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Comment

***Interactive comment on “Retrieval of water vapor profile in the mesosphere from satellite ozone and hydroxyl measurements by the basic dynamic model of mesospheric photochemical system” by M. Yu. Kulikov et al.***

**Anonymous Referee #2**

Received and published: 27 April 2009

General Comments:

This paper describes the retrieval procedure for water vapour profile in the mesosphere from satellite ozone and hydroxyl measurements. The role of the minor gas constituents (MGC) in the Earth's atmosphere is well known. But direct (in situ) measurements of MGC in the stratosphere and mesosphere are very difficult from technical point of view. That is why an indirect method for retrieving a number of significant MGC based on the use basic dynamical models of atmospheric photochemical system is very important for practical application to a mesospheric system. The results

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contained in this manuscript are interesting, important, novel and topical. The paper is very well written and is well structured. The results provide useful information on the water vapour profile in the mesosphere as well as the details of the applied retrieval procedure. The results also demonstrate clearly the ability of the basic dynamic model for retrieval of water vapour of the altitude range 53-85 km. The title clearly reflects the content of the paper and the abstract provides a complete summary. This paper addresses relevant scientific questions within the scope of ACP and will be ready for publication in ACP once the authors have considered the following minor points. Page 5756 line 20 &#8220;From the table 1 it is clear that, first, reaction with participation of the members of the families of ClOx and NOx as well as with participation CH4, H2,H2O2 and some mesospheric MGCs weakly influence the constituents of interest to us&#8221; This sentence should be more justified. There is only list of reaction in the Table 1 and explanation is not sufficient for reader.

Specific Comments: The results on water vapour distribution obtained on the base on proposed retrieval are discussed in the Section 5. Figures 4-6 show modeled profiles of water vapor and the text discusses the origins of height maxima. At that, the discrepancies between experimental and modeled profiles are partly attributed to the possible errors in the initial data on OH concentration. It would be very useful to show also the experimental data in Fig. 4-6, against which the modeled profiles are compared. The proposed retrieval is applied to a mesospheric system describing day evolution of key minor constituents at this heights. It is not clear what kind of experimental data were used for comparisons (data version, averaging for what period and geographical domain ect)? Did these experimental data reflect also diurnal variation of mesospheric water vapour or was H2O considered as a dynamical tracer?

Unique in situ rocket measurements of water vapour were presented in the following papers Khaplanov et al. A direct measurements of water vapour in the stratosphere and mesosphere, Geophys.Res.Lett., 23, 1645-1648, 1996 Lossow et al. Middle atmospheric water vapour and dynamics in the vicinity of the polar vortex dur-

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ing Hygrosonde-2 campaign, ACP,2008 In these papers the combined measurements yielded a high resolution water vapour profile up to an altitude of 75 km. Using water vapour as a dynamical tracer it was possible to directly relate the water data to the position of the polar vortex. Systematic difference in the water vapour concentration between the inside and outside the polar vortex conditions was observed in the mesosphere and is consistent with efficient downward transport of air inside the vortex. Comparisons with the mentioned direct water vapour measurements could be useful for understanding the role of mesospheric dynamics and for verifying the results of the proposed retrieval.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5753, 2009.

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