The transition from Perfect Problems Forecasts are continually improving: the weather element guidance. For example, the NWS and MDL have applied the MOS approach to the European Centre for Medium-Range Weather Forecasts (ECMWF) model to generate additional station-based guidance (Rudack 2014). While ECMWF model output is widely recognized in the meteorological community for its skill, it can contain systematic bias. Application of the MOS technique to ECMWF model output has produced guidance for weather elements found in MOS, the guidance scores. ECMWF MOS including elements not available directly in ECMWF model output, such as probability of precipitation.

Past Performance: Long-Term Verification

The Meteorological Development Laboratory (MDL) of the National Weather Service (NWS) has issued model output statistics (MOS) guidance forecasts for nearly four decades (Chu and Lowry 1972). The NWS and MDL routinely evaluate official forecasts at stations and compare the skill of the human forecast to the guidance for the same weather element. Dallavalle and Dagostaro (2004) and Ruth et al. (2009) documented the improvement in guidance products that objectively interpreted the output of numerical weather prediction models. The results shown here have been updated through the 2013 cool season for 79 CONUS stations available at the official site. The past four decades of MOS guidance have been compared to official forecasts prepared at local NWS offices for daytime maximum temperature (MaxT), nighttime minimum temperature (MinT), and 12-hour probability of precipitation (PoP12). Local forecasts are compared to MOS guidance that is available several hours prior to local forecast issuance. For example, through the 2011 cool season, local maximum temperature forecasts issued at approximately 1800 local time for the next two days are compared to MOS based on the 0000 UTC model cycle.

Improvements in NWS public weather forecasts and in statistically post-processed numerical weather prediction can be traced by the verification of the weather element guidance. For example:

- The transition from Perfect Prog guidance to MOS in 1973 resulted in a clear improvement to MaxT guidance scores.

- The implementation of nighttime MinT in late 1984 reduced errors of both local forecasts and guidance.

- Forecasts are continually improving. Day 2 local forecasts (dark blue) are now as good as they were for day 1 (light blue) 10 to 20 years earlier.

- Problems with models contribute to decreases in performance: GFS model changes in 2010-2011 changed bias during spring and negatively affected MOS. A refresh of the GFS MOS guidance is planned for January 2015, coincident with the GFS model upgrade.

Conclusions

MDL has continually adapted MOS guidance to meet the needs of NWS forecasters at Weather Forecast Offices (WFO). Both local forecasts and guidance have clearly improved in quality over the last 40 years. Day 2 local forecasts are as good as they were for day 1 about 10 years ago. Guidance quality has been negatively impacted in recent years by model changes, but remains valuable.

Improvements to MOS guidance continue. A refresh of GFS MOS guidance is ongoing in response to the planned GFS model upgrade in early 2015. NAM MOS will also be refreshed to better calibrated to the most recent operational version of NAM. ECMWF MOS is planned to be made operationally available to forecasters by mid-2015. In addition, the ECMWF MOS extension to European models for the National Blend of Models project. We anticipate that NWS forecasters will continue to find MOS guidance products valuable for many years to come.

References


