

## ***Interactive comment on “Volcanic effects on climate: revisiting the mechanisms” by H.-F. Graf et al.***

### **Anonymous Referee #2**

Received and published: 3 May 2007

Graf et al investigate features of planetary waves during volcanic and non-volcanic winters. The main goal is to revisit the mechanisms that determine troposphere-stratospheric coupling during volcanic winters. This study investigates the mean basic state of zonal wind, vertical propagation of planetary waves, and tropospheric wave sources. The role of El Niño, which coincides with the two volcanic eruptions El Chichón and Pinatubo, is discussed. The statistical significance of the results cannot be determined because of the small number of volcanic eruptions. Nevertheless, this study is very interesting. It offers new ideas, which need to be proven using model simulations. Documenting these features based on observations, is a first step. In my opinion, the study merits to be published after some minor revisions.

1.) Table 1: Caption: SVR and WVR are mixed up in the table. SVR are listed in (b) and

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WVR are listed in (a), opposite to what is described in the caption. Table: I cannot see the bold-marked years for volcanic periods as described in text (page 3945, line 14) Listing of the WVR periods is not necessary because they are not used for analysis.

2) Figure 1.

a) Page 3946, line 6: When describing figure 1, the authors mention that a stronger polar vortex is penetrating from the stratosphere down to the troposphere. I would not use the word “penetrating”, because this figures describes a temporally averaged field, and not a time depending feature.

b) The figure indicates statistically significant areas. How is the statistical significance determined?

c) Caption, page 3957: The caption is very confusing and I suggest rewriting it. Using “difference” and “minus” in the same sentence is “doppelt gemoppelt” to use a German expression.

d) Figure 1 describes the known variability pattern of Northern Hemisphere zonal mean wind (weak subtropical jet is linked to strong polar night jet, and vise versa). I suggest referring to some studies, which have documented this (e.g. Feser et al. 2000, Theoret. Appl. Climatol.; Kodera et al. ,1991, J. Meteor. Soc., Japan; Nigam, 1990, J. Atmos. Sci.,).

3) Page, 3949, first paragraph; The authors show that observed enhanced vertical EP-flux during volcanic winters are related to both enhanced wave activity of zonal wave number 1 and improved vertical propagation conditions for this wave. In my opinion, it cannot be excluded that the enhanced tropospheric wave activity is the cause for the improved vertical propagation condition.

4) Page 3951, line 6: The reference is “Garcia-Herrera et al. (2005)” and not Garcia-Herrera (2005).

5) Caption, Fig. 2; Second sentences: Differences between which composites are

shown?

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3941, 2007.

ACPD

7, S1549–S1551, 2007

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