



Non-linear modes of climate variability via neural network methods

W. Hsieh

University of British Columbia, Canada (whsieh@eos.ubc.ca)

Due to the prevalence of linear statistical methods, large scale global climate variability has been largely explained in terms of linear modes, which give rise to standing oscillatory patterns such as the Pacific-North American (PNA) teleconnection and the Arctic Oscillation (AO). Unfortunately, when the underlying data structure is non-linear, the linear statistical methods have a tendency to scatter a single oscillatory phenomenon into numerous unphysical modes or higher harmonics. Since the late 1980s, neural network methods have become popular for performing non-linear regression and classification, and more recently, non-linear generalization of principal component analysis (PCA), canonical correlation analysis (CCA) and singular spectrum analysis (SSA). In this presentation, neural network methods are used to extract the non-linear modes of climate variability, including the El Niño-Southern Oscillation (ENSO), the PNA, the stratospheric Quasi-Biennial Oscillation (QBO), and the AO. As the non-linear modes are not standing oscillatory patterns, movies will be used to reveal their more sophisticated structures.