

INVESTIGATING THE STATISTICAL SIGNIFICANCE OF OSCILLATIONS IN THE CLIMATE SYSTEM

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Empirical Orthogonal Function (EOF) analysis, whether done on a single time series (known as Singular Spectrum Analysis-SSA) or on fields (spatial arrays of variables), is a power tool that is being used extensively in atmospheric sciences. Some of the most important result from EOF analysis is the discovery of several oscillations in the climate system including the Pacific Decadal Oscillation (PDO), the Arctic Oscillation (AO), bidecadal oscillations, a 70-year oscillation and others. These oscillations are usually derived from the leading EOFs and represent features of the climate system that are claimed to affect the weather in many places on Earth. Lately, however, there is a growing awareness that due to limitations in the data the significance of some of these oscillations should be appropriately tested. The reason is that by **construction** EOF analysis will produce patterns or oscillations. This means that the corresponding to the leading EOFs oscillations may not always be statistically significant and thus may not represent real features of the climate system. In this case predictions based on these “cycles” may not be reliable. In this presentation we will show examples where the above points are clearly demonstrated and we will outline methods to test for the significance of an oscillation. The result of these tests will provide clues as to whether or not certain oscillations are dynamical features or simply red noise, an issue that is presently hotly debated.