



Energy and water cycle climatology: present status and future direction

Bing Lin, C. Adam Schlosser, and NEWCC team

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Key areas

- Radiative energy: SW, LW & net
TOA & surface
- Precipitation
rainfall, drizzle, snowfall
- Turbulent fluxes: sensible & latent heat
ocean, land surface
- Storage
land: moisture; ocean: heat
- Runoff, discharge

Key areas



- Horizontal heat and moisture transports
TOA, atmosphere, ocean
- Vertical profiles
atmospheric states & heating rates
radiative heating, precip. latent
- Cold area processes
ice sheet, frozen soil & thaw
- Energy and moisture consistencies
assimilation results, blended data,
satellite results

NEWCC plan



- **Progress: initial phase**
October 2007 ~ present
- **Short term goals**
by this fall
- **Middle term goals**
within next year or next 1.5 years
- **Long term goals**
at the end of Phase 1 of NEWS program

Progress



Zonal means: 2003 - 2005

- Precipitation: GPCP
- Radiation: CERES, SRB, ISCCP
- Sea surface turbulence: RSS, HOAPS
- Land surface: model assimilated results
- Atmospheric states: Aqua merged data

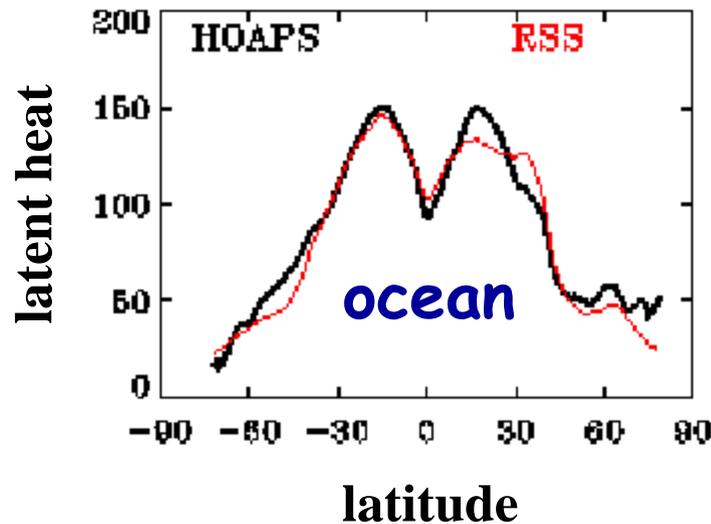
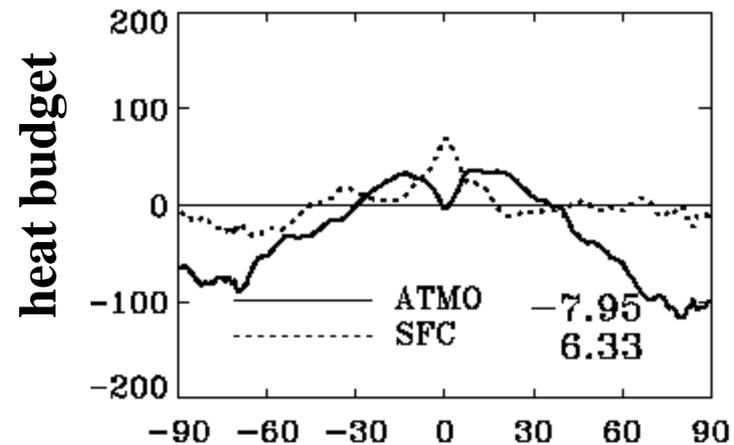
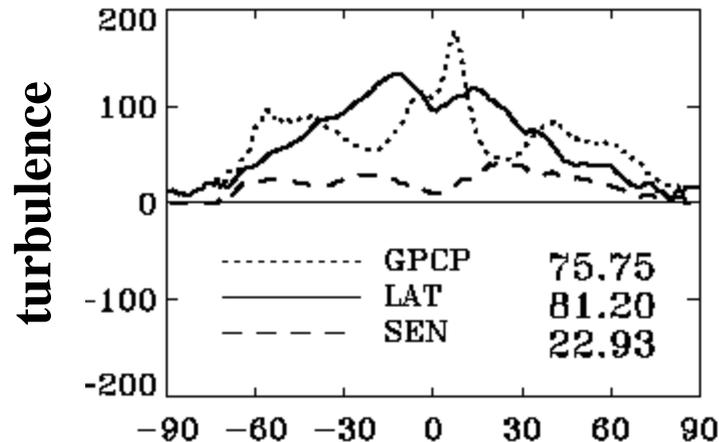
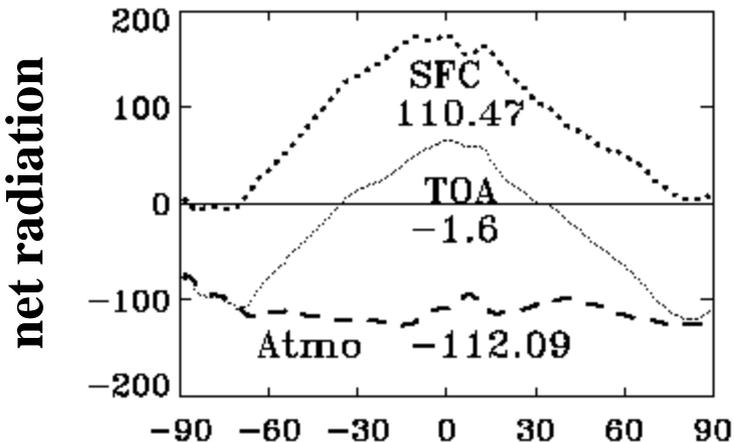
Progress



new products

- Horizontal moisture transport:
 QuikScat
 passive microwave measurements
- Storage: GRACE (delivered ??)

Atmos. heat budget (2003)



unit: W/m^2

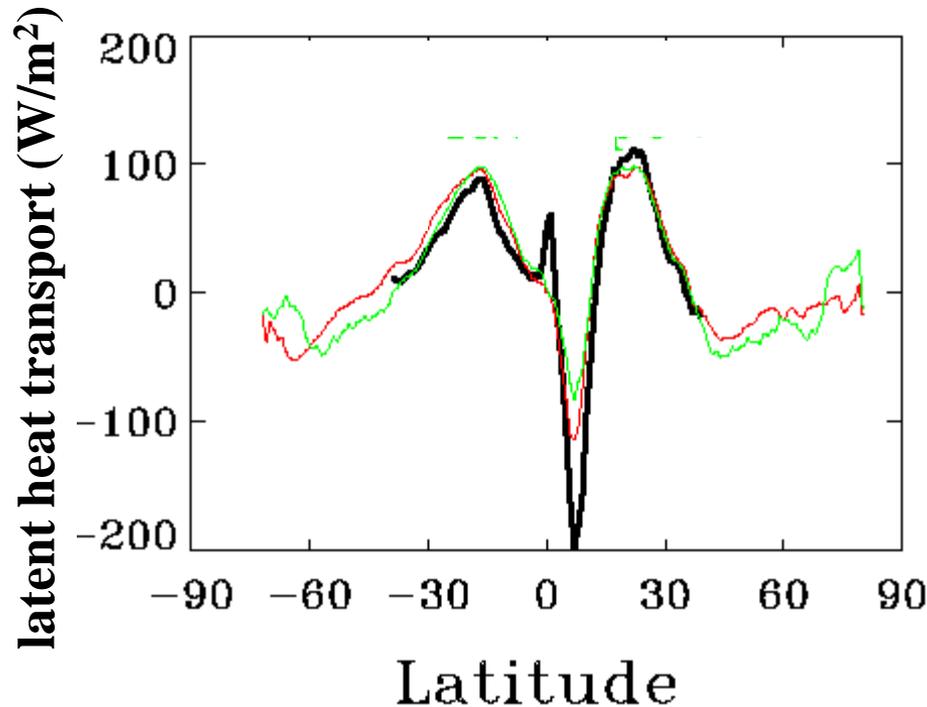
budget: HOAPS, MOSAIC & SRB

Atmos. heat budget (2003)



latest progress

atmospheric latent heat, or moisture: transport?



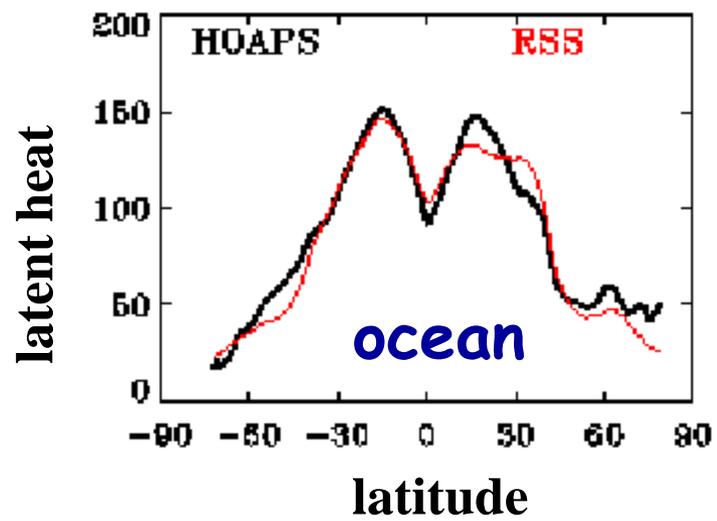
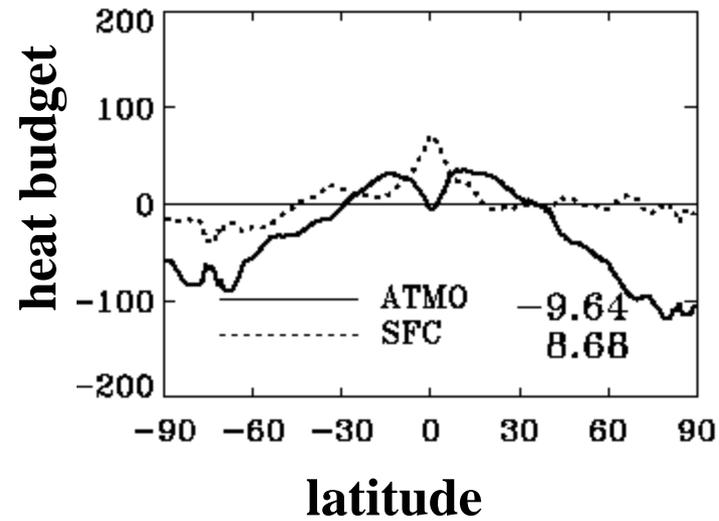
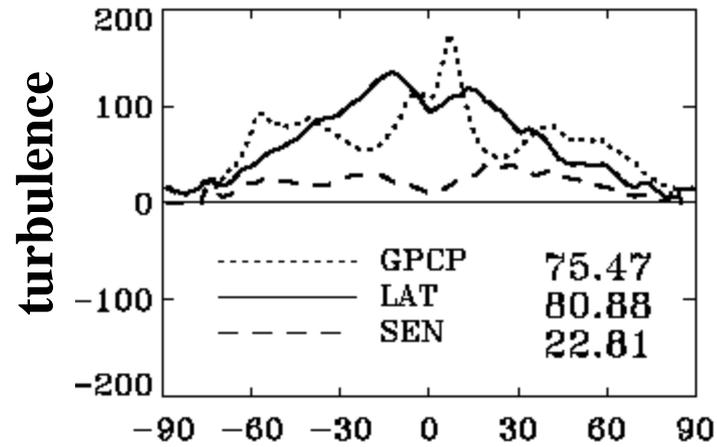
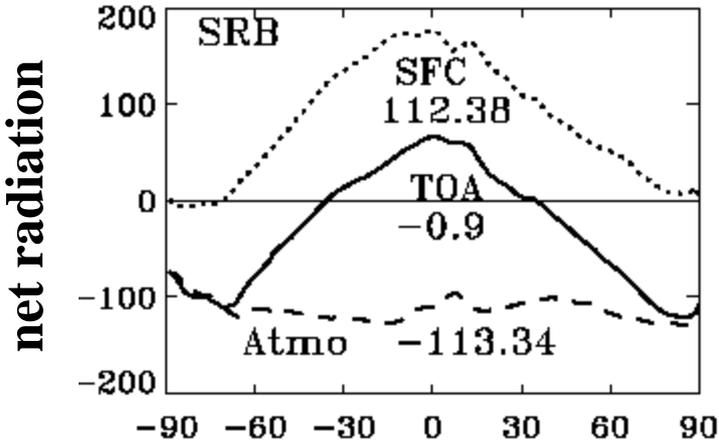
Red: HOAPS evap-rr
Grn: HOAPS evap-gpcp
Blk: QuikScat horizontal moisture transport

QuikScat moisture transports: very similar results as E-P

Atmos. heat budget (2003-2005)



HOAPS+MOSIC



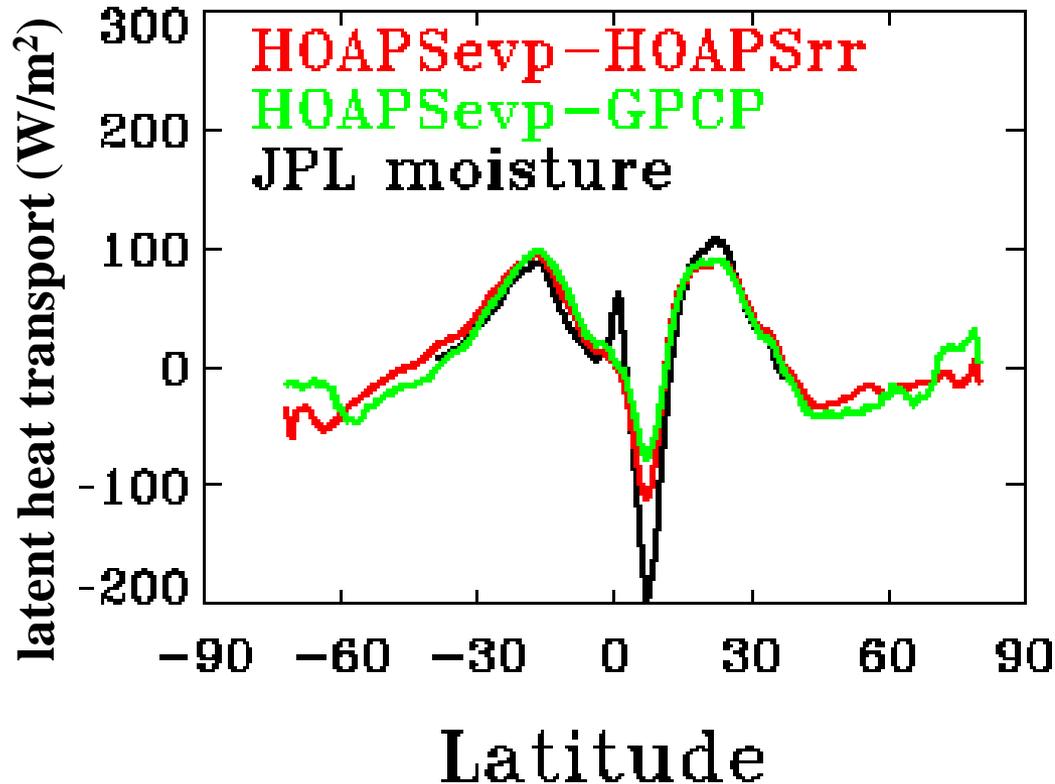
unit: W/m^2

budget: HOAPS, MOSAIC & SRB

Atmos. heat budget (2003-2005)



latest progress

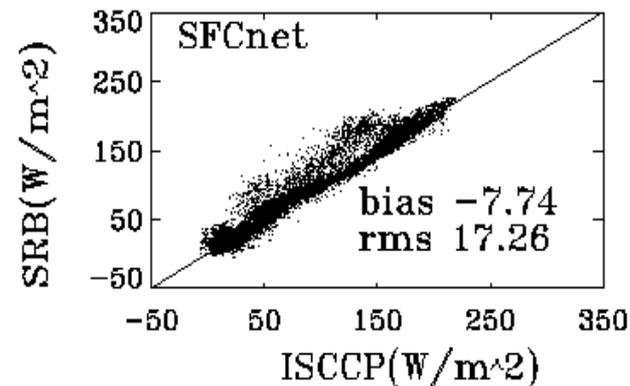
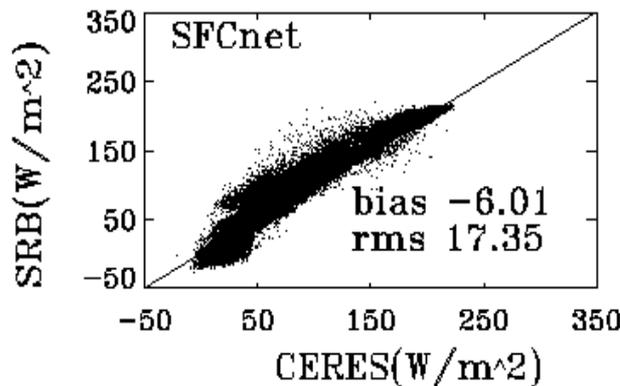
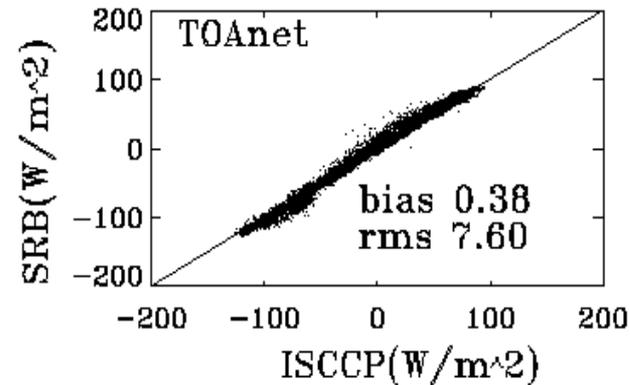
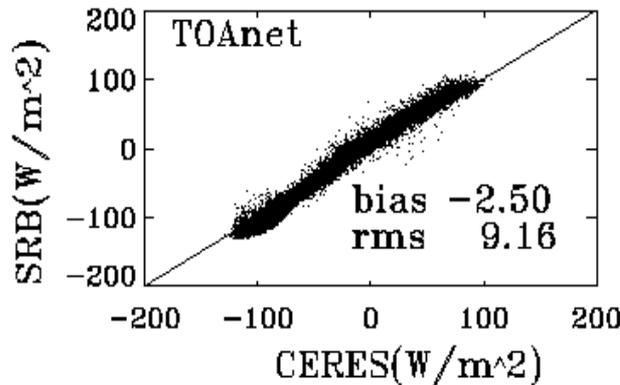


QuikScat moisture transports: very similar results as E-P
Big differences are found along ITCZ.

Short term goals (by fall 2008)



- Transition from zonal to gridded data
 - ❖ Spatial: global, $2.5^\circ \times 2.5^\circ$ or $1.0^\circ \times 1.0^\circ$
 - ❖ Temporal: monthly, 2003 ~ 2005

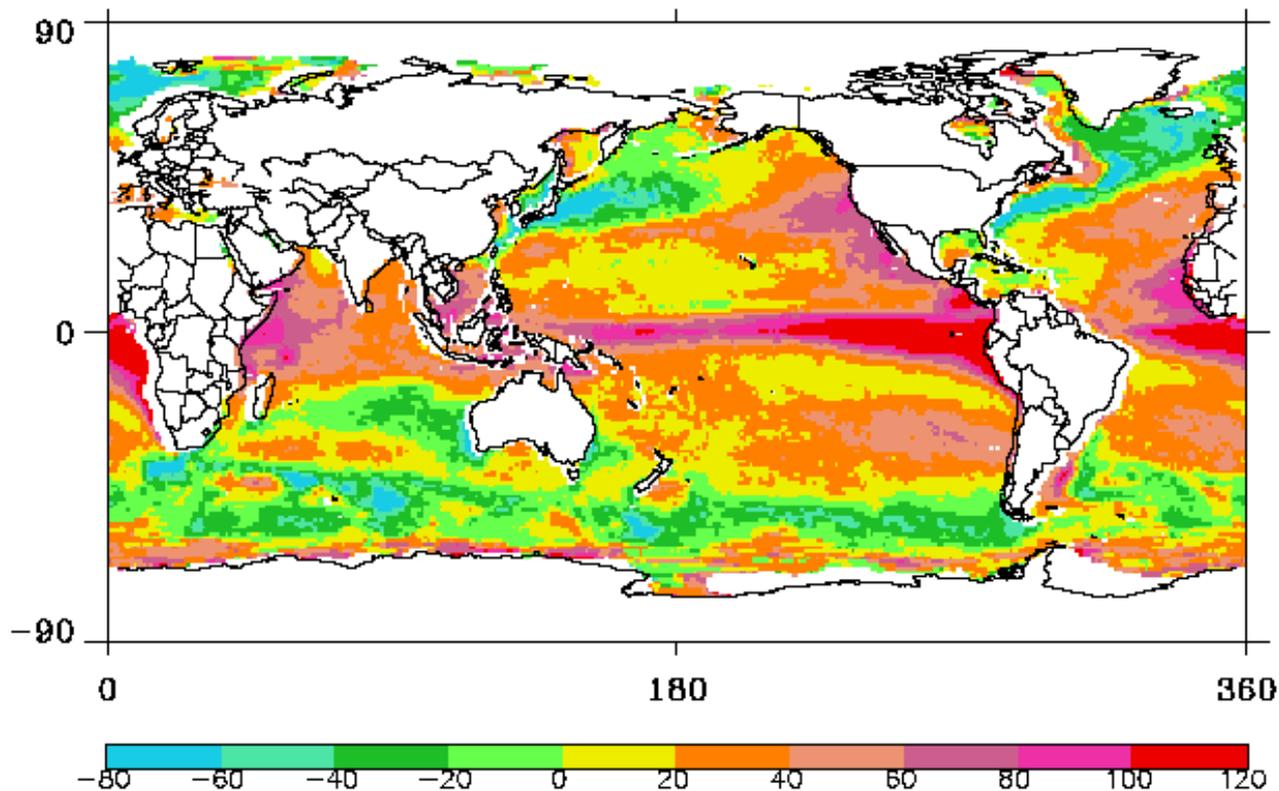


2000
 $1.0^\circ \times 1.0^\circ$

Short term goals



- Most data sets are ready.
sea surface heat budget for 2000
(land forced to balance with radiation)



Middle term goals



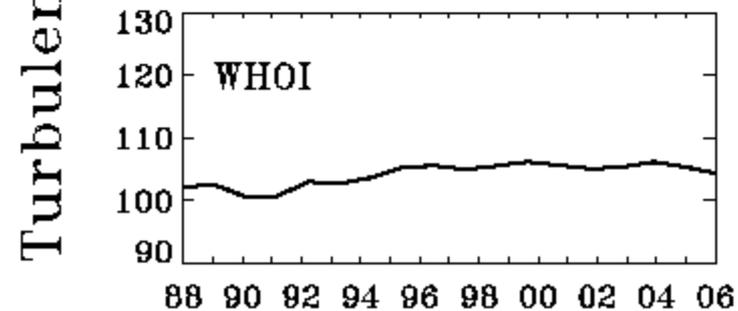
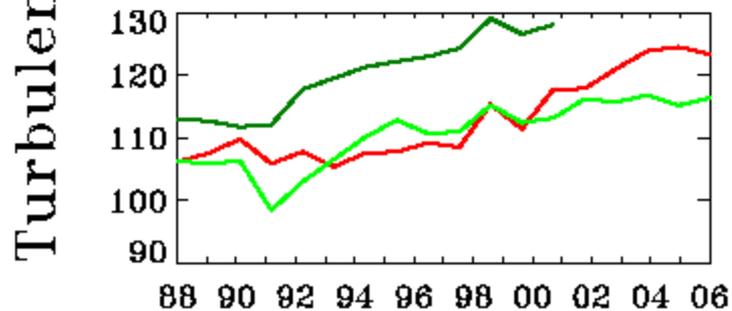
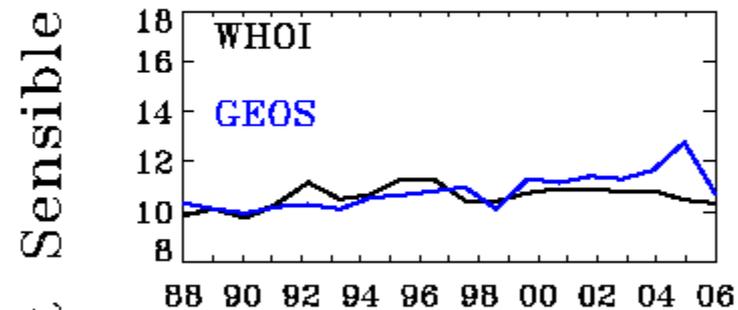
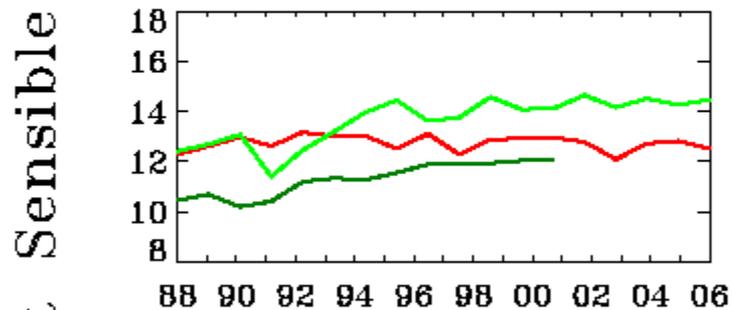
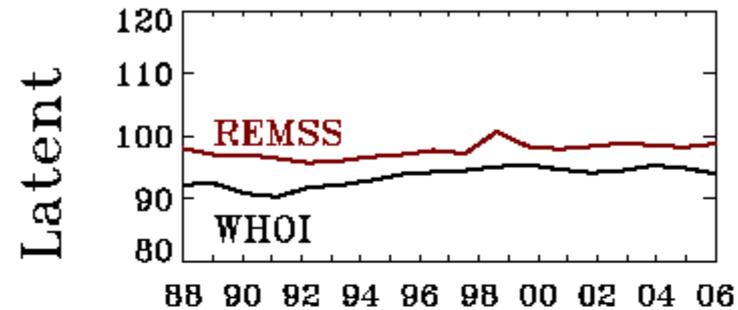
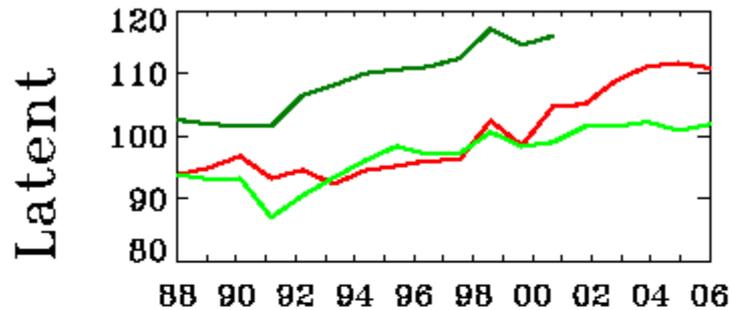
- Extend the monthly data to daily
 - ❖ Within a year
 - ❖ Ready (??): yes for radiation, precip.,
- Extend backward to 2000 (within 1.5 yrs)
- New data sets
 - ❖ Vertical profiles
 - ❖ NEWS funded sea fluxes
- Integrated assessment
 - ❖ Assessment: global WEC budgets
 - ❖ Uncertainties in components

more turbulent measurements

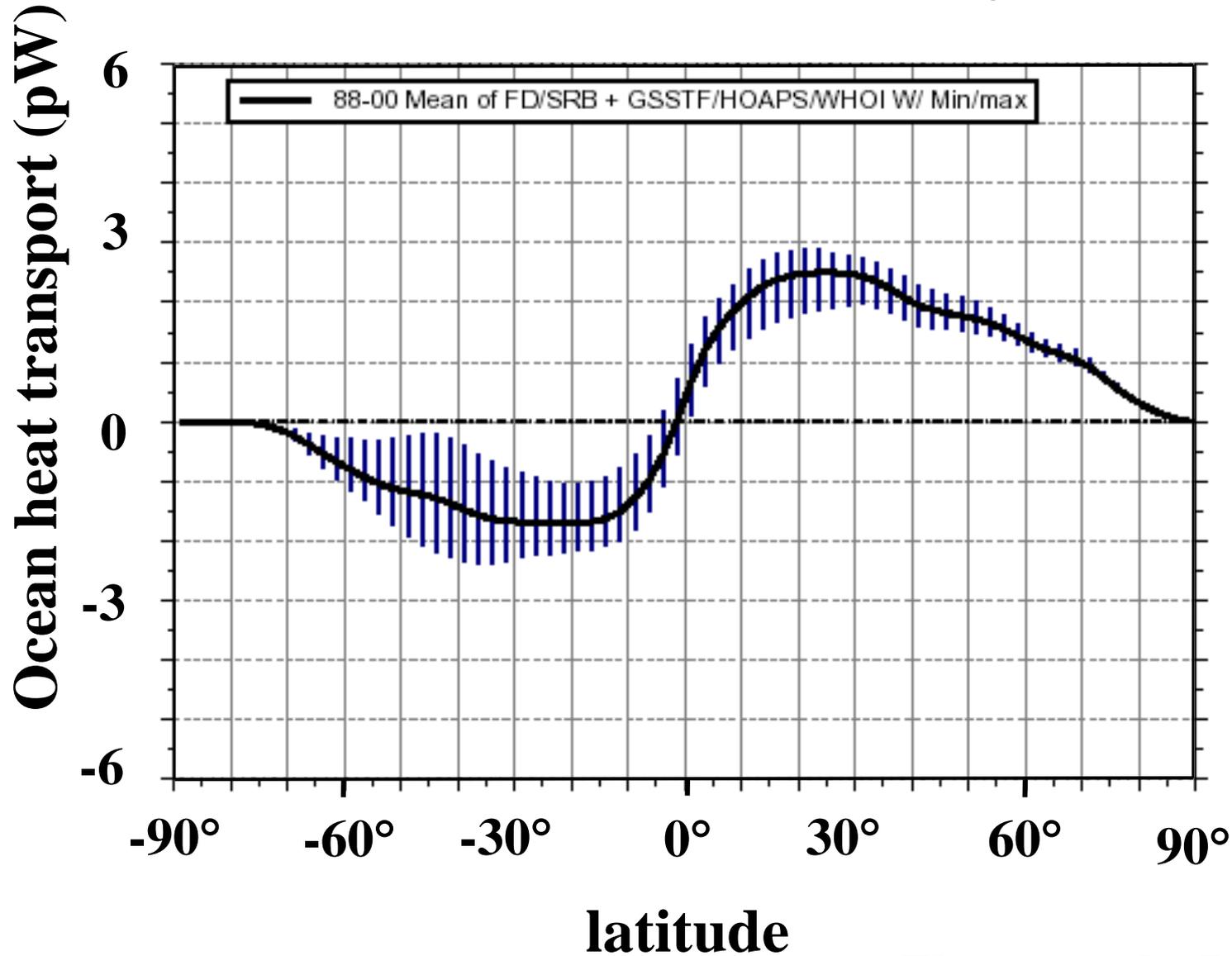


large biases & spurious trends: SSM/I calibration

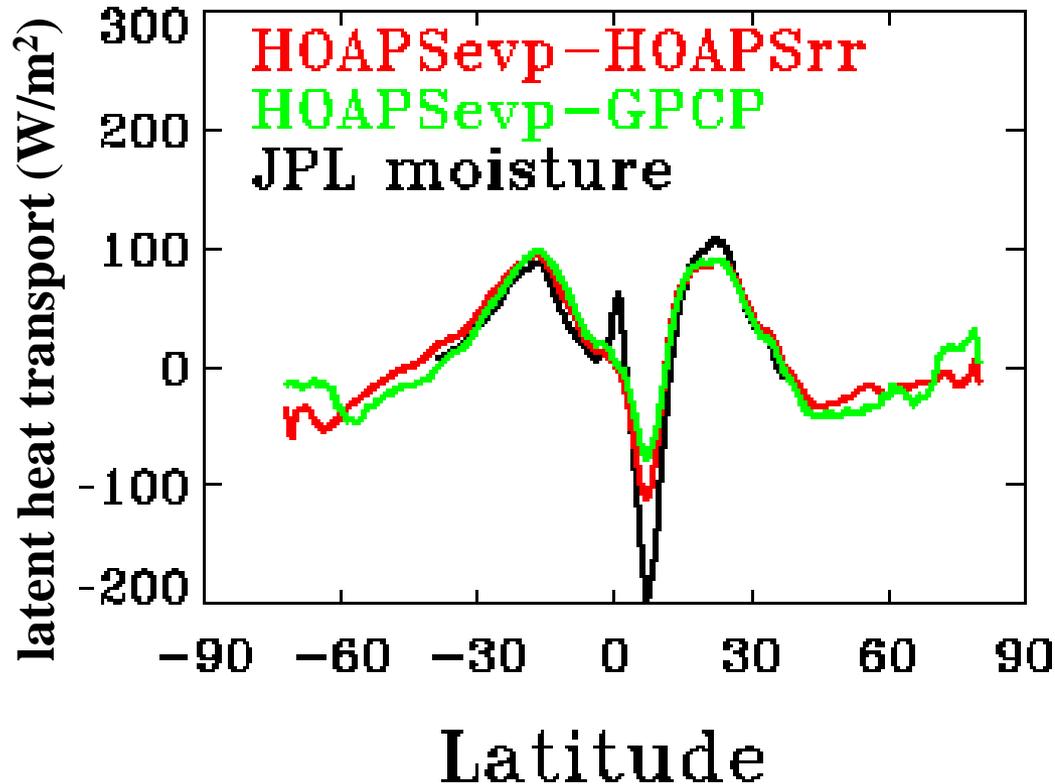
GSSTF OFURO HOAPS GEOS REMSS WHOI



oceanic heat transport



Atmos. heat budget (2003-2005)



Reduce uncertainties in atmospheric heat transport

Long term goals

(at the end of Phase 1)



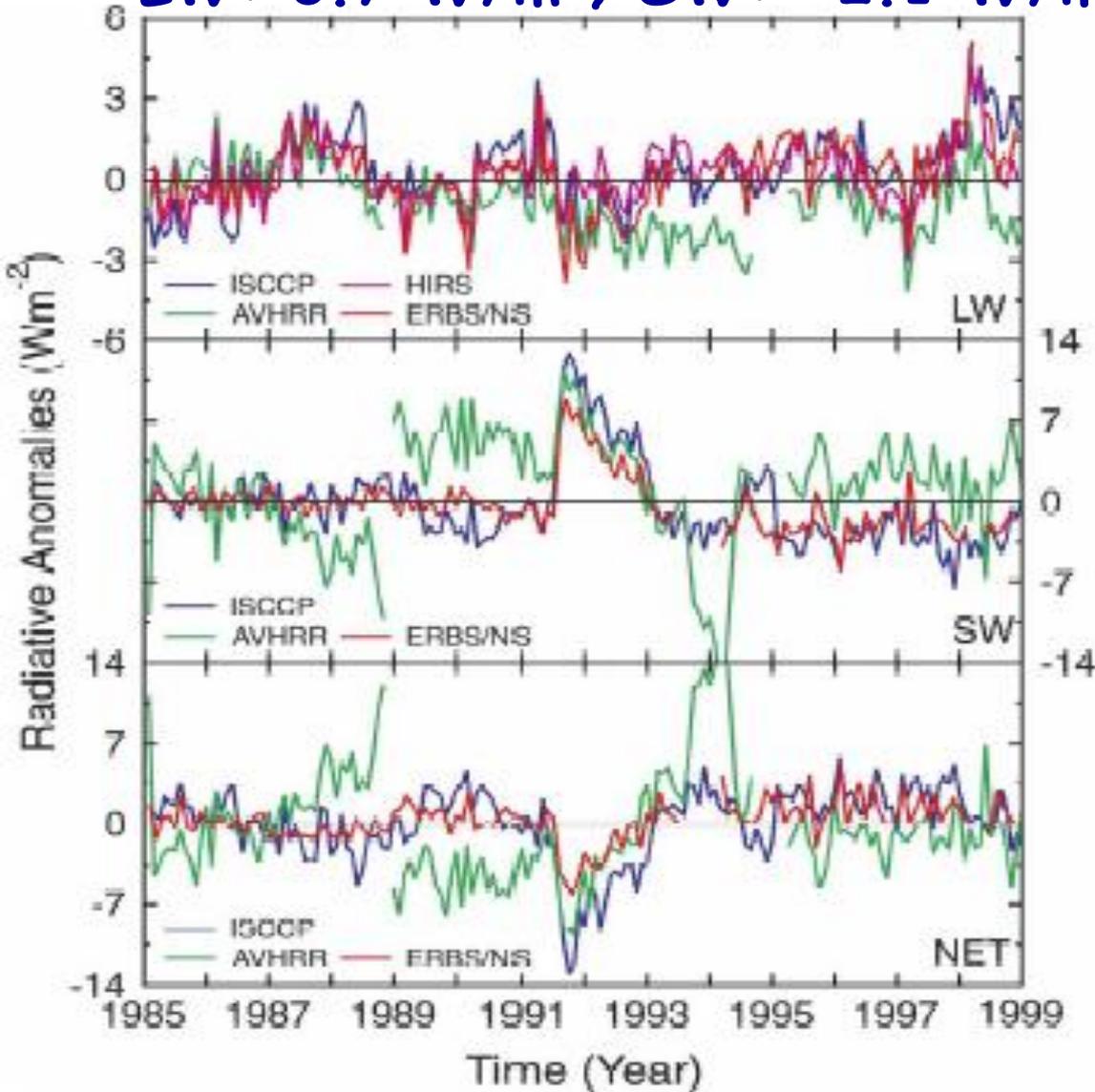
- Extend monthly analysis forward/backward to longest term possible
- From global gridded monthly means to global gridded daily means
- Obtain 3-hourly, full time period, gridded data sets
 - ❖ Last two items may be parallel depending on the requirements of each data set and individual variables
 - ❖ Requirements:

Implementation Plan (IP): Phase 1

decadal variations (TOA)



LW: 0.7 W/m^2 ; SW: -2.1 W/m^2 ; net: 1.4 W/m^2



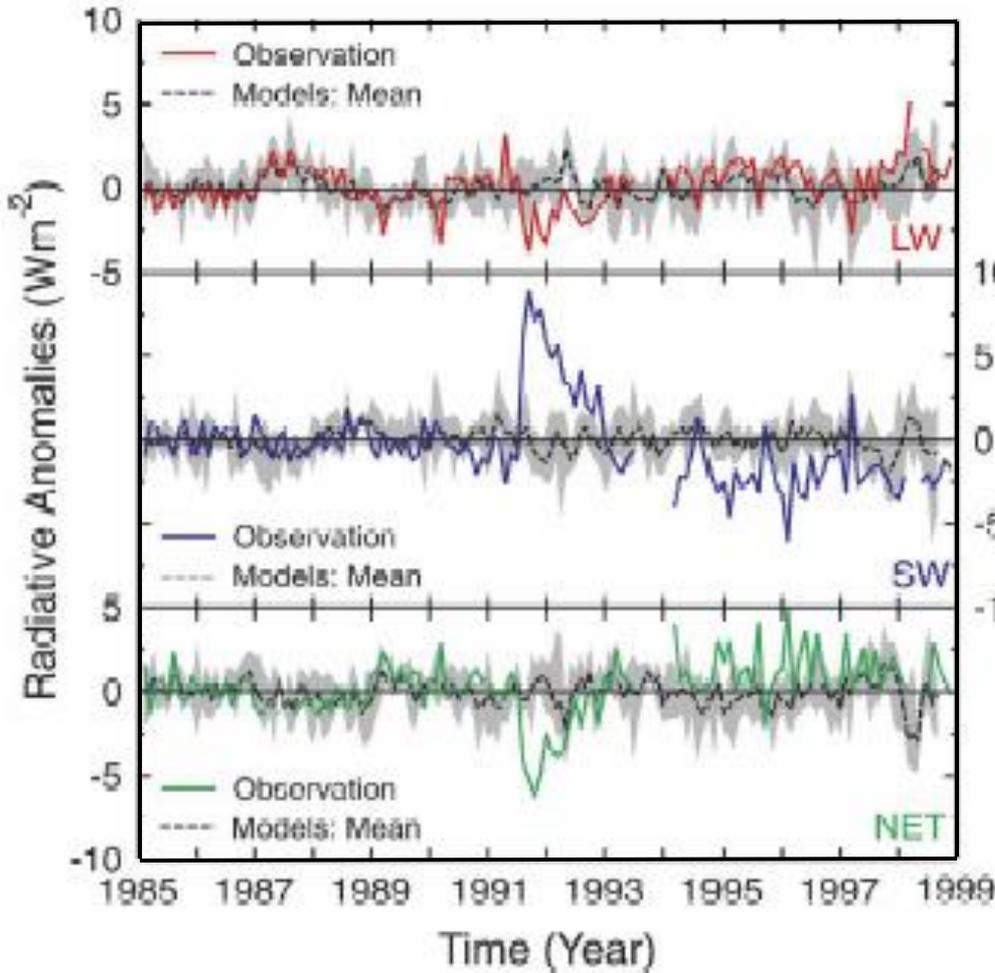
These radiative changes may be related to the changes in ocean heat storage.

Decadal: partly contributed to decadal latent heat.

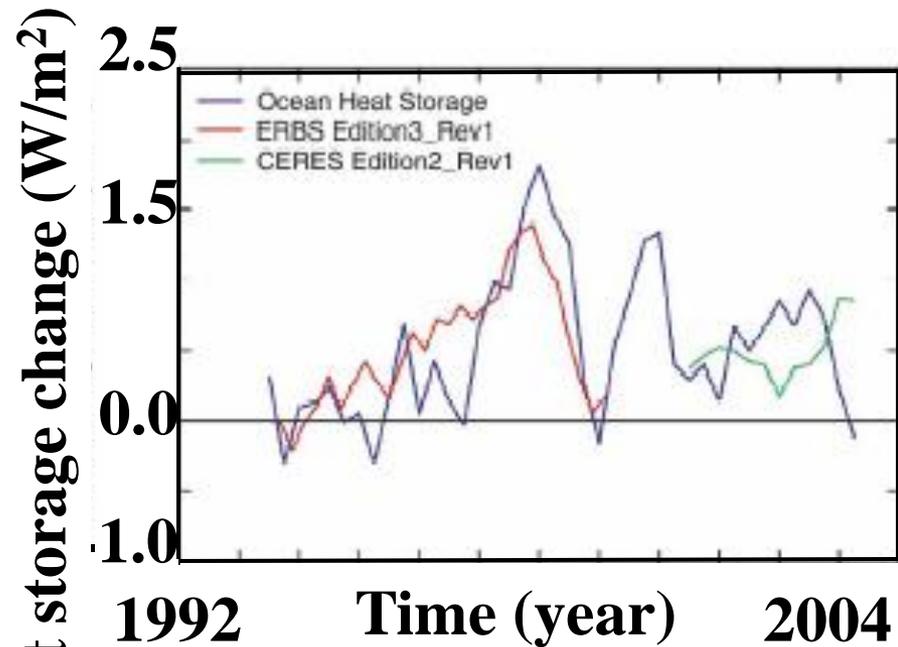
Satellite data records



shaded: model range



Ocean heat storage vs Radiation ERBS & CERES



Middle & long term goals



- Identify critical data gaps in light of pending/potential missions (i.e. SMAP, surface water mission, cold lands, etc.)
- Model/Reanalysis comparisons and assessments:
 - ❖ Develop a standard set of metrics that quantify accuracies and spatio-temporal consistency of variabilities for individual components.