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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Multi Axis Differential Optical Absorption Spectroscopy (MAX-DOAS)" *by* G. Hönninger et al.

Anonymous Referee #1

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Review of Multi-Axis Optical Absorption Spectroscopy (MAX-DOAS) by Honninger, Friedeburg and U Platt

This is an excellent paper which is very well written. It is very detailed, almost too detailed, and covers the subject in good order and rigor. I suggest that the authors add more information about the instrumentation , especially since they discuss 3 options for instrumentation and which one is better than the others. I also worry about algorithm uniqueness Ű is the solution obtained from the algorithm a unique one that properly represents the atmosphere, or is it just one of several solutions that cannot be discriminated against.

Specific comments:

abstract - neither the title nor the first sentence of the abstract mention the word Şat-

mosphereŤ Ű for someone just picking up the paper, there should be some reference to the atmosphere in more general terms than used here - second sentence of abstract after Şclose to the instrumentŤ, please define what you mean here Ű the PBL, the troposphere, a height range, what is meant here?

introduction - table 1 is referenced and should contain under AIRCRAFT DOAS the paper by Wahner et al., JGR 94, 16619, 1989. This paper may have been the first aircraft application of sky DOAS. - pg 5597 Ű after Şhundreds of spectral channels allows detection of much weaker absorption features and thus higher sensitivityŤ I would add why this is the case Ű the differential pattern of the cross section is more easily fit in a least squares or some such thing - pg 5597, I would add the long path work of Harder et al. JGR 102, 6215, 1997

DOAS technique - pg 5602 Ű it would be good in listing references for rotational Raman effect, to include that of George Kattawar in Astrophysical Journal, about 1981, since it is one of the original references to this effect

MAXDOAS - pg 5603 Ű The calculation of average trace Ě Perhaps say Şpath averageŤ

RT Calculations - pg 5612 Ű please note that the azimuth dep section is for homogeneous distributions

Practical Realisation - section 5.1 just sort of dangles in the text. It should be moved up to section 2. above and included in the option 2 text. - I find this entire section too short. The paper is very long and wordy in places, but here it is very short and not very comprehensive. It would be useful if the authors would expand this section to include more instrument details and problems faced by them in actual use. The section has the work ŞpracticalŤ in it; how about some more practical text on how well the instruments work in the various configurations. Is option 2 really so hard to realize Ű with fast computers surely one can convolve quickly if one has an accurate slit function for the CCD as a function of position on it. Please discuss more the advantage of

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simultaneity Ű at low solar zenith angles, surely having to move from one angle to another compromises the science.

Comparison - it would help to have error bars on Fig 21 since the authors in the text imply that the MAXDOAS system has better time resolution than the long path instrument Ű maybe the deviations from a smooth line are just noise. What is the time resolution of the long path instrument and the (presumably) nonsimultaneous measurements of the MAXDOAS instrument? How long did it take to cycle the MAXDOAS instrument for low alpha to 90 degrees?

Other applications - the authors should discuss in detail, for their examples or elsewhere in the paper, the effective on nonhomogeneous air plumes in the troposphere. This must be a real problem with the proposed urban monitoring. How does one remove this effect? Is the solution in the nonhomogeneous case one that can be believed?

refs - the web site given for the Honninger thesis is not accessible Ű it does not work

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Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5595, 2003.