**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "How important is the vertical structure for the representation of aerosol impacts on the diurnal cycle of marine stratocumulus?" *by* I. Sandu et al.

Anonymous Referee #2

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GENERAL

This paper demonstrates that a mixed-layer model may fail badly in simulating the response of a stratocumulus layer to a change in aerosol concentration. This happens because the deviations from the mixel-layer state can depend strongly on aerosol concentration, and as such cannot be represented correctly by a model that assumes a well-mixed boundary layer.

Overall, I found the paper to be well-written. There is relatively little I found to criticize (although, this could also be because I am not a specialist on this topic).

SPECIFIC COMMENTS:

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Interactive Discussion

Discussion Paper

1. p. 5467, line 20: Another recent study where the mixed-layer framework is used to study the impact of aerosols on subtropical stratocumulus clouds is that by Caldwell and Bretherton (J. Climate, vol. 22, p. 20-38).

2. p. 5472, line 9: in which sense is 2-3 K in 72 hours only a minor drift? In a NWP model, for example, it would be considered quite large.

3. p. 5479, lines 3-4: "assuming that the cloud optical properties are the same as in the LES simulations". Be specific about what you mean by optical properties here. When the LES and the EML have different LWP, at least the optical depth should differ too.

TECHNICAL CORRECTIONS:

The hyphen (-) is omitted in many places where it should be used. Some examples include:

- p. 5466, line 7: aerosol-induced

- p. 5466, lines 14-15: mixed-layer

- p. 5468: line 28: well-mixedness

- p. 5469, lines 22: Large-eddy

- p. 5471, line 7: large-scale

- p. 5472, line 22: time-invariant

- p. 5475, line 12: large-scale

- p. 5475, line 18: mixed-layer

- p. 5481, line 1: process-wise

- p. 5481, line 19: non-linear

Some typographic errors etc:

- p. 5470, line 5: should be "referred"

- p. 5471, line 25: I assume w_s is the subsidence rate.

- p. 5472, line 19: should be "flux values"

- p. 5475, line 3: remove comma (,) after "mechanism"

- p. 5482, line 27: replace "more important" with "larger"

- p. 5484, line 7: Sect 3.2 should be Sect. 4?

- p. 5485, line 20: remove comma after "not"

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5465, 2009.