



**BESM**  
Brazilian Earth System Model

# Testes, Ajustes e Validação do código de Radiação RRTMG: Rapid Radiative Transfer Model

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Grupo: Atmosfera

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Ministério da  
Ciência, Tecnologia  
e Inovação





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## Índice



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### RRTMG - SW

- Coeficientes de absorção são obtidos diretamente do modelo line-by-line LBLRTM
- Fluxos e taxas de aquecimento são obtidos para 14 bandas espectrais.
- Fontes de extinção considerados são: H<sub>2</sub>O, CO<sub>2</sub>, O<sub>3</sub>, CH<sub>4</sub>, O<sub>2</sub>, N<sub>2</sub>, aerossóis e espalhamento Rayleigh.
- Uso do algoritmo Two-Stream para realizar cálculos de espalhamento.
- Utiliza o método de Monte Carlo para representar variabilidade de nuvens em escala de subgrade.

### RRTMG - LW

- Coeficientes de absorção são obtidos diretamente do modelo line-by-line LBLRTM
- Fluxos e taxas de aquecimento são obtidos para 16 bandas espectrais.
- Fontes de extinção considerados são: H<sub>2</sub>O, CO<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O, CH<sub>4</sub>, O<sub>2</sub>, N<sub>2</sub> e diversos halocarbonos (CFC-11, CFC-12, CFC-22, e CCL<sub>4</sub>).
- Utiliza o método de Monte Carlo para representar variabilidade de nuvens em escala de subgrade.

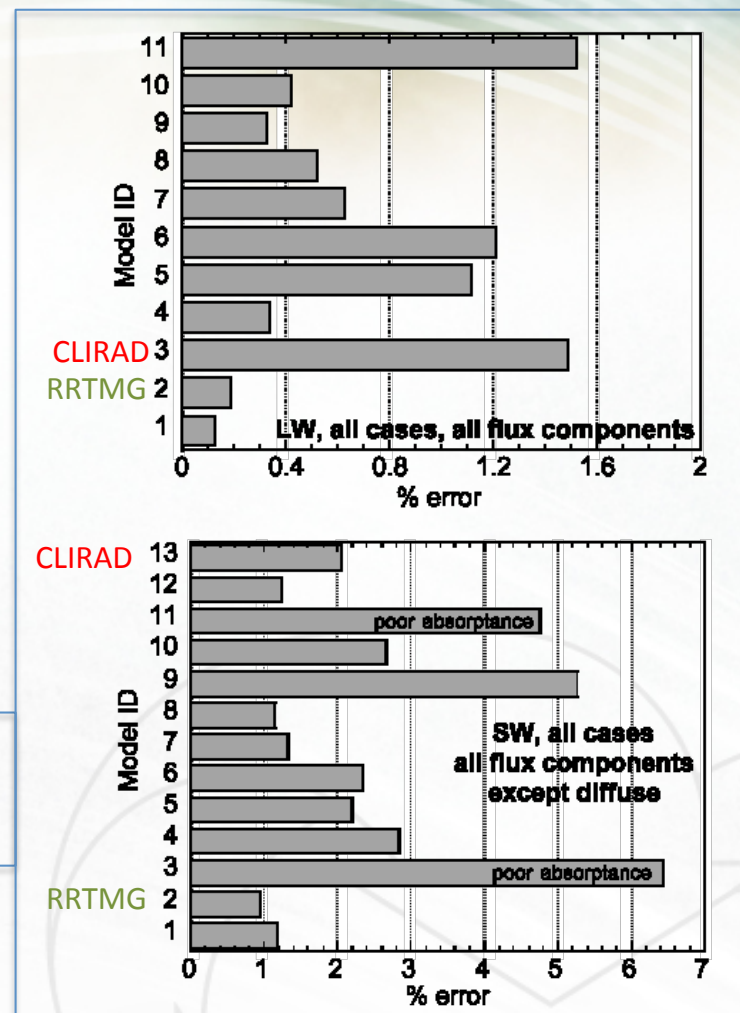
## Por que o RRTMG?

Presente nos principais modelos dinâmicos:

- WRF-ARW
- NCAR CAM5 e CESM1
- NASA GEOS-5
- NCEP GFS, CFS, RUC
- ECMWF IFA e ERA40
- ECHAM 5

Apresenta os menores erros (CIRC)  
(Oreopoulos et al., JGR, 2012)

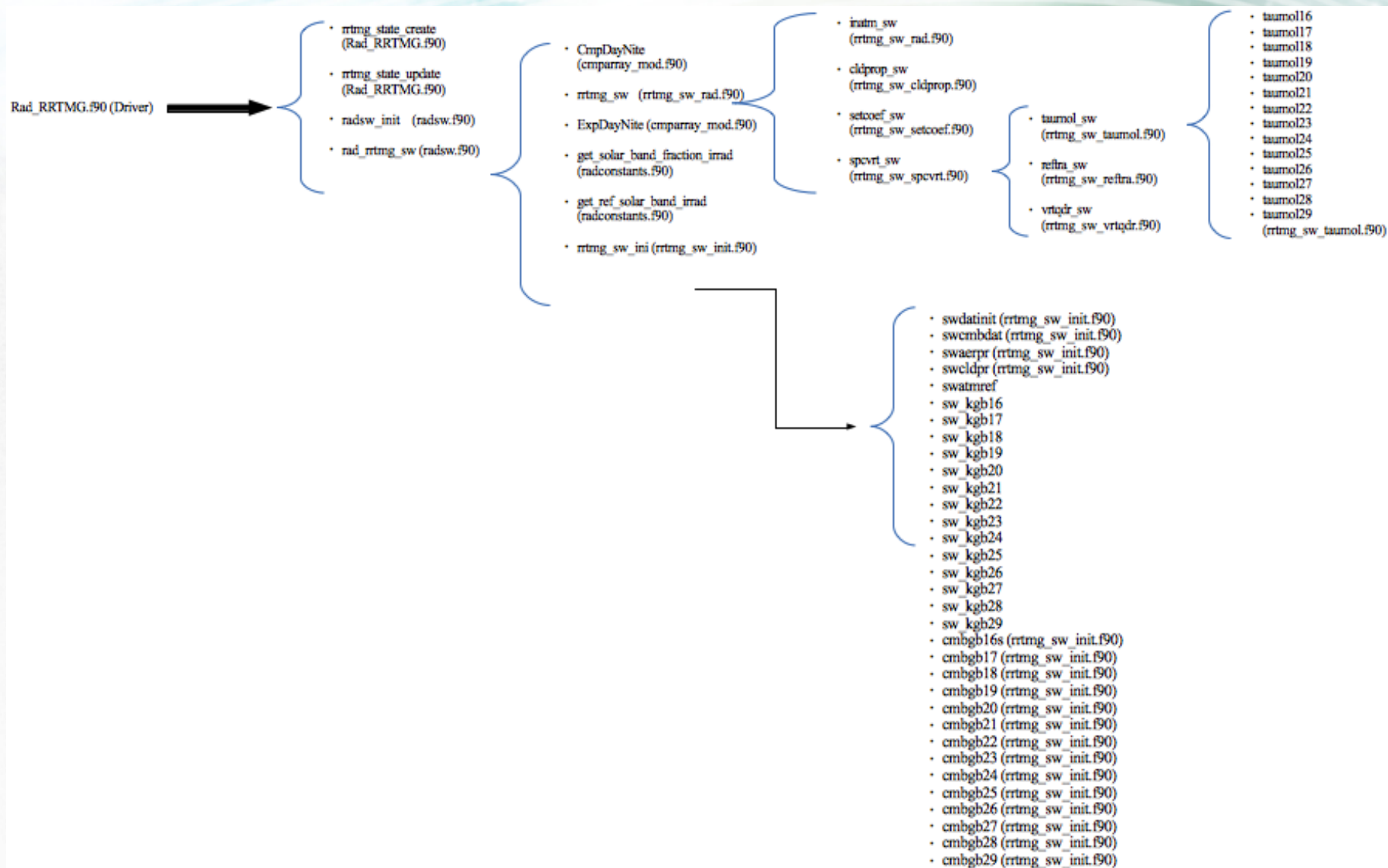
Está preparado para receber Propriedades Ópticas de **Aerossóis**





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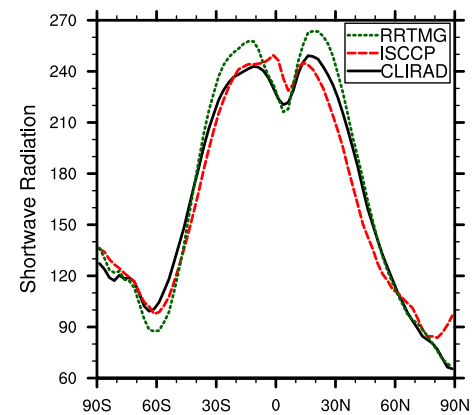
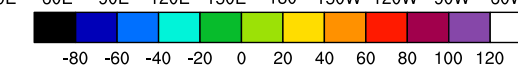
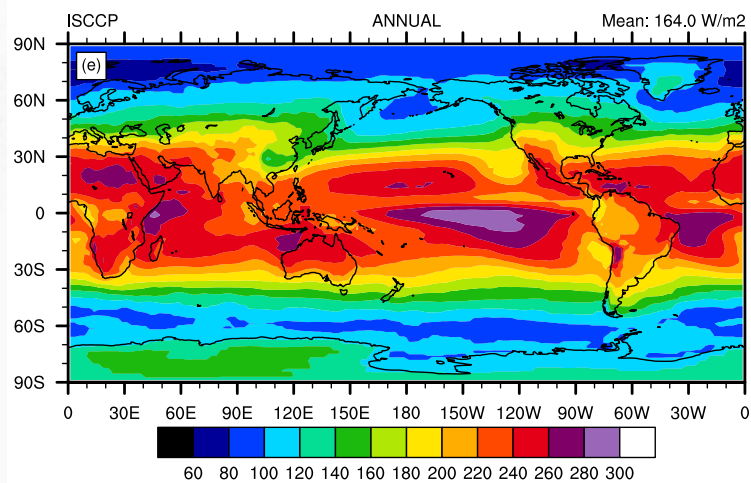
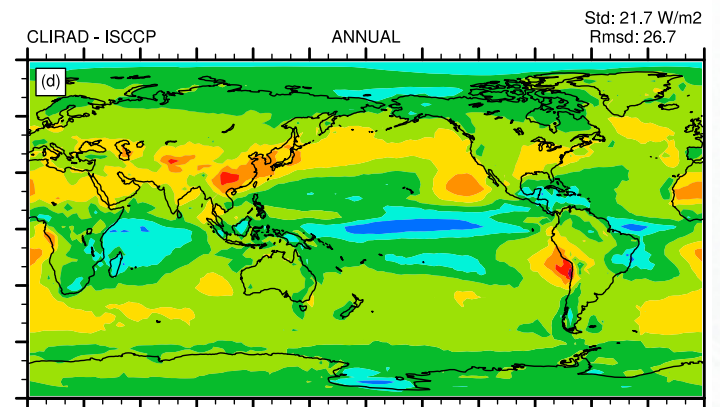
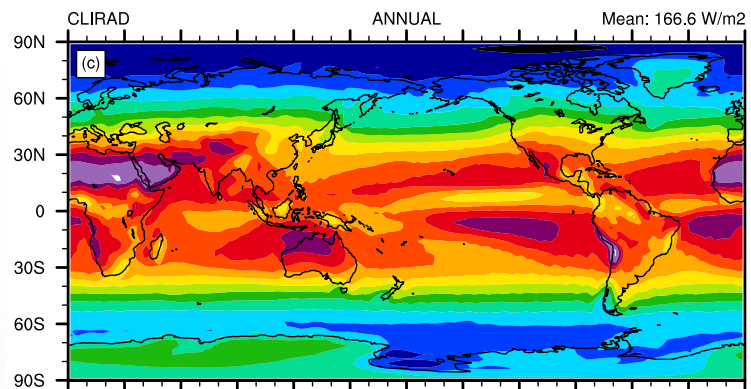
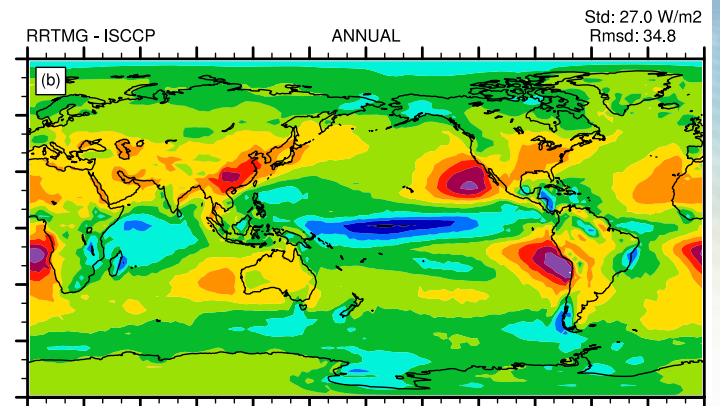
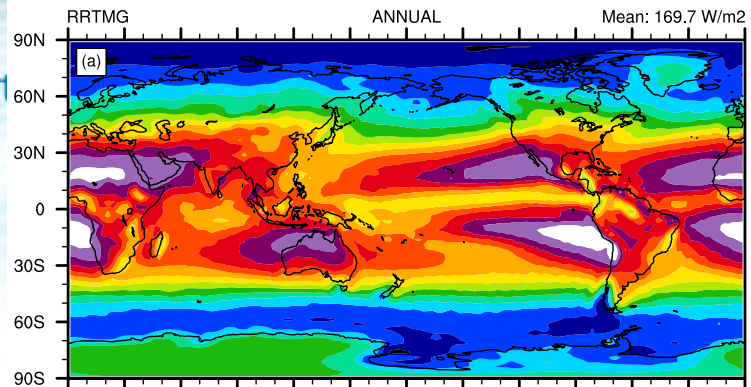
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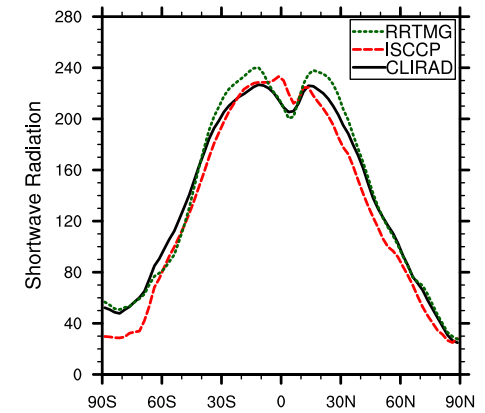
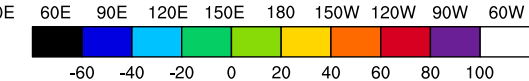
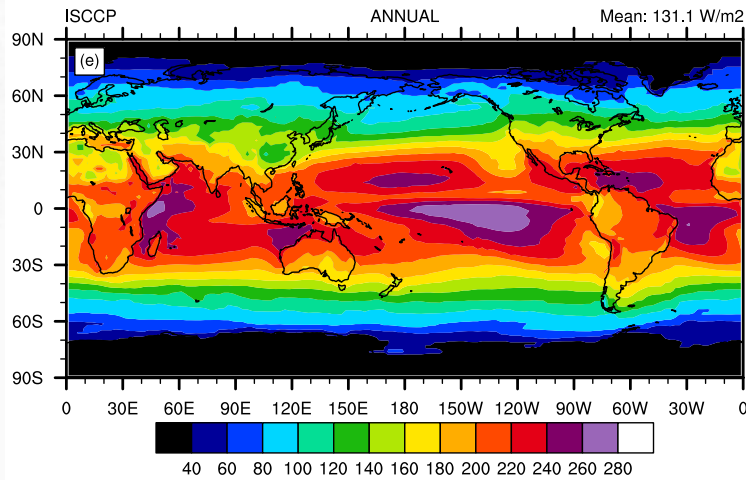
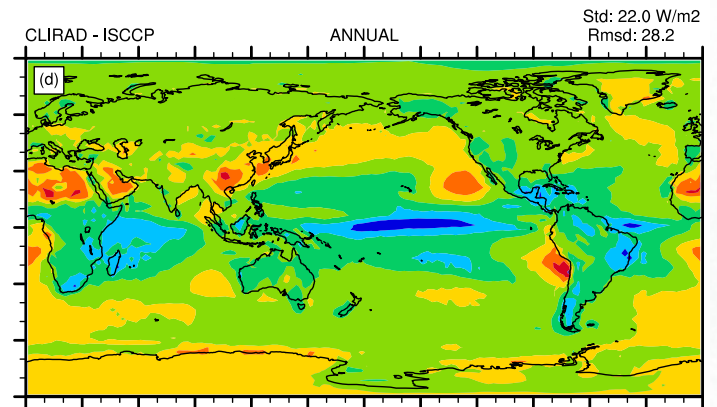
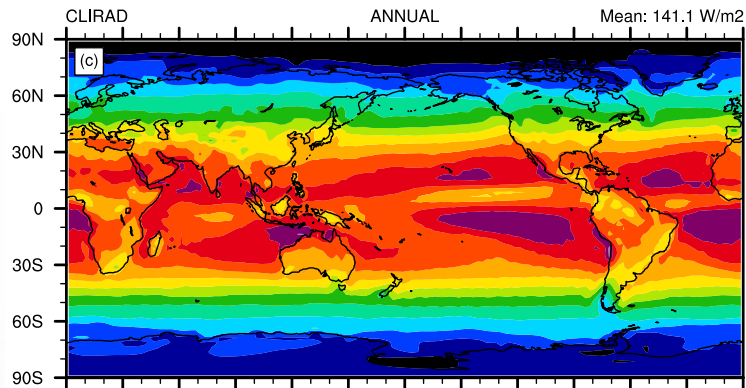
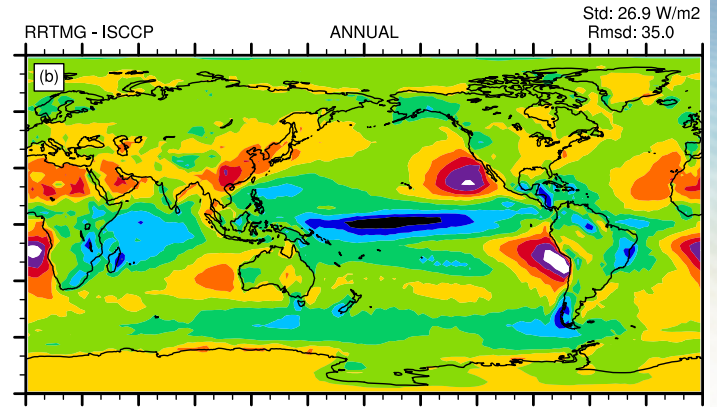
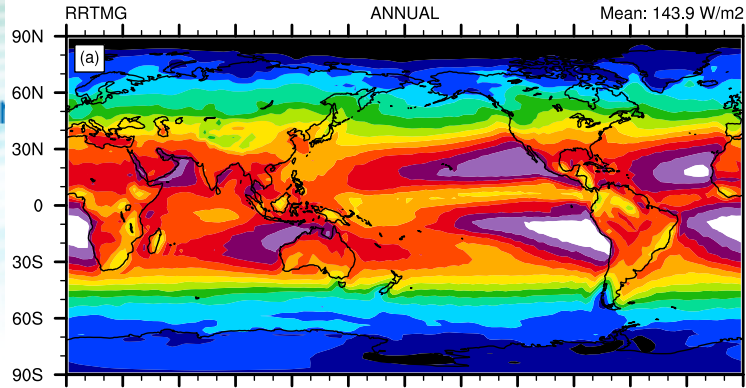
### Downward Shortwave at Ground





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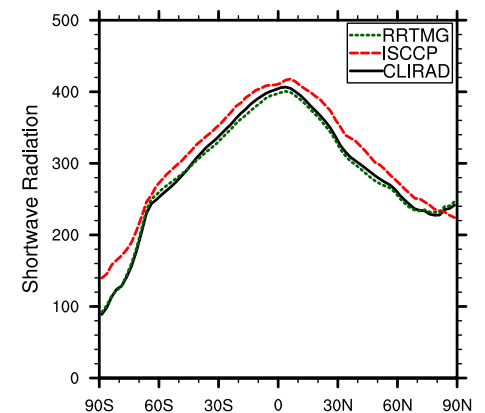
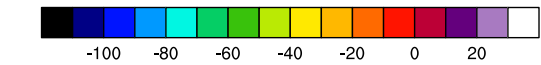
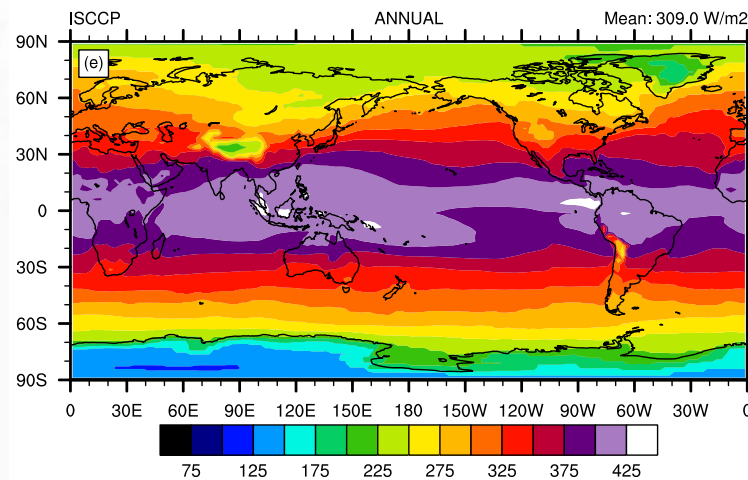
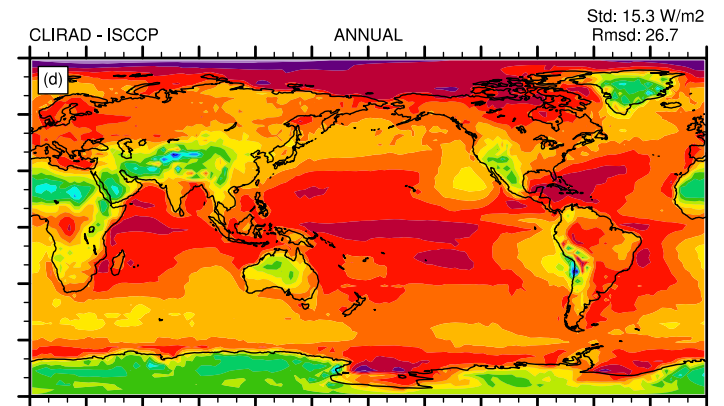
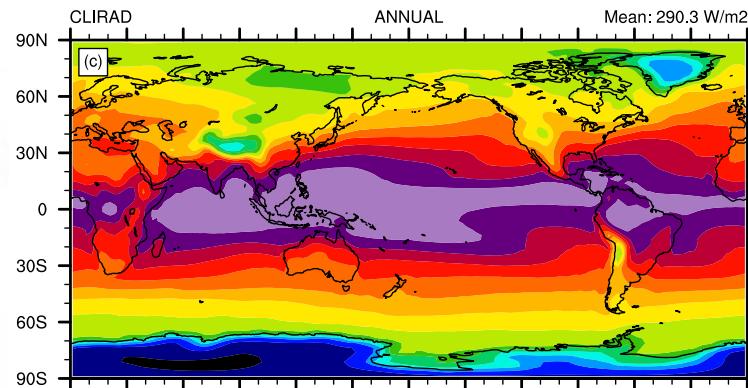
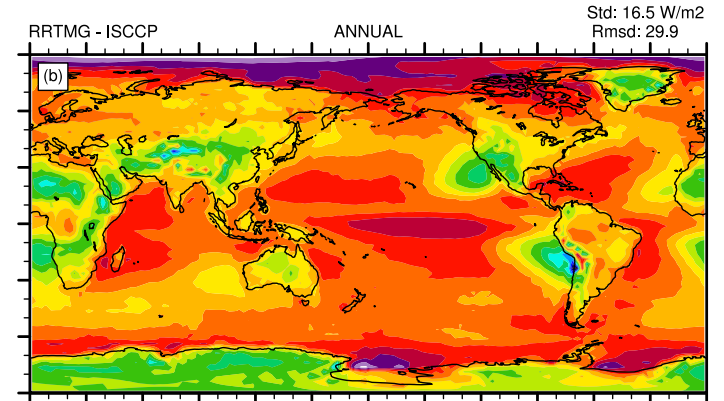
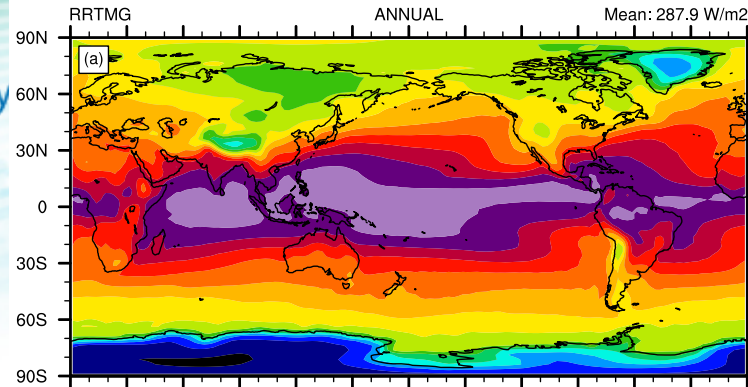
### BOC at Ground





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### Downward Longwave at Ground

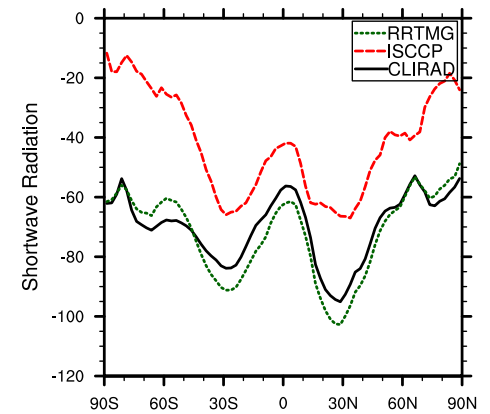
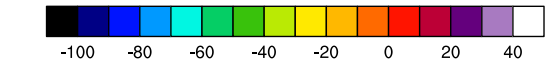
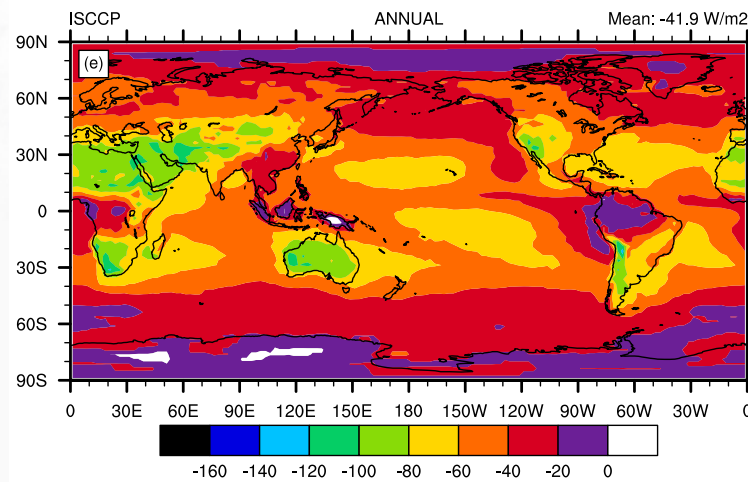
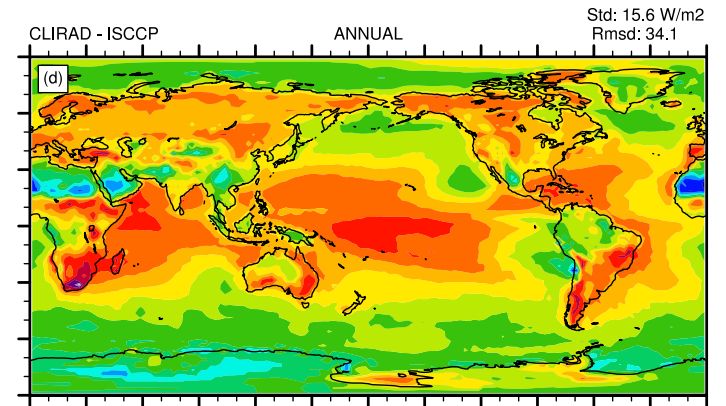
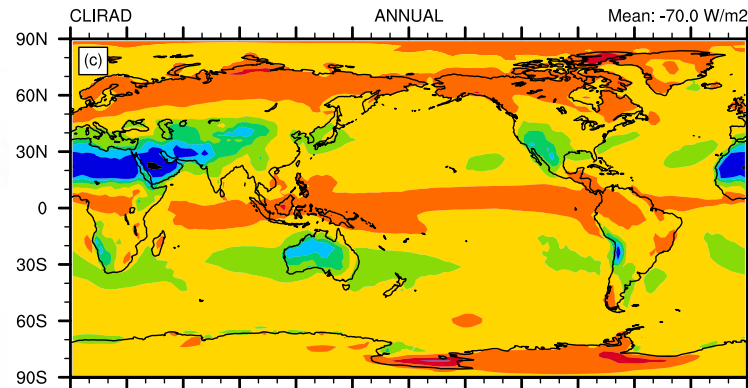
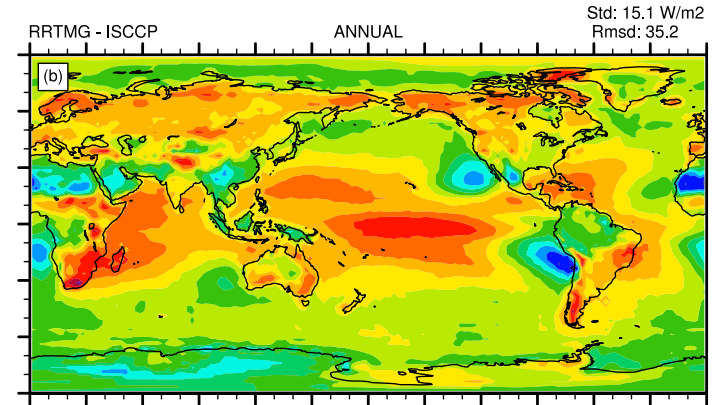
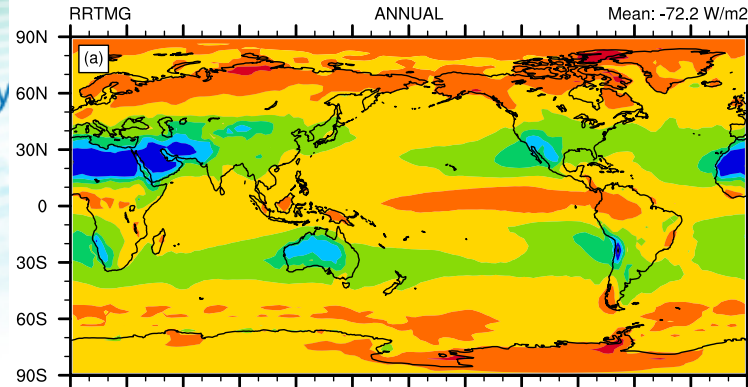






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### BOL at Ground





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### Net Radiation at Ground

