Response to referee's comments for "A parameterisation for the activation of cloud drops including the effects of semi-volatile organics"

The referee's comments to be addressed are given as bullet points in black text with our replies following in red text.

Anonymous referee #1

- Page 14452, line 12. Remove "Both". Why? The sentence reads `Both Abdul-Razzak et al. (1998) and Fountoukis and Nenes (2005) schemes define different forms of the integral to be evaluated'
- Page 14452, line. Replace "rates" with "rate". OK
- Page 14453, lines 4-5. This makes no sense. Please check for typos and then think it through. This appears to be an error in type setting. Our original manuscript read `To find dwl/dt at the critical supersaturation in Equation 10, Equation 13 is substituted into Equation 11, which is multiplied by Equation 2 and integrated between 0 and Smax. This yields'
- Page 14453, lines 8-9. Abdul-Razzak et al. do not neglect the first term in (14). They consider two different limits of behavior, and add them. I would say "Abdul-Razzak et al. (1998) use an approximation for the second term by Twomey (1959) to formulate an analytical expression". OK, thanks, we will make this clear.
- Page 14455, line 10. Replace "the in" with "in the". Thanks, will do.
- Page 14457. Specify how much semi-volatile organic is present. Ah yes we omitted this and will include it in a new draft. However, it is clearly visible from the figure if you would like to see it in the meantime.
- Page 14458, lines 14-16. This sentence suggests poor performance for all updraft velocities, which is inconsistent with what is stated in the previous two sentences. I see no need for it, so suggest you delete it. OK, we will do.
- Figure 8. How can the cumulative fraction activated for the Abdul-Razzak and Ghan scheme be greater than zero (and >0.2 with semi-volatiles) when the activated fraction is zero? This seems impossible. The activated fraction is not non zero (just very small). In any case the bins for the histogram have a finite width equal to 0.1 in activated fraction so the first bin isn't equal to zero activated fraction.
- Page 14461. The saturation of activation helps get droplet number correct when the treatment of condensation breaks down, but it doesn't help with wet removal of the semi-volatile organics. Please comment. We are not treating wet removal of the semi-volatile organics in the current paper. The reason the vapours are not removed in our simulations is because there is insufficient time for condensation of these vapours to happen. So clearly, the amount of vapour condensed in the cloud would depend on the cloud lifetime. Precipitation is also key: if we consider two clouds that both precipitate the same amount then the cloud that has a higher fraction of the organics in the cloud water will remove a higher fraction of the organic vapour from the atmosphere. If neither clouds precipitate then the organic will likely end up back in the vapour phase once the cloud evaporates (neglecting any condensed phase reactions).