

***Interactive comment on “Analysing  
spatio-temporal patterns of the global  
NO<sub>2</sub>-distribution retrieved from GOME satellite  
observations using a generalized additive model”  
by M. Hayn et al.***

**Anonymous Referee #2**

Received and published: 9 June 2009

This manuscript presents a novel approach for analysis of satellite NO<sub>2</sub> observations which leads to interesting results concerning long-term trends, annual and weekly cycles and the effects of changing wind directions. Although I do not fully understand how a general additive model works (how it determines the functional form of each term), the results appear to be reasonable. For some of the aspects of the analysis (e.g., weekly cycle) the results of the GAM are similar to those from prior literature. However, the GAM provides interesting new information, such as the apparent propagation of the weekly signal from western to eastern Europe. I do not believe that a wind directional

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analysis has been performed (at least not as comprehensively) previously on GOME NO<sub>2</sub> data (or NO<sub>2</sub> data from other satellite instruments). Therefore, I recommend that this paper be published with the minor revisions suggested below.

p. 9370, lines 19-20. I would argue that there is more than a "little prior knowledge" available concerning NO<sub>2</sub> – from previous analyses of satellite data and from chemical transport models. Please either remove or modify this statement.

p. 9373, lines 12-16. What about variation in the tropospheric NO<sub>2</sub> profile shape? Shouldn't this be important for the AMF? Shouldn't some assumption from a chemical transport model be used in specifying these shapes?

p. 9374, line 24: What is R?

p. 9377, lines 21-24. Obviously, some knowledge of the behavior of NO<sub>2</sub> is required for choosing these functions. The authors need to acknowledge that fact. Somewhere in the manuscript the authors need to explain a bit more in layman's terms how the model "learns" the relationship between the data being analyzed and the explanatory variables.

p. 9379, lines 21-22. Not sure what this sentence means.

p. 9379, line 24 through p. 9380 line 4. It is unclear from this paragraph as to whether the authors are advocating parametric or non-parametric approaches for the annual cycle.

p. 9380, line 19. change high to long

General comment: In general the English is fine, but there are some sentences throughout the manuscript that are a bit awkward and would benefit being edited by a native English speaker.