

Comment on amt-2021-215

Joern Ungermann (Referee)

Referee comment on "The ESA MIPAS/Envisat level2-v8 dataset: 10 years of measurements retrieved with ORM v8.22" by Bianca Maria Dinelli et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-215-RC2>, 2021

GENERAL COMMENTS

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The paper describes a new level 2 data set for the MIPAS instrument. All parts of the instrument, level 2 processing, and associated data products are well described in sufficient detail for the purpose of this paper.

The topic fits the journal, but the paper might be even better suited for ESSD (<https://www.earth-system-science-data.net/>).

I do not have any major criticism on this very nice paper, only a couple of minor issues mostly related to proper terminology and precise description.

I suggest that a language service should be used to review grammar and expressions; maybe the "normal" copy-editing by the journal is already sufficient for this purpose. I collected some suggestions for improvements as
Minor Remarks.

The paper can be published after addressing the specific comments (a very minor revision).

MAJOR COMMENTS

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None

SPECIFIC COMMENTS

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line 194

This and the preceding sentences sounds as if optimal estimation would be an alternative technique to Levenberg-Marquardt. According to mathematical literature, Levenberg-Marquardt is an algorithm for minimizing non-linear least squares problems (it's a special case of the trust region methods), whereas optimal estimation is a regularization scheme that can be seen as a special (or extended, depending on perspective) case of Tikhonov regularisation. That is, one can use the Levenberg-Marquardt algorithm to solve the non-linear minimisation required by an optimal estimation formulation of the problem.

Please clarify the text such that Levenberg-Marquardt is used in both cases for both problem formulations or clarify.

See also comment for line 269.

line 219

You use a constant a priori to capture the variability contained from the MIPAS information and not introduce any bias. Why did you deviate in the case of HDO from this principle?

line 269

The Levenberg-Marquardt method is not a regularisation method, but an algorithm for identifying a (local) solution to (reasonably behaved) non-linear least-square problems. In contrast, regularisation approximates the original not well-behaved problem by a well-behaved one and thus typically leads to a different (but stable!) solution compared to the original problem (which is why one probably tries to have as "weak" as possible regularisation). When the Levenberg-Marquardt algorithm converges, it identifies a minimum to the original problem, not an approximate one and thus it is not a regularization by definition (see e.g. Engl, Hanke&Neubauer or Nocedal&Wright).

Please adopt the text to use mathematical standard terminology.

line 385

I am sure how to interpret this. When applying the AVK, e.g. to model data, one always needs to employ all columns of the AK matrix on the model data, whereas one may skip rows if the AKM associated with "not useful" elements of the profile. Is this what you are trying to express?

Further, you are using also non-zero a priori profiles (at least for OE). It would be useful to remind users here to not forget the $(I-A) x_a$ term.

lines 363, 366, 478, Figure 5, Figure 6

CFC-22 -> HCFC-22

MINOR REMARKS

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line 67

time lapse -> period?

line 75

connections with -> connections to

line 83

a part from -> apart from

line 92

to the -> to

line 102

the "." should be on the end of the preceding line

line 176

Section -> section

line 184

HDO -> and HDO

line 232

Table numbers are missing (??)

line 262

netcdf -> NetCDF; also in the following

line 273

AKs; abbreviation not introduced

line 542

"are thought for" -> "are for" ?