Interactive comment on "The University of Victoria Cloud Feedback Emulator (UVic-CFE): cloud radiative feedbacks in an intermediate complexity model" *by* David Ullman and Andreas Schmittner

K. Gierens (Editor)

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I have a few comments/questions concerning several equations in the manuscript. Please consider them for your revised version.

1) Eq. 3: a better explanation of f is needed. How does the choice of f guarantee that α_{atm} remains bounded by 0 and 1? Also it should be stated that S in equation 2 is identical to $SW_{in,TOA}$ in eq. 4.

2) Eqs. 11 and 12: The argument that albedo values are not additive leads you to formally consider the ratio $\alpha_{atm,perturbed}/\alpha_{atm,CERES}$ in eq. 11, however it is necessary to subtract one from this ratio. Mathematically, we then have the difference of the

albedo values back, since

$$(\alpha_{atm,perturbed}/\alpha_{atm,CERES}) - 1 = (\alpha_{atm,perturbed} - \alpha_{atm,CERES})/\alpha_{atm,CERES}.$$

In eq. 12 this expression is then multiplied by $\alpha_{atm,CERES}$, and the simple difference of the albedo values returns back. So this argumentation seems to add unnecessary complexity.

3) Eqs. 12 and 15: I wonder whether these equations are used at every timestep. If so, how do you distinguish climatological temperature variations from diurnal and seasonal temperature variations? Should a feedback not work only on the long climatological time scales? Furthermore, are these equations applied to each grid point independently or are they averaged over, e.g., latitude zones?

4) Page 11, line 4: Why do you write $F_{2\times CO_2} = F_{4\times CO_2}/2$ when there is a logarithmic relation between radiative fluxes and the CO_2 concentration? Is this close to linear because the absolute change is very small?