**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on **"Seeking for the rational basis of the median model: the optimal combination of multi-model ensemble results"** *by* **A. Riccio et al.**

A. Riccio et al.

Received and published: 18 November 2007

First, we would to thank the reviewer for the strongly positive comments. We will take into consideration your comments during the preparation of the revised paper. In the following you will find a short reply to your comments. We paste your most important comments (in italics), followed by our reply.

The authors are certainly aware of the literature work in Europe and US on the application of ensemble modeling for air quality predictions. In the introduction they should list key references of those works, being air quality studies closely connected to dispersion studies.

We will include some recent references to air quality ensemble modeling in the revised

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paper.

define BMA here (is defined at page 5710)

We moved the BMA definition here, following your suggestion

PAGE 5707: "This is a manifestation ... divergence theorem". Explain better or provide reference.

The reference to the Kullback-Leibler's information theory is not strictly needed at this point. The previous paragraph already explain our thoughts. In order not to confuse the reader with scholarly (but unnecessary) references, we preferred to drop this sentence.

PAGE 5712: is "...difference between the highest and lowest forecast" an example of forecast error? Clarify.

Equation (7) relates the ensemble error (the variance) to the ensemble spread (the between-ensemble spread) represented by the first term on the right hand side. We will provide some references for the reader interested in a more-in-depth discussion of the spread-error relationship in weather forecasting modeling.

PAGE 5716: label fonts on Fig 2 (and most of remaining figures) are too small, and are not easily readable.

We will provide new figures with larger fonts in the revised paper.

PAGE 5719: '...as measured by the Gelman and Rubin test...'-

Are the authors referring to a necessary (but not sufficient) condition for convergence? Clarify.

We refer to the 'potential scale reduction factor', as defined in Gelman and Rubin (1992), Inference from iterative simulation using multiple sequences, Statistical Science, 7, pages 457-511. This test refers to the number of iterations to perform, in order to assure that the Markov chain correctly explored the posterior space. In a preliminary

test, we run several chains in parallel with different initial values, overdispersed relative to their prior distribution. The Gelman and Rubin test diagnosed convergence almost immediately (after a few iterations). We then run a single long (5500 iterations) chain, and conservatively discarded the first 500 iterations (well beyond the 'burn-in' period indicated by the Gelman and Rubin test). This will be more clearly described in the revised paper.

PAGE 5719: a brief comment on the computational cost to run the algorithm would be useful.

The impact of computational costs are not a primary concern; anyway the McMC estimation approach is cheap, so that the data analysis procedure is suitable for real-time applications, too. The estimation process takes about 12 seconds for 100 iterations (using Matlab as computing environment installed on a PC with an Intel Centrino Core2 T7200@2GHz and 2048M of main memory), so that a large number of iterations can be accomplished within a few minutes. We will insert a brief comment on computational costs at the end of section 5.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 5701, 2007.

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