

Radiative energy flows in the atmosphere Observations vs. Modeling

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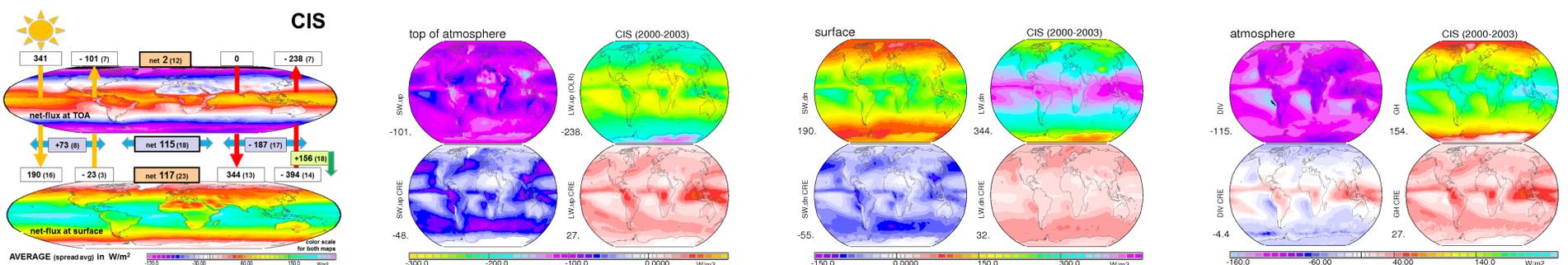
Questions

- How consistent are radiative energy flows based on (satellite based) observations ?
- What are major causes of diversity in (satellite based) observations (and climate modeling) ?
- Are there systematic differences between (based satellite) observations and climate modeling?

Data Sources

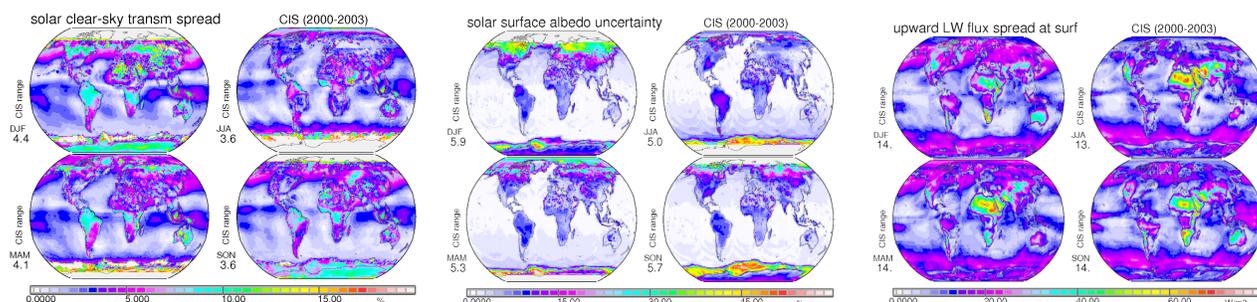
(satellite) observations: CERES, ISCCP and SRB average ('CIS') (2000-2003 period)
 climate modeling: CMIP3 / IPCC4 model ensemble (local / monthly) interquartile averages (1980-1999 period)

Observations - radiative fluxes and contributing cloud radiative effects of CIS



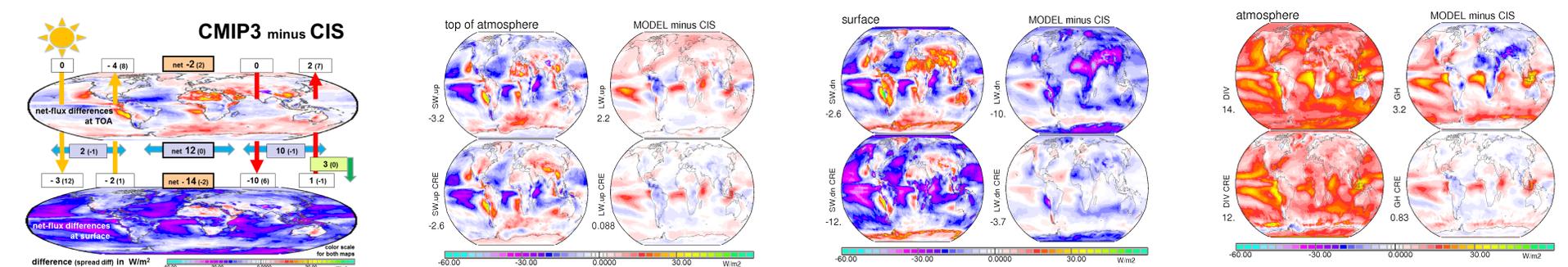
annual mean fluxes and maps for net-fluxes at TOA and surface (panel 1), maps for annual upward SW and LW fluxes at TOA (panel 2), maps for annual downward SW and LW fluxes to the surface (panel 3) and maps for annual atmospheric divergence and LW Greenhouse Effect (panel 4). Also indicated are distributions of contributing cloud radiative effects (in the lower graphs of panels 2 to 4).

Diversity in Observations - mainly an ancillary data quality problem



range between CERES, ISCCP and SRB in applied ancillary data
 seasonal ranges are presented for
 - **solar surface albedo** (left)
 - **clear-sky solar transmission** (center)
 - **LW upward fluxes off surface** (right)

Differences between modeling and observations



differences in annual mean fluxes and difference maps for net-fluxes at TOA and surface (panel 1), difference maps for annual upward SW and LW fluxes at TOA (panel 2), difference maps for annual downward SW and LW fluxes to the surface (panel 3) and difference maps for annual atmospheric divergence and LW Greenhouse Effect (panel 4). Also indicated are contributing differences of cloud radiative effects (in lower graphs of panels 2 to 4).

Take home messages

- (satellite) observations often suffer from low quality ancillary data
- high quality ancillary data are important for reliable surface and atmospheric fluxes of (satellite) observations
- differences between observations and modeling at TOA are driven by differences in cloud radiative effects
- differences between observations and modeling are very large at the surface (net-flux in modeling is much lower)



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