

## ***Interactive comment on “A simple model for cloud radiative forcing” by T. Corti and T. Peter***

**T. Corti**

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We thank Referee #2 for his or her thorough and positive review which is valuable for the revision of the manuscript, as detailed in our answer below.

Answer to general comment: The reviewer wishes to obtain more information about the assumptions made to develop the equations. We will follow this suggestion and expand the discussion of our assumptions as suggested in the Referee's specific comments. We will also add a summary of assumptions, conditions and needed input parameters in the revised manuscript.

Answer to specific comments:

1. The reviewer points to an inconsistency in our discussion of the radiative forcing. It is true that our definition of CRF is different to the IPCC definition. However, it is  
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equivalent to the definition by Chen et al (2000). We will therefore define radiative forcing in the introduction with reference to Chen et al (2000) and discuss the differences to the IPCC definition.

2. We introduce Equation 5 with reference to Stephens et al. (1990). As suggested by the Referee, we will state the approximations that went into that equation. We will also improve on the discussion of the uncertainty involved in the derivation of  $\Delta^*$ .
3. Concerning the discussion of Eq (10) through (13), we agree that it needs some improvements. Eq (11) is in its original form only accurate at small optical depths. As the referee suspects, our derived  $\gamma^*$  makes it applicable to a larger range of optical depth. We will mention this in the revised manuscript and indicate the uncertainty of using a fixed value for  $\gamma^*$ . Eq (12) is derived under the assumption that the diffusive upward radiation is isotropic. We will add this specification.
4. We agree that we should mention that the largest uncertainty in Figure 4c is where the transition from heating to cooling occurs for optically dense clouds. We thank the referee for pointing this out. This will help avoiding misapplications of our simple approximations.
5. It is true that our paper was developed as part of the SCOUT-O3 tropical mission. The equations were however derived based on radiative transfer calculations based on a range of global atmospheric conditions from ECMWF ERA 40 reanalysis data and a wide range of optical thicknesses. Our parameterization is therefore globally applicable. We realize however that we should stress this point and will do so in the revised manuscript.