Application to NWP Models Verification of an Atmospheric Circulation Patterns Classification

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At Meteo Expert, a Italian private organization providing weather and climate services and formerly known as Epson Meteo Centre, we are using the Self Organizing Map (SOM) algorithm to study synoptic circulation over Southern Europe, evaluating the capability of five NWP global models and one multi-model ensemble to predict its variability in order to relate synoptic circulation patterns to temperature and precipitation forecast's quality over Italy. SOM is an iterative algorithm that 'learns' the patterns of the input data vectors and organizes them into nodes within the SOM space, arranging like patterns in neighboring nodes and the most unlike patterns in nodes farthest from each other. Daily observed and predicted weather types from the five NWP global models and the multi-model ensemble were recognized and classified by the SOM. The SOM-based classification built for our purposes produces a 12-weather-type set using daily 500 hPa and 700 hPa geopotential, sea level pressure, 850 hPa temperature and 700 hPa specific humidity. The five global models are GFS from National Centers for Environmental Prediction, IFS from European Centre for Medium-Range Weather (ECMWF), Arpege from Meteo France, GEM from Canadian Meteorological Centre, ICON from Deutscher Wetterdienst, together with MIX, our multi-model ensemble. Here we would like to present some examples of this operational activity in the one-year-period, also showing how much the source of forecast errors may depend on large-scale dynamics rather than model's physical parameterisations. A quality index has been used to quantify the overall ability of models in predicting the circulation patterns, showing that MIX and ECMWF reached the best performance within 96 hours of forecast.