Response to reviewer 1

We would like to thanks the reviewers for their many helpful comments and appreciate their careful reading of this paper. We hope that their constructive reviews will lead to an improved paper. We will address the comments in the order received, highlighting them in italics.

(1)The abstract will be extended. The new abstract will read as follows:

The Parallel Offline Radiative Transfer (PORT) model is a stand-alone tool, driven by model-generated datasets, that can be used for any radiation calculation that the underlying radiative transfer schemes can perform, such as diagnosing radiative forcing. In its present distribution, PORT isolates the radiation code from the Community Atmosphere Model (CAM4) in the Community Earth System Model (CESM1). The current configuration focuses on CAM4 radiation with the constituents as represented in present- day conditions in CESM1, along with their optic properties. PORT also has an implementation of stratospheric temperature adjustment under the assumption of fixed dynamical heating, which is necessary to perform radiative forcing computations in addition to the simpler instantaneous radiative forcing. The model can be extended to use radiative constituents from other models, model simulations and/or other radiation models. As illustrations, we perform the computation of radiative forcing from doubling of carbon dioxide, from the change of tropospheric ozone concentration from year 1850 to 2000, and from aerosols illustrates the use of PORT. The radiative forcing from tropospheric ozone (with respect to 1850) generated by a collection of model simulations under the Atmospheric Chemistry and Climate Model Intercomparison Project is found to be 0.34 (with an intermodel standard deviation of 0.07) W/m**2**. Present day aerosol direct forcing (relative to no aerosols) is found to be -1.3 W/m**2**.

(2)*Radiation Model Description*: We will expand the second paragraph in the introduction as follows:

The Community Earth System Model, (CESM1) and the Community Atmosphere Model version 4 (CAM4, [Gent et al., 2011]), use a radiation parameterization developed by [**?**], [**?**], and [**?**]. The CAM4 radiation parameterization computes the scattering and absorption of shortwave (solar) radiation by the atmosphere and surface, as well as the absorption and emission of longwave radiation by the atmosphere and surface. This parameterization applies to atmospheres from about 1mb (because of the lack of non-local thermal equilibrium parameterization and additional absorption) to the surface. The shortwave radiative transfer solver assumes plane parallel composition and is a 2-stream method. The longwave radiative transfer is an absorption-emission computation with no scattering. The radiation parameterization includes optical effects of water vapor, methane, ozone, halocarbons, sulfuric acid stratospheric aerosols, ammonium sulfate aerosols, dust, aerosols, carbonaceous aerosols, sea salt aerosols, nitrous oxide, carbon dioxide, water and ice clouds, and molecular oxygen. Of course, the methods can be expanded to implement any radiatively active constituent for which the user can construct and include the required optics. In the longwave there are 7 bands and in the shortwave there are 19 bands. It also includes optical characterizations of the surface and time-dependent spectral characteristics of the solar irradiance, including solar cycle variability and sun-earth geometry.

Gent, P. R., Danabasoglu, G., Donner, L. J., Holland, M. M., Hunke, E. C., Jayne, S. R., Lawrence, D. M., Neale, R. B., Rasch, P. J., Vertenstein, M., Worley P. H., Yang, Z.-L., and Zhang, M.: The community climate system model version 4, J. Climate, 24, 4973–4991, 2011.

(3) *Comparison with other models*: We will add the following paragraph and two references.

Stevenson et al. (2012) provides an extensive comparison of tropospheric ozone radiative forcings as computed using PORT or the Edwards-Slingo radiative transfer scheme (1996). for the same collection of 8 different model ozone distributions, the stratospherically adjusted net (shortwave + longwave) radiative forcing is 326±100 mW/m2 using PORT and 361±68 mW/m2 using Edwards-Slingo. As both approaches lead to similar results, this confirms the usability of PORT as a tool for radiative forcing calculations, instantaneous or stratospherically adjusted.

Edwards, J. M. and Slingo, A.: Studies with a flexible new radiation code. I: Choosing a configuration for a large-scale model, Q. J. Roy. Meteorol. Soc., 122, 689–719, 1996.

Stevenson, D. S., Young, P. J., Naik, V., Lamarque, J.-F., Shindell, D. T., Voulgarakis, A., Skeie, R. B., Dalsoren, S. B., Myhre, G., Berntsen, T. K., Folberth, G. A., Rumbold, S. T., Collins, W. J., MacKenzie, I. A., Doherty, R. M., Zeng, G., van Noije, T. P. C., Strunk, A., Bergmann, D., Cameron-Smith, P., Plummer, D. A., Strode, S. A., Horowitz, L., Lee, Y. H., Szopa, S., Sudo, K., Nagashima, T., Josse, B., Cionni, I., Righi, M., Eyring, V., Conley, A., Bowman, K. W., and Wild, O.: Tropospheric ozone changes, radiative forcing and attribution to emissions in the Atmospheric Chemistry and Climate Model Inter-comparison Project (ACCMIP), Atmos. Chem. Phys. Discuss., 12, 26047-26097, doi:10.5194/acpd-12-26047-2012, 2012.

(4)*The question of why to work with an offline model was raised*. We will add the following paragraph in the introduction:

The definition of radiative forcing requires the computation of radiative transfer with surface and tropospheric states fixed at unperturbed values. An offline radiation code is an ideal tool to implement this definition, as long as we have demonstrated that no significant biases are introduced by using limited time sampling. An offline model also allows for testing of 1) different radiative transfer methods, 2) alternate optical characterization of aerosol and cloud optics, 3) sensitivity to spatial distributions of chemical species, 4) sensitivity to solar irradiance, 5) surface radiative characterizations, 6) role of specific distributions of constituents (from observations or other models without the effects of atmospheric and surface responses.

(5) All the "SPECIFIC COMMENTS" of Referee #1 will be implemented.

Additional note: in the process of reviewing our results, the scale markings on Figure 3 are off by a factor of 2. We will provide a new figure with a corrected scale where the heating rates are twice as large. This was due to unit conversion error. This does not affect our conclusions.