**Atmospheric
Chemistry
and Physics
Discussions**

# *Interactive comment on* "Numerical simulation of tropospheric injection of biomass burning products by pyro-thermal plumes" *by* C. Rio et al.

**Anonymous Referee #2**

Received and published: 23 December 2009

This paper aims to generate global-scale simulations of wildfire injection, using a mass-flux parameterization of plume rise. This is an important next-step, beyond regional plume rise studies; in this case, it is aimed specifically at reproducing the diurnal $CO_2$ cycle in the middle and upper troposphere.

1. Page 4. I'm wondering if the units of "d" above Equation 1 are not "depth" (m), but rather "biomass burn rate per unit area" (kg-m/s), for Equation 2 to work out. On Page 9, however, d is given in meters. . .

2. Page 5, top. It might be clearer to describe alpha as the "fraction of a grid cell covered by the plume," rather than "the fractional cover of the plume."

3. Page 5, Equation 5. I'm having another units question, regarding the second (buoy-

ancy) term on the right side. This term seems to need units [kg-m**2/s**2], so might some function of density, or mass/length be missing?

4. I guess a general note is in order here – I've tried to re-derive the equations, and I'm having difficulty. This might be a matter of incomplete definitions, typos, or my lack of familiarity with this specific model, but I'm unsure about reviewing the Results sections being so unclear about the model.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18659, 2009.