

## ***Interactive comment on “Regional radiative impact of volcanic aerosol from the 2009 eruption of Redoubt volcano” by C. L. Young et al.***

**Anonymous Referee #2**

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Review of “Regional radiative impact of volcanic aerosol from the 2009 eruption of Redoubt volcano,” by C. L. Young, I. N. Sokolik, and J. Dufek

### General comments

This is a moderately comprehensive study of the radiative effects of a volcanic plume on the surface, atmosphere, and the TOA, albeit almost completely model based. An exception is that the model runs are constrained by measurements and aerosol properties derived from A-train satellites. The authors use those estimates of aerosol microphysical properties and AOD measurements to distinguish a sulfate-rich plume (old) from an ash-rich plume (young), and compare their respective radiative properties throughout the depth of the troposphere and lower stratosphere. They rely on MODIS AOD, which is fine over water, where most of the plume resides, but not so reliable over land. It

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is unfortunate that there were no surface measurements of AOD to compare to the MODIS product. Other than that and some problems with nomenclature, see specific comments, this is a well done, comprehensive study that could form the basis of a parameterization scheme and method that would integrate satellite data and modeling to better handle volcanic aerosols in climate models. The abstract is comprehensive but contains too much detail. Last, the title does not read well. Please insert “the Mt.” in front of Redoubt.

p. 26697, l. 3-4 What is the difference between “vertical placement” and “heights” in this sentence?

p. 26698, l. 11 Please explain what an “ash reduction level” is.

p. 26699, l. 10-13 What does the sigma refer to in eq. 1 and 2?

p. 26702 The columns of images in figures 3 and 4d are not explained in the text or figure captions, nor are they clearly distinguished in the figures themselves.

p. 26705, l. 14 For clarity, I recommend that “each AOD” be changed to “each measured AOD”

p. 26706-7 I would suggest that referring to  $55^\circ$  as the “higher zenith angle” and  $75^\circ$  as the “lower zenith angle” may be confusing to readers unfamiliar with the nomenclature used in atmospheric radiation. I would suggest that instead of “high zenith angle,” you refer to those situations as “high sun ( $SZA=55^\circ$ ),” and similarly, “low sun ( $SZA=75^\circ$ ).”

p. 26708, l. 22 I think that you really mean “thick plume over seawater” at the end of this line.

p. 26711, l. 25 The reference here is to Fig. 16a here, not 17a, correct?

p. 26712, l. 3 Likewise, the reference here is to Fig. 16b here, not 17b, correct?

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 11, 26691, 2011.

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