

USE OF AN OBJECTIVE SYNOPTIC WEATHER PATTERN CLASSIFICATION SCHEME FOR NUMERICAL WEATHER PREDICTION AND CLIMATE APPLICATIONS IN THE ANTARCTIC

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The use of self-organizing maps (SOMs) to objectively identify synoptic weather patterns is relatively new, but has already proven to be useful for applications ranging from numerical weather prediction to climate model analysis. Results from SOM analyses of real-time Antarctic Mesoscale Prediction System (AMPS) forecasts and Intergovernmental Panel on Climate Change (IPCC) global climate model (GCM) simulations of the 20th and 21st century will be presented.

The SOM methodology has been used to evaluate model performance for both numerical weather prediction (NWP) and climate simulations, often providing a unique perspective on model skill not provided by more traditional model evaluation techniques. Of particular interest for climate simulations is the ability to readily identify models that do not simulate a distribution of synoptic weather patterns that matches the observed climate. For NWP applications the SOM-based model evaluation provides guidance to weather forecasters regarding model performance for a variety of synoptic weather patterns, and highlights those patterns which have the greatest model errors.

The SOM method has also proven to be successful in analyzing atmospheric dynamics and transport processes. Using the AMPS NWP model output we have created an objective synoptic climatology for the Ross Ice Shelf region, Antarctica. Using this climatology we have analyzed relationships between the synoptic weather patterns that were identified and the observed near surface wind regime. For climate applications we have used the SOM method to evaluate changes in synoptic forcing of net precipitation over Antarctica and the Southern Ocean using the IPCC GCM simulations of the 20th and 21st centuries.