Atmos. Chem. Phys. Discuss., 2, S402–S403, 2002
www.atmos-chem-phys.org/acpd/2/S402/

Atmospheric Chemistry and Physics Discussions

ACPD
2, S402–S403, 2002

Interactive Comment

Interactive comment on "Redistribution of trace gases by convective clouds – mixed-phase processes" *by* Y. Yin et al.

Y. Yin et al.

Received and published: 13 September 2002

Replies to the specific comments:

1. Our results are generally consistent with the field measurements by Voisin et al. (2000). We found that gas transport is most sensitive to the value of retention coefficient (during riming) when the solubility is high. This can be explained by the fact that high solubility species such as strong acids are mainly present in the aqueous phase when riming occurs. Voisin et al. found that high solubility gases also have high retention coefficients, which implies that we need to look at the top-right corner of our figures 6 and 7 to estimate gas transport.

   We found that variations in the efficiency of gas uptake by growing ice particles have less effect on gas transport than variations in retention upon freezing, except for relatively insoluble gases. For example, for a moderately soluble gas with

Full Screen / Esc
Print Version
Interactive Discussion
Original Paper

$H^* = 10^4$ mol dm^{-3} atm^{-1}, changing the burial coefficient from 0 to 1 reduces the gas abundance in the outflow region by 30%, which may or may not be negligible depending on your point of view (compared with a factor of 12 change caused by changing R_c from 0 to 1).

2. The labels in Figs. 4 and 5 are modified based on the referee's suggestion.

3. Closer inspection of our model data shows that in the continental case the slight increase in integrated trace gas masses for gas solubility higher than 10^7 mol dm^{-3} atm^{-1} results from both gas and condensed phase concentration in the upper cloud layers. With an increase in gas solubility, more dissolved gas left in the condensed phase remains in the outflow region even after rain. We speculate that this accounts for the difference in characteristics from the maritime case in which most of the dissolved gas in the condensed phase is washed out.

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 875, 2002.