

Strengths, Weaknesses and Ways to Improve Current Air Quality Forecasting in the Region

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Strengths

- Forecaster Experience
- Key O₃ predictors can be well forecast so that simple forecast models show reasonable skill:
 - Previous day peak O₃
 - Temperature
 - Cloud cover
- Gas phase chemistry pretty well describes O₃ formation so that operational coupled numerical models show “decent” skill.

Weaknesses (1 of 2)

- Climatology of O_3 has changed since NO_x SIP Rule enacted making statistical forecast models more uncertain.
- $PM_{2.5}$ is linked to meteorology in a much more complex way than O_3 so that “simple” statistical techniques show little skill.
 - Especially in high end of distribution (Code Orange)
- $PM_{2.5}$ depends on both gas phase and aqueous chemistry, as well as uncertain emissions, so that numerical models are less skillful.

Weaknesses (2 of 2)

- Smoke emissions from fires lead to high concentrations and are a source of large error in $PM_{2.5}$ forecasts.
 - Can't be included in statistical techniques
 - Difficult to include in numerical models.
- Other weaknesses?

Ways to Improve - 1

- Stand alone statistical models for O_3 are at or near limit of skill.
 - And provide only local predictions.
- Further improvement likely to come from combination of numerical model output post-processed with statistical techniques.
 - MOS Approach
- The best (only?) way to improve forecasts and forecaster decision making is the close analysis of errors.

Ways to Improve - 2

- The forecasting community needs better and easier access to location specific output from NOAA-EPA forecast models so that post-analysis can be carried out.
 - Right now NOAA-EPA model output is archived in limited fashion in the maw of NCDC.
 - Only a subset of data available and hard to get.
 - Format is GRIB – OK for forecasters with great technical support but a high barrier to most state and local forecasters.

Ways to Improve - 3

- As an example, what if?:
 - Searchable data base of NOAA-EPA model output
 - Provide dates and lat/lon for point or box, return spread sheet (CSV file) with hourly or peak 8-hour O₃ or PM_{2.5} forecasts and AirNOW observations.
 - Corresponding meteorological model output
 - Provide met model forecasts of key variables for that location.
 - Combination of forecast data may provide insight into local systematic errors of forecast models.