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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of stratospheric intrusions and intercontinental transport on ozone at Jungfraujoch in 2005: comparison and validation of two Lagrangian approaches" *by* J. Cui et al.

Anonymous Referee #2

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General Comments: This article investigates stratospheric intrusion and intercontinental transport events affecting the high altitude site Jungfraujoch at the Swiss Alps using two Lagrangian approaches based on FLEXPART and LAGRANTO simulations, respectively. The time period of the study is the year 2005. It is an interesting, scientifically solid and well structured article and I suggest publication of the article after taking into account the comments below.

Major comments: In page 1449 at lines 21-23, the authors mention that Ordonez et al. (2005) suggests positive ozone trend sin winter due to enhanced flux from the

stratosphere. I have not found such a solid conclusion in the cited article. Instead in another more recent paper from the same lead-author (Ordonez et al., GRL, 2007) it is concluded that Lagrangian model simulations indicate that changes in downward transport of ozone from the stratosphere into the troposphere were dominated by changes in lowermost stratospheric ozone concentrations rather than by variations of cross-tropopause air mass transport.

In page 1452 at lines 21-23, the authors mention that they have contacted forward simulations from the North American PBL and of stratospheric ozone tracers. I am not quite sure why they selected the forward approach and not the backward approach from JFJ. From my point of view I find more sensible the forward approach since the analysis is for a single station.

In page 1452 at line 18, the authors refer to the forcing ECMWF meteorological fields for their calculations. What is the horizontal grid resolution of the forcing field? Is it simply similar to the relevant interpolated fields?

In page 1455 at lines 8-10, the authors state that due to the fact that LAGRANTO does not simulate any diffusion, using trajectory ensemble is also a cost efficient way to qualitatively capture diffusion. I cannot understand if you do not have as a physical process diffusion in the calculation how to qualitatively capture diffusion based on trajectory ensemble. Please specify this point.

In page 1463 at lines 6-9, the authors mention that the measured NOy concentration during this long SI event was found to be significantly elevated, which might be due to the mixing with uplifted polluted air from the planetary boundary layer, causing increased O3 titration, thus to large extent weakening the stratospheric signature. Additionally it can be also just mixing and dilution of the stratospheric air with PBL air with lower ozone concentration which may cause weakening of the stratospheric signature.

Minor comments: In page 1449 at line 13, I think the references for previous studies on stratosphere-troposphere exchange events should be in chronological order and not in

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alphabetical order. Furthermore the reference James et al., 2003b should be James et al. 2003a since it is the first time cited in the manuscript.

In page 1454 at lines 23-26, the authors state that the model output of CO and O3 was interpolated to the height of JFJ. Was it interpolated to the real height of JFJ or to the model height of JFJ?

In page 1450 at line25, Just for the information of the authors, apart from the study of Stohl et al, 2000 cited here there is also a Stratosphere to Troposphere Transport case study using FLEXPART from the EU-project STACCATO by Zanis et al., ACP, 2003.

In page 1456 at line 6, replace “In this terms” with “In these terms”.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1447, 2009.

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Interactive Comment