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Modes of climate variability visualized by self-organizing map

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We visualize modes of climate variability, using a relatively new technique, spherical self-organizing map (SOM) with dynamically growing neurons. In the fields of meteorology and climatology, empirical orthogonal function (EOF) analysis has been traditionally used to extract the leading patterns of climate variability. However, the contribution rate of the two principal components to the total variance is less than 30% for most cases, since EOF analysis obtains a linear mapping. In the present study, we propose a high speed spherical SOM to obtain a more powerful nonlinear mapping. In the proposed method, we start from a few neurons, and add neurons in the most variance region step by step. We also move neurons in projected sphere. Then, in a typical case, computational time is significantly reduced (10000 times faster than conventional SOM). Moreover, this high speed SOM allows us to visualize dominant modes of a huge observational climatology dataset in a two-dimensional visible space in a topology-preserving manner. As a result, our SOM successfully distinguishes the modes which are significantly different physical patterns, but projected to near positions with the EOF analysis. Our method therefore gives rise to a better and fast understanding of climatology data. At present we are detecting and visualizing dominant modes from the climatology datasets of the high resolution GCM, and will show recent results in the presentation.