

# New Radiative Transfer Code for CCSM4

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# Topics

- Why change RT code now?
- SE concerns
- Code design
- Init/Run phases
- Please ask questions as we go!

# New Science

- Gas spectroscopy
- New broadband methods
- Aerosol optics (SW and LW)
- Cloud microphysics (dynamic size, type, number concentration)

# Application Needs

- Need greater accuracy
- Traceability (Where did this number come from?)
- Contexts: CAM, WACCM, Single-Column-Model, Offline, WRF

# Science Requirements

- Flexibility (Constituents and optics)
- Flexibility for cloud geometry and inhomogeneity (ICA - subcolumns)
- Standardize constituent specification
- Offline repeatability (Data output)
- Comparison to line-by-line computations

# Potential Candidates

- Bugsrad from CSU
- They are comparing with RTMIP
- Nothing integrated with CAM yet
- RRTMG from AER
- Will compare with RTMIP soon
- They have integrated with CAM3.4

# SE Concerns

- Speed
- Memory Footprint (scalability)
  - gas, aerosol, cloud optics parameter
- Portability (machines/compiler)
- Thread/task safe
- Portability (other software contexts)
- Improve interfaces

## CAM or Offline Driver

Collects Configuration Info (namelist)  
Calls LW and SW with physical  
(sub)column(s)

## RT Code

Converts physical column  
to fluxes and heating rates

## Optics Module

Converts constituents  
to radiative properties,  
mixes optics

## Rad\_constituents

Registers gases  
Registers aerosols  
Pointer to data

## Other components

Subcolumn/Cloud  
generator  
Surface/Top B.C.s (state?)



# Initialization Phase

- Read optical data for clouds, aerosols, and gases (RT)
- Register all possible sources of constituent data (CAM)
- Register namelist RT configurations (Rad or Radtest) (CAM)
- Verify optics and constituents for RT configurations are present (CAM,RT) and are the same (how?)

# Summary

- New science requires new RT code
  - Spectroscopy
  - Contemporary RT methods (Accuracy)
- Concerns: scalability, speed
- Target an improvement in SE standards for interfaces.