

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

Anonymous Referee #4

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Review of the manuscript entitled Volcanic effect on climate: Revisiting the mechanism by Hans-F. Graf, Qian Li, and Marco A. Giorgetta

The paper addresses an important problem of mechanisms of sensitivity of high-latitude circulation with respect to volcanic forcing. The authors attempted to distinguish two major mechanisms based on reflection and refraction of planetary waves using analysis of NCEP data assimilation output for the period from 1958 to 2002. All previous data analyses were conducted using mostly surface data. Therefore this is a logical and useful study. However, the results suffer from insufficient sampling. The re-analysis includes responses to all physical disturbances and therefore exhibits higher variability than model results. At the same time the sample sizes especially for volcanic cases are significantly smaller than in the recent model studies referenced for compar-

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ison. The analysis of zonal mean fields make the responses more stable if the signals are zonally symmetric so it will not work at all time, e.g. it will not work for NAO patterns. Nevertheless, this is an interesting study, which discusses an important scientific issue that has multiple practical implications. It certainly deserves publication in ACP with minor revisions. The reviewer's concerns are discussed below:

Section 3, description of Fig. 3: It looks like all is defined by the amplitude of the vertical component of EP flux at tropopause level. Why it is so high for volcanic winters? It is definitely not the case for the model simulations with prescribed SST.

Figure 5: It is seen that already in the lower stratosphere EP fluxes are larger in volcanic winters and in SVR in comparison with the non-volcanic winters. It looks like this is what further defines the differences of EP fluxes at higher levels. It would be useful to discuss this effect in more details.

It looks like Fig. 3a contradicts to Fig. 2 which shows that vertical propagation of wave activity in SVR should increase in comparison with non-volcanic cases. Please explain.

Section 2, line 5 from the bottom of the section: The sentence is not complete.

Section 3, 1st paragraph: The beginning of the discussion is unclear. What is compared with what and for what reason? This has to be defined clearly upfront.

Table 1: The volcano years are not shown in bold. It would be good to have a separate table for the years chosen for volcano sample. Why do you need weak vortex regimes at all?

Figure 2: Figure caption is incomplete.

Figure 3: Standard deviation curve looks very similar to general winter curve. Please improve. Please explain how the standard deviation was calculated.

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