

Interactive comment on “Algorithmic Differentiation for Cloud Schemes” by Manuel Baumgartner et al.

Anonymous Referee #2

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The manuscript “Algorithmic Differentiation for Cloud Schemes” by Baumgartner et al., applies Algorithmic Differentiation (AD) to the cloud scheme of the IFS model. The paper is a nice introduction of the AD method and shows an example of its use for identifying parameters for which the IFS cloud scheme is sensitive to during cloud formation and evaporation. The paper is well and clearly written and the topic fits well in the scope of Geoscientific Model Development. I have only minor comments and requests for clarification. Once they have been addressed, I can recommend publishing the paper.

Minor comments

Some of the statements in Introduction require references:

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- Page 1: Cloud droplet from aerosol activation and rain droplet formation through coagulation processes are explained without references.
- Page 2: The uncertainty of cloud scheme parameters is discussed without references or examples of what these parameters are.

The statement that algorithmic differentiation is “largely unused in meteorological contexts” does not seem valid. For example, the first references following this statement describes the use of AD with MM5 weather prediction/climate projection model. Not that there, there are two Bischof et al., 1996 references which should be identifiable.

Page 2, Line 29: What do you mean with the term “the most promising”?

The reasoning in the following sentence may not be clear to the reader without knowing how the formation of cloud water is treated in the model: “The reason of not choosing $q_c(0) = 0 \text{ kg kg}^{-1}$ is our neglectance of the activation mechanism, so we need a nonzero initial value for the cloud water mass in order to observe cloud formation..”

Why the neglectance requires a nonzero initial value? Why not just say that Equation (12a) requires a nonzero initial value.

Page 5, Line 7: derivative for → derivative of

Page 10, Line 11: Isn’t autoconversion the most relevant process decreasing the cloud water mass rather than accretion 900s into the simulation? When rain starts to form at approx 900s, autoconversion moves water from cloud water to rain water as explained in the next paragraph.

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