

Introduction

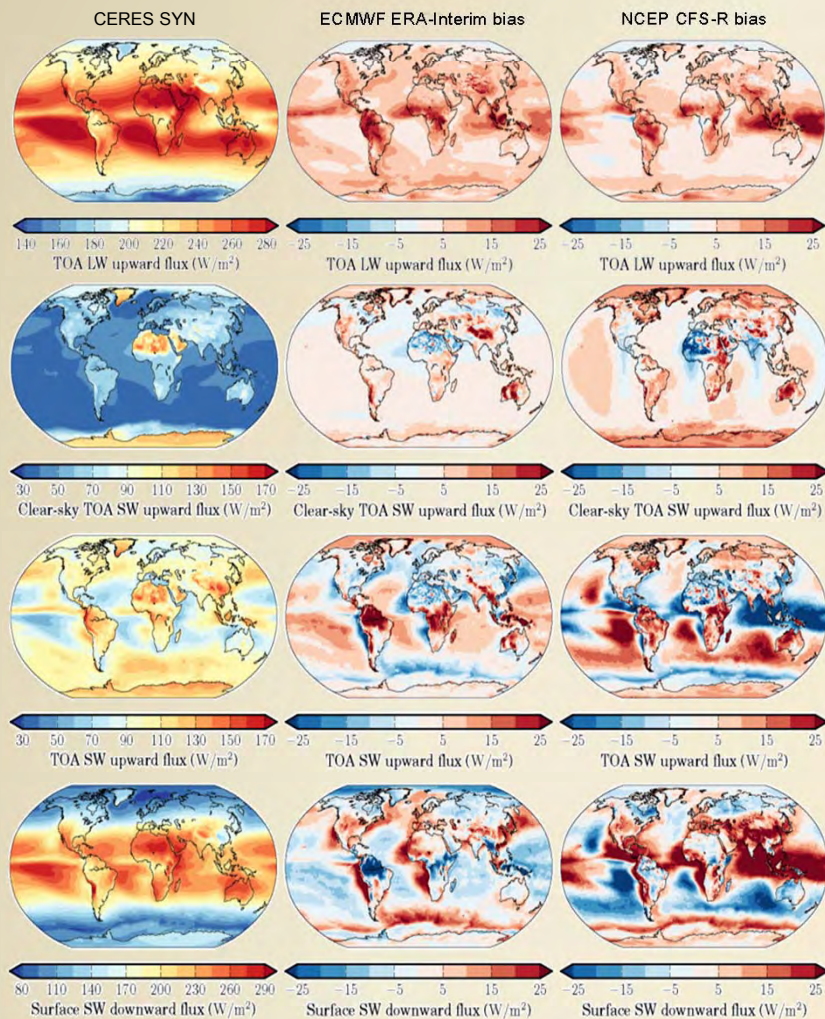
- Reanalysis output from numerical weather prediction (NWP) models is being used as our best representation of the actual state of the atmosphere.
- Cloud properties are generated by model parameterizations and largely unconstrained by assimilated data.
- Cloud properties control the model radiation budget.
- How well does reanalysis output simulate global and regional radiation budgets?

Comparing Data and Reanalysis Output

- CERES SYN data set (June 2000 to June 2005)
 - a) TOA CERES fluxes
 - b) Surface fluxes computed using observed profiles of radiatively important species
- NCEP CFS-R and ERA-Interim output (June 2000 to June 2005)
 - a) Means computed from 6-hour averages
 - b) Output interpolated to CERES 1 equal angle grid

Global Energy Fields

(Each panel show CERES data followed by difference plots (model – data) for both reanalysis datasets)



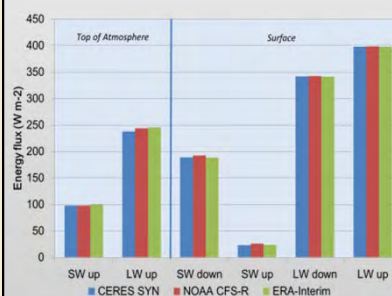
TOA LW up: generally good agreement but overprediction in tropical convective areas => insufficient cloud amount or optical depth.

Clear sky TOA SW up: generally good agreement but some issues with land surface reflectivity.

TOA SW up: substantial errors due to clouds; CFS-R has unusual signature with too much reflectivity in southern hemisphere and too little in northern hemisphere tropics and subtropics.

Surface SW down: approximately the inverse of TOA SW up (as expected).

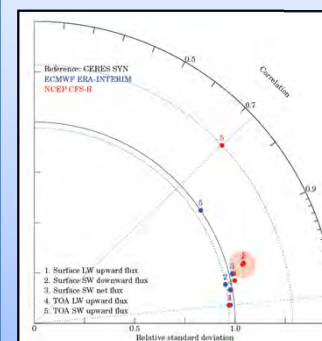
Global Energy Budget (Annual Average)



Net Total Energy (units of W m-2)

	TOA net	Surface net
CERES	5.5	110
CFS-R	-0.5	110
ERA-I	-1.3	108

Taylor diagram



- Plot agreement of reanalysis fields with data using the relative standard deviation (radial axis) and the correlation of (azimuth)
- Agreement good (>95% correlation) except for TOA SW up
- For TOA SW, ERA-I correlation significantly better than CFS-R

Conclusion

- Global energy budget terms (TOA and surface) agree well
- Substantial differences from data (>10%) in regional energy budgets, particularly in SW TOA and SW down
- Due to variations in cloud properties
- **Currently unable to identify error sources in cloud properties due to lack of cloud profile and cloud properties data in reanalysis dataset**