Offline radiation calculations for RFMIP-IRF

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This short note provides guidance in using the set of atmospheric profiles provided by the Radiative Forcing Model Intercomparison Project to compute radiative transfer so that the accuracy of radiation parameterizations may be assessed. The calculation is outlined in the RFMIP protocol description (doi:10.5194/gmd-9-3447-2016).

The file `multiple_input4MIPs_radiation_RFMIP_UColorado-RFMIP-0-3.0_none.nc` provides atmospheric and boundary conditions to be used for radiative transfer. The file contains 100 atmospheric profiles defined in 60 layers (61 levels). Eighteen sets of conditions are provided to span present-day, pre-industrial, hypothetical future conditions, and various idealized scenarios. Please provide broadband longwave and shortwave fluxes at all 61 levels on this grid.

The atmospheric conditions sampled from ERA-Interim reanalysis. Information on the original time and location of each column is provided but this is only for transparency. Please use the radiative boundary conditions provided in the file (total solar irradiance, solar zenith angle, surface skin temperature, surface albedo and emissivity) rather than values from a simulation.

Solar (shortwave) calculations are not requested for those columns (roughly half) for which the solar zenith angle exceeds 90 degrees.

We have provided concentration fields for all the very many gases in the CMIP6 specification (doi:10.5194/gmd-2016-169). Climate modeling centers should follow the greenhouse gas specification to be used for simulations in CMIP6, either a) implement a subset of the 43 greenhouse gases (please report which); b) use the carbon dioxide, methane, nitrous oxide, and CFC-12 values provided, along with `cfc11eq` as a proxy for all other greenhouse gases; c) use the carbon dioxide, methane, and nitrous oxide values provided, along with `cfc12eq` and `hfc134aeq` as proxies.

Our specification departs from the CMIP protocol in that all greenhouse gases except water vapor and ozone are assumed to be uniformly mixed throughout the atmosphere. (Variable names ending in _GM denote global means.)

As of version 0.3 ozone concentrations for future scenarios are not available so results will change for experiment_label `"future" all`.

Gas concentrations are provided as volume or molar mixing ratios with respect to dry air. The `units` attribute of each concentration field indicates parts per million/billion etc.

Global mean fluxes may be computed by apply the `profile_weight` field.

Final results will be published on the Earth System Grid which requires quite tightly-controlled netCDF files with one experiment_label per file. Example files may generated using the Python script `generate-output-file-templates.py`.

Please feel free to contact me with any questions or concerns.