Geophysical Research Abstracts
Vol. 18, EGU2016-11192, 2016
EGU General Assembly 2016

Innovative use of self-organising maps (SOMs) in model validation.

Ben Jolly, Adrian McDonald, and Jack Coggins
University of Canterbury, Physics and Astronomy, Christchurch, New Zealand (adrian.mcdonald@canterbury.ac.nz)

We present an innovative combination of techniques for validation of numerical weather prediction (NWP) output against both observations and reanalyses using two classification schemes, demonstrated by a validation of the operational NWP 'AMPS' (the Antarctic Mesoscale Prediction System). Historically, model validation techniques have centred on case studies or statistics at various time scales (yearly/seasonal/monthly). Within the past decade the latter technique has been expanded by the addition of classification schemes in place of time scales, allowing more precise analysis. Classifications are typically generated for either the model or the observations, then used to create composites for both which are compared. Our method creates and trains a single self-organising map (SOM) on both the model output and observations, which is then used to classify both datasets using the same class definitions. In addition to the standard statistics on class composites, we compare the classifications themselves between the model and the observations. To add further context to the area studied, we use the same techniques to compare the SOM classifications with regimes developed for another study to great effect.

The AMPS validation study compares model output against surface observations from SNOWWEB and existing University of Wisconsin-Madison Antarctic Automatic Weather Stations (AWS) during two months over the austral summer of 2014-15. Twelve SOM classes were defined in a '4 x 3' pattern, trained on both model output and observations of 2 m wind components, then used to classify both training datasets. Simple statistics (correlation, bias and normalised root-mean-square-difference) computed for SOM class composites showed that AMPS performed well during extreme weather events, but less well during lighter winds and poorly during the more changeable conditions between either extreme. Comparison of the classification time-series showed that, while correlations were lower during lighter wind periods, AMPS actually forecast the existence of those periods well suggesting that the correlations may be unfairly low. Further investigation showed poor temporal alignment during more changeable conditions, highlighting problems AMPS has around the exact timing of events. There was also a tendency for AMPS to over-predict certain wind flow patterns at the expense of others. In order to gain a larger scale perspective, we compared our mesoscale SOM classification time-series with synoptic scale regimes developed by another study using ERA-Interim reanalysis output and k-means clustering. There was good alignment between the regimes and the observations classifications (observations/regimes), highlighting the effect of synoptic scale forcing on the area. However, comparing the alignment between observations/regimes and AMPS/regimes showed that AMPS may have problems accurately resolving the strength and location of cyclones in the Ross Sea to the north of the target area.