

## ***Interactive comment on* “Technical note: Functional sliced inverse regression to infer temperature, water vapour and ozone from IASI data” by U. Amato et al.**

### **Anonymous Referee #1**

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The article is about a modification of a retrieval method. The basic idea is a generalization of PCA and the information lossless reduction of dimensionality. This is done to reduce the amount of necessary computations and to circumvent principal problems (curse of dimensionality).

The method is applied to IASI data from the commissioning phase of the instrument and verified with "true" data generated with a radiative transfer code and based on profiles of atmospheric constituents and state parameters from ECMWF.

In general I found the manuscript to be well written and interesting. However, the organisation of the paper is sometimes confusing. Also since it is quite technical and

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not truly presents new concepts but a modification of existing methods I very much agree with publication as technical note.

#### General remarks

The list of references contains 25% of citations from reports, proceedings etc.

The introduction gives sort of a historical breakdown of high-spectral resolution satellite instruments but almost completely misses out the recent European history, i.e. Envisat and its suite of instruments.

The discussion of the data in section 4 was carried out with absolute values. I would like to know why the authors did not use relative values. The differences of the data points are partly not visible in the figures.

#### Specific questions/comments

p7591 / I16 It is not clear at this point what exactly is a "functional model"?

p7591 / I18-20 The reference for the "well known ECMWF Chevalier data base" is a (internal?) research report. I could not find a source to download it. Therefore I have no idea about its level of accuracy.

p7591 / I23 What is "NPOESS" ?

p7592 / Eq (1) and explanations

p7593 / I1 Please explain m

p7593 / I2 What is  $R(v)$ ? Do you mean  $R(v_j)$ ? Or is it the discretized version of  $R$ ? Which one is actually used in Eq(1)?

p7593 / I4 I dont understand the expression  $\{\beta_i(v), i=1, \dots, K\}$ . Is  $\beta_i$  a vector or a number? If it is a number (what I assume since it is result of a function): Why is the inner product used in Eq(1)? Is  $v$  a vector or a number? According to ACPD typeset conventions it is a number. What number? How is  $K$  determined at this stage? Is  $K$  the

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ranked importance that is mentioned in I 16 (same page)? If yes how is "importance" defined?

P7593 / I9-10 The sentence beginning with "Hence ...": Is this always possible? Is there a criterium to check if a reduction from d to K is possible?

P7597 I would advise to shorten the whole passage and remove some equations. For instance it is not necessary to repeat in formula that a matrix norm is not additive, this can be found in textbooks, as most of the linear algebra in this section. Also the last paragraph is just an elegant way to say that single numbers can be added, isn't it?

P7598 / I6 Can you give an example where the value  $i_D = M - 1$  actually is reached?

P7600 / I4 to 8 From what data was this index calculated? Was it calculated for the whole data (averaged) set? The term "degree of freedom" needs some explanation in this context because there are several definitions. Also the link between the index and "pieces of information" mentioned further in the text needs some explanation.

P7600 / I16 In this paragraph you speak about limitations due to the low number of degrees of freedom. In the conclusion however, this sounds no to worry to any longer as long as the method shows better results than EOF. But the question remains: can FSIR be used to help resolve important small scale structures in water better?

P7602 / paragraph 2 I have the feeling that using relative measures would display the better performance of the FSIR method in Fig. 3 more clearly.

Technical issues

P7591 / I13 A closing bracket is missing

p7591 / I29 typo: recoded -> recorded

p7592 / p5 typo: observation -> observations

P7593 / I6 Please explain the symbol  $E[]$  when it first appears. It is explained in section

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4 on p7599 / I18

P7593/ I15 Why are hats ("^") used here? Please explain symbols when they first appear.

P7598 / I6 replace "(15)" with "in Eq (15)".

P7600 /I12 typo: indicates -> indicate

P7601 / I1 typo: where -> were

P7603 / I8 typo: physical -> a physical

P7603/ I9 The last part of the phrase seems not to be a correct sentence.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7589, 2009.

## ACPD

9, S1942–S1945, 2009

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