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Interactive comment on “Response of tropical stratospheric O₃, NO₂ and NO₃ to the equatorial Quasi-Biennial Oscillation and to temperature as seen from GOMOS/ENVISAT” by A. Hauchecorne et al.

Anonymous Referee #2

Received and published: 3 June 2010

This paper presents an analysis of the QBO signature on O₃, NO₂ and NO₃ derived from satellite observations by the GOMOS instrument. The topic is of great interest, and the paper would be the first use of the GOMOS observations to uncover a QBO signature. However, the paper lacks clarity, and needs major revisions before it is acceptable for publication.

Major comments.

1. The time series of GOMOS observations only spans about 3 QBO cycles, and it is

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far from obvious that there is actually a QBO signal over the whole altitude range in O3 or NO2. For example, in Fig. 2, there is a clear QBO signal in O3 below 30km, but above that, it is far from convincing, and some time series could help the interpretation. It is not obvious that there is a QBO signal in the temperature plot either above 30km (Fig. 4).

2. How the authors extract the O3 field from the multi-parameter regression is not clear either, and the authors could present more clearly the intermediate steps, starting with the ozone seasonal deviations, and showing the fitted components. It is not clear how these regressed ozone fields are used in the rest of the paper. For example, in Fig. 3, there is a clear positive correlation between O3 and NO2 above 40 km, but does it imply that this is a QBO-related signal?

3. The authors propose a new hypothesis to explain the anti-correlation between NO2 and T above 40 km. As I read Baldwin's review article (p217; right column), it is mentioned that ascent modifies NOy gradient, hence presumably N2O, a well-known source of NOx. The authors should clarify what is new in their hypothesis.

Minor comments.

Anomalies in the chemical constituents or tracers are driven by the mean meridional circulation cells induced by the QBO wind vertical shears, at least in the dynamically-controlled region. These cells have a latitudinal extent with, in the easterly shear phase, rising motions at equator and descent near 20 degrees, as seen in the aerosol observations on Figure 26 (also CH4 on Fig 28) of Baldwin's review article. I wonder if the authors have averaged over a too broad latitude range (20S-20N), thereby weakening the signatures. The authors could check on that, if the GOMOS sampling allows.

In beginning of section 5 (line 13), the NO3 concentration is said to be sensitive to T, but later in that section it is mentioned that this only occurs in a limited range 25-46 km. The information should be put together in same paragraph.

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An additional suggestion is that the whole vertical structure of the QBO winds could be used in a lag-correlation plot (altitude vs time in years) with respect to O3 at a chosen level, for example.

Caption of Fig 1. Indicate in caption the meaning of black line

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9153, 2010.

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