the site is chosen for EOF study. EOF procedures assume that there is no data gap in the original data series. So, appropriate interpolation has been done to eradicate this problem. Singular value decomposition (SVD) has been used for EOF analysis. It is found that EOF could identify background and smaller signals from long time series of salinity with respect to orthogonal modes depending on their variance in salinity dataset. Also, it is found that the EOF can be used as filter process to eradicate abruptness in dataset.

Keywords: EOF, BOB, filter, SVD, Modes.



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