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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone prediction based on meteorological variables: a fuzzy inductive reasoning approach" *by* A. Nebot et al.

S. Madronich (Referee)

sasha@ucar.edu

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The authors use Fuzzy Inductive Reasoning (FIR) to predict O3 concentrations measured at one surface station in Mexico City, based on correlations with other observed variables: time of day, wind speed and direction, temperature, relative humidity, and O3 concentrations at previous times. The method and results could be interesting. However, the text lacks clarity and the figures are not constructed adequately to show the results. The manuscript should not be published in the present form. A major revision of the manuscript should be considered, possibly with the following suggestions:

The method is not described well. The description should focus more on what was actually done in this particular study. The authors have replied to Referee 2 with some general statements about the FIR method, and examples (e.g. temperature trends in Anchorage and Mexico) that are irrelevant for the present study. The issue is not whether FIR can be considered a statistical method or not (it is based on historical correlation of observed O3 with other observed variables, and is clearly not based on the chemistry or physics of the atmosphere). The real point is that the authors need to describe more carefully how this specific model was set up, and describe more thoroughly the significance of the results, particularly the forecasting skill as pointed out by Referee 2.

A major confusion exists in the text about input and output variables. O3(t) is clearly the output - no problem. But it is less clear if O3(t-dt) is an input or an output. If O3(t-dt) is from observations, then it is a simple input as stated in Table 1. On the other hand, if O3(t-dt) is the previously predicted value, then it is not an input, but rather an internal parameter of the model. Although this is not made clear in the manuscript, it seems that the latter interpretation is true, and O3 is only initialized with observations at the very beginning (e.g. March 1st 2006 for the monthly model). After that initialization, the O3 is recomputed at each time from its value computed at the previous time step. This is what leads to the accumulation of errors, and to the meaningful difference between daily, monthly, and seasonal models, since these are progressively projecting further ahead in time from the initial value. It seems to me that this is a key point, yet the text is remarkably obscure on this. The only indication is from a sentence in the last paragraph of the response to Referee 2, which reads "When long term prediction is performed, previously predicted values of ozone are used to forecast the next value of this contaminant."

Similarly, the current figures do not provide useful information, particularly for the growth of error. In figures 1 and 2, it is not clear if the errors are smaller at the beginning of the month and grow during the month. The figures could be re-drawn, e.g. showing the % error for the daily maximum O3 for each day of the month, and then it would be easier to judge this growth of error. Figures 3-6 currently provide no information on forecasting skill.

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Interactive Comment

More generally, it would be useful to mention that the variable O3 is treated in a way that is fundamentally different than the other variables. Winds and temperature (for example) are observed or forecast independently, while past, current, and future O3 values are predicted through the FIR model. In other words, no O3 observations are used except for the one initial value. Why not update the model with recent O3 observations (e.g. previous few days)? Is there really a benefit in forecasting weeks ahead (especially since these forecasts are inaccurate)? More discussion would be useful, and some figures (to replace current Figs. 3-6) could show the dependence of the forecasting skill on the time elapsed since last update.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12343, 2008.