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Interactive comment on "Analysis of the frequency-dependent response to wave forcing in the extratropics" *by* A. J. Haklander et al.

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We gratefully acknowledge your comments and questions, which are indeed helpful to improve the manuscript. Some important points have been addressed, and we think that all comments deserve separate answers.

Answers to specific comments:

1) The estimates given at the top of the second column of p. 1395 in Prinn (1977) are not for a perturbation with a vertical wavelength of 5 km, but of 2π*5 km. Especially for the winter season at 60° N, this is generally three to four times the tropopause height, which is probably much more than is justifiable, see footnote 2 in Prinn (1977). For the troposphere at 60° N, we have placed T_0 = 263 K instead of 296 K in Eq. (27) in Prinn

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(1977), so that the tabulated estimates are multiplied by a factor $(296/263)^3 \approx 1.43$. A tropospheric perturbation with a vertical wavelength of about 3 km (actually π km) then yields values between 0.7 days (r_g = 0, conducting ground) and 2.0 days ($r_g = \infty$), as stated at the top of page 1406.

2) Eq. (3) can be written as $r^{-2} \equiv a + b\omega^{-2}$, with $a \equiv (1+\mu^{-1})^2$ and $b \equiv \alpha^2 \mu^{-2}$. Finding estimates for a and b then implies performing a linear least-squares regression analysis with r^{-2} and ω^{-2} as known dependent (y) and independent (x) variables, respectively. Thus, the unknowns are a and b, which can both be computed with a standard least-squares method. As we have more than one pair of (x, y), the least-squares fit is unique. The estimated high-frequency limit of r equals $1/\sqrt{a}$, the estimated radiative damping time $(\sqrt{a}-1)/\sqrt{b}$. We have posed no further constraints on the regression analysis. We have included a more detailed description of the least-squares fitting procedure in the revised manuscript.

3) For the fitting procedure, variations with timescales shorter than about 4 days were omitted from the analysis, see p. 1404/1405. Non-physical high-frequency variability in the fields due to the adjustment of the assimilation model to a balanced state therefore should not affect the calculation of the radiative rates and the scaling parameter too much. Furthermore, Eq. (4) indeed does not incorporate the zonal-mean zonal momentum deposition due to breaking gravity waves, which is known to play an important role in the mesosphere. We have put more emphasis on these issues in the revised manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1399, 2006.