

## ***Interactive comment on “Nitric acid and particulate matter measurements at Athens, Greece, in connection with corrosion studies” by C. Tzanis et al.***

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The paper entitled "Nitric acid and particulate matter measurements at Athens, Greece, in connection with corrosion studies" discussed outcomes of an EU funded project, entitled MULTI-ASSESS, to determine the effects of air pollution on materials and especially on the monuments of the cultural heritage. This manuscript represents a substantial contribution to scientific progress within the scope of the highly esteemed journal "Atmospheric Chemistry and Physics". It should be mentioned that the authors have addressed a highly important issue. The authors of this paper have adopted a regressive approach to view the association between different pairs of passive sam-

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plers. The approach has been made statistically sound by showing the coefficients of determination along with the regression equations. Scatterplots have been prepared with linear trend lines to give a pictorial view of the type of association between different pairs of variables under study. The present paper has given ample scopes for further research. I feel that some research works may be carried out using a multivariate approach. In the present regression approach, only one predictor-one predictand situations have been considered. It would be a very interesting work, if more predictors are used with a single predictand. That would give some new insights into their mutual relationships. The cases, where poor correlation (i.e. low coefficient of determination) is discernible in the bivariate approach, may be further viewed in a multivariate environment. Another future direction of this study is to make a time series analysis of different variables under study in univariate as well as in multivariate environments. Deposition for the  $Mg^{2+}$ ,  $NH_4^+$ ,  $Na^+$  and  $Cl^-$  may be recorded continuously and autoregressive (AR), Autoregressive Moving Average (ARMA), and Autoregressive Integrated Moving Average (ARIMA) methods can be carried out to view their variations over time. I feel that this study may help in assessing the feasibility of different protective measures against the effects of air pollution on materials and especially on the monuments of the cultural heritage. As it has been found that in some cases the coefficients of determination are not very high, there would be scope for implementation of non-linear methodologies like artificial neural network and exponential regression to develop predictive models. Some papers (e.g. Chattopadhyay and Chattopadhyay, 2009a, 2009b; Dutot et al, 2003) have considered such low correlated situations using neural network and multiple non-linear regression method. The performances of the models may be measured using various statistics like Willmott's indices, percentage errors of prediction. Preparation of confusion matrix may help in viewing the goodness of fit of the model.

References:

Chattopadhyay, G., Chattopadhyay, S., 2009a, Autoregressive forecast of monthly to-

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tal ozone concentration: A neurocomputing approach, *Computers and Geosciences*, doi:10.1016/j.cageo.2008.11.007

Chattopadhyay, G., Chattopadhyay, S., 2009b, Predicting daily total ozone over Kolkata, India: skill assessment of different neural network , *Meteorological Applications*, 16, 179-190, doi: 10.1002/met.97

Dutot, A.L., Rude, J. and Aumont, B.,2003, Julien Rude and Bernard Aumont Neural network method to estimate the aqueous rate constants for the OH reactions with organic compounds *Atmospheric Environment*, 37, 269-276, doi:10.1016/S1352-2310(02)00777-X

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 9, 14683, 2009.