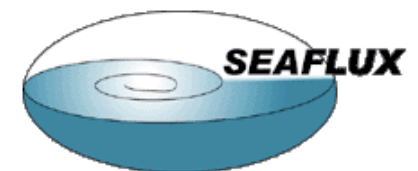
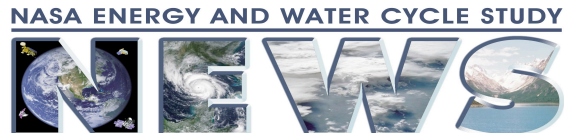


# Overview of newly developed technologies

Carol Anne Clayson with input from Abderrahim Bentamy and Rachel Pinker

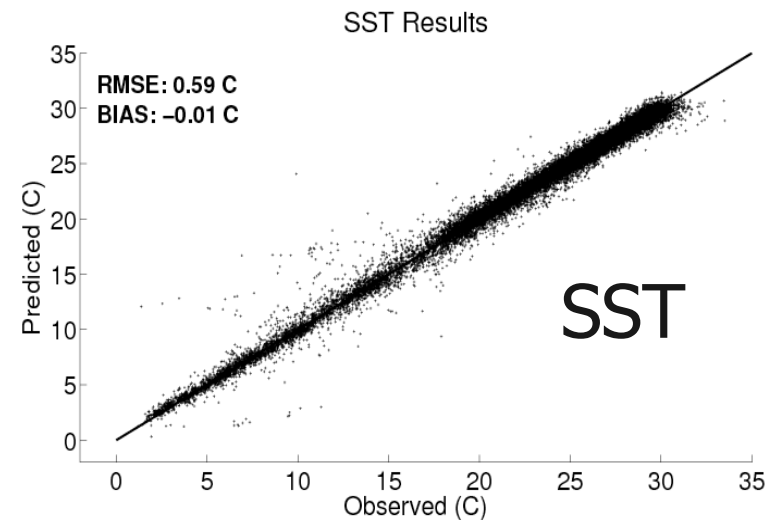
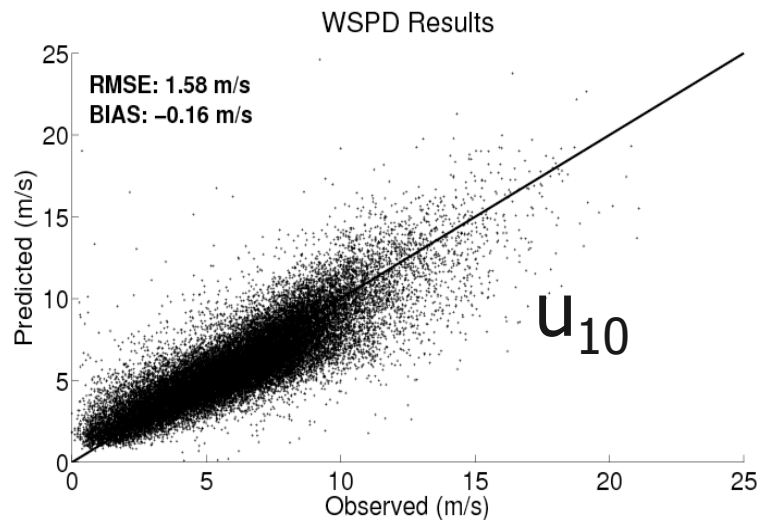
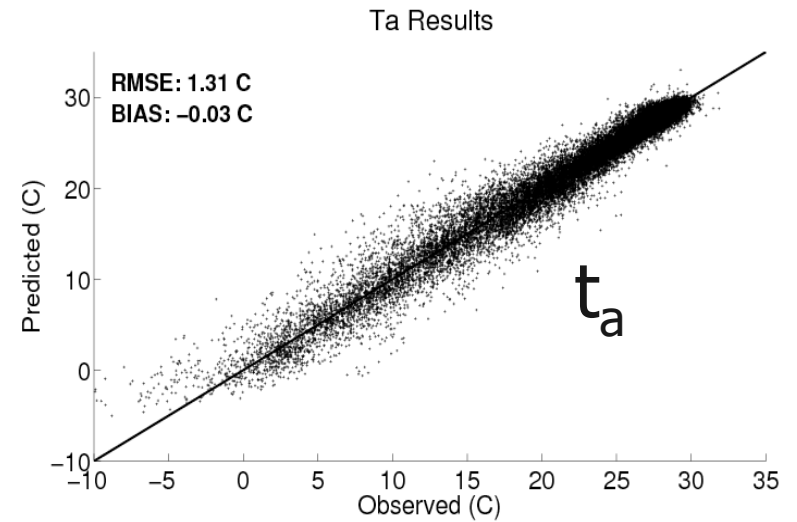
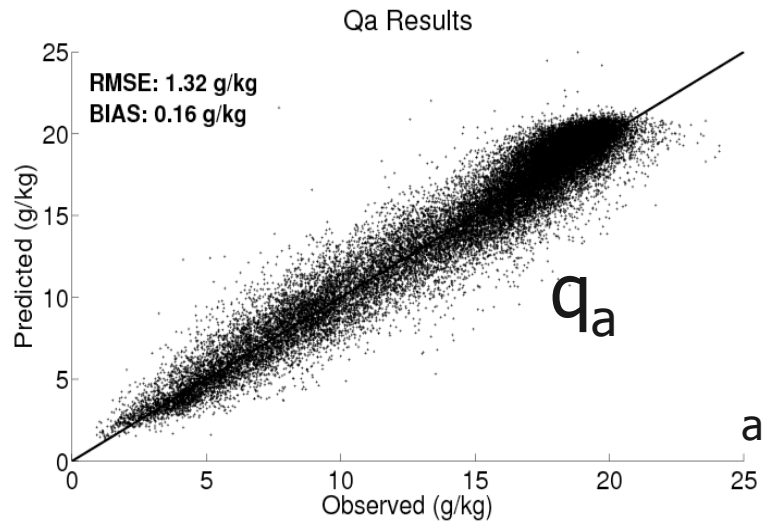


# Recent developments

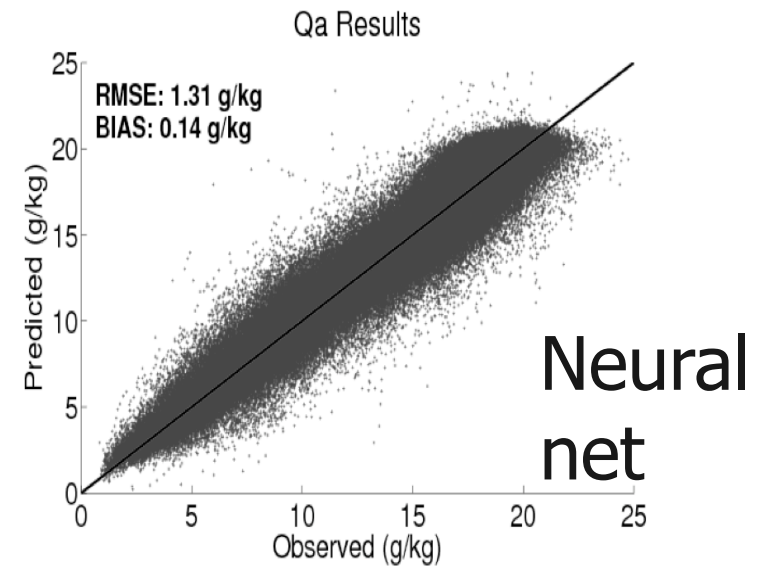
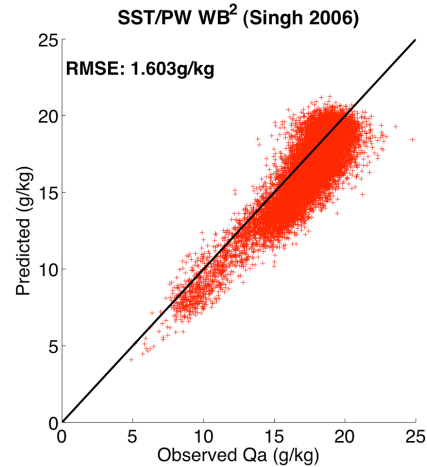
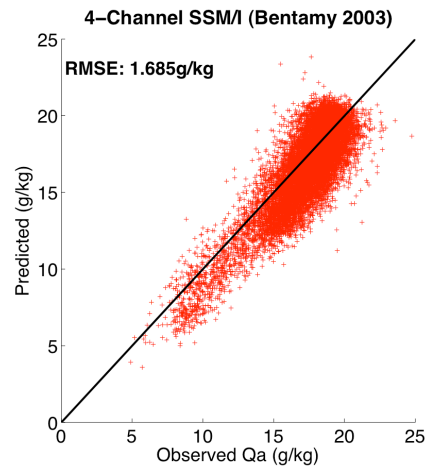
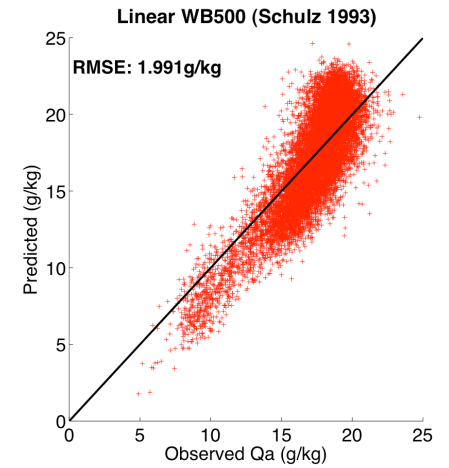
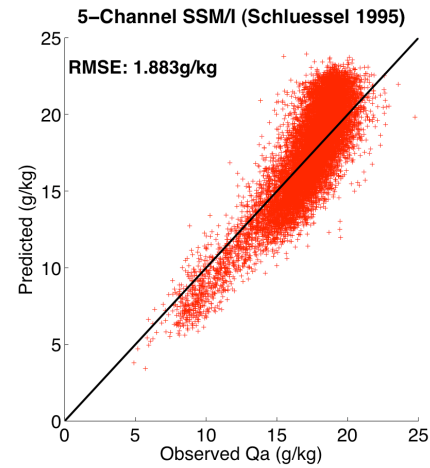
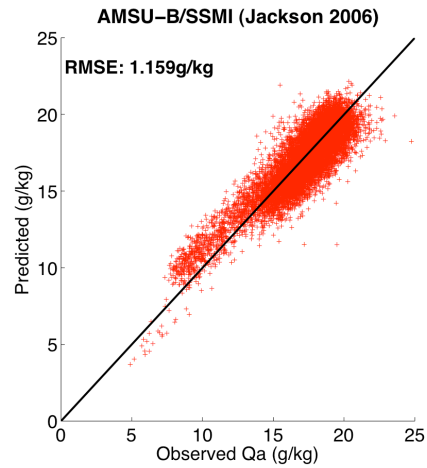
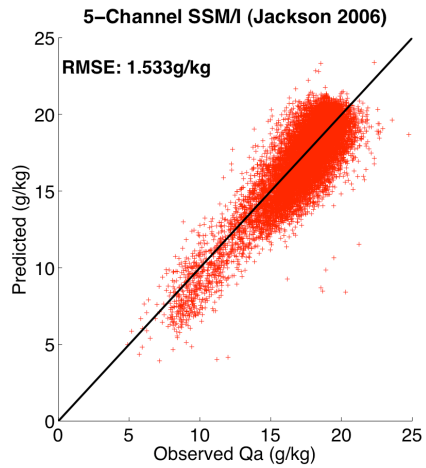
- For turbulent fluxes:
  - Increased use of neural net methods
  - Increased use of multiple satellites for increased quality of retrievals, improved time/space resolution
  
  - Both have led to improved retrievals in near-surface specific humidity and air temperature
- For radiative fluxes:
  - Quality is high, long time record

# Neural Network Improvements

## Roberts et al. 2010



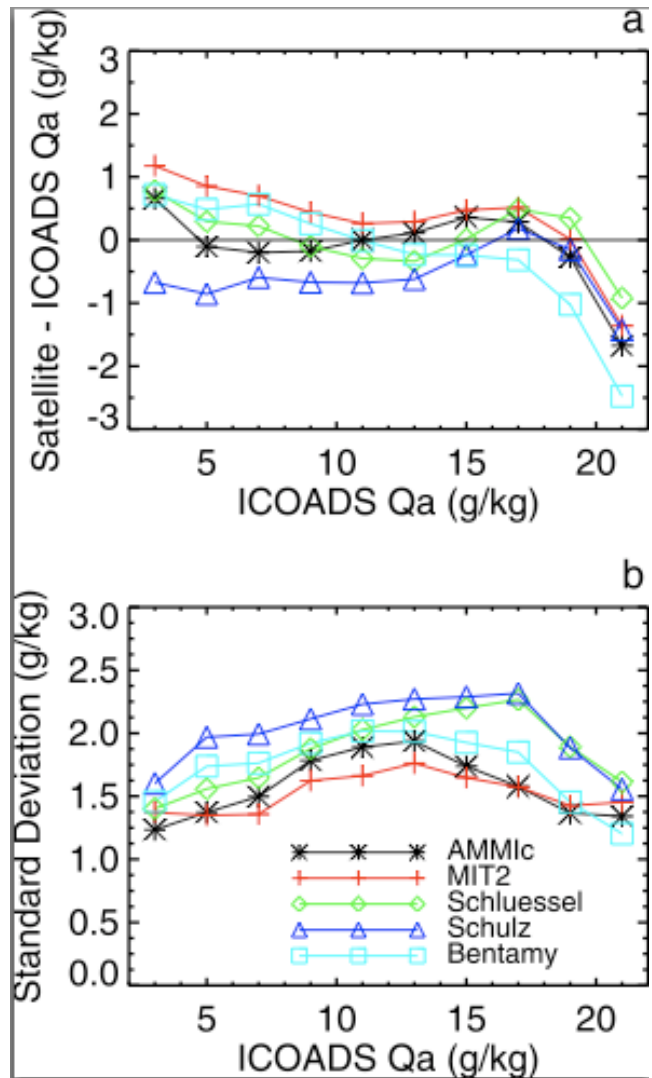
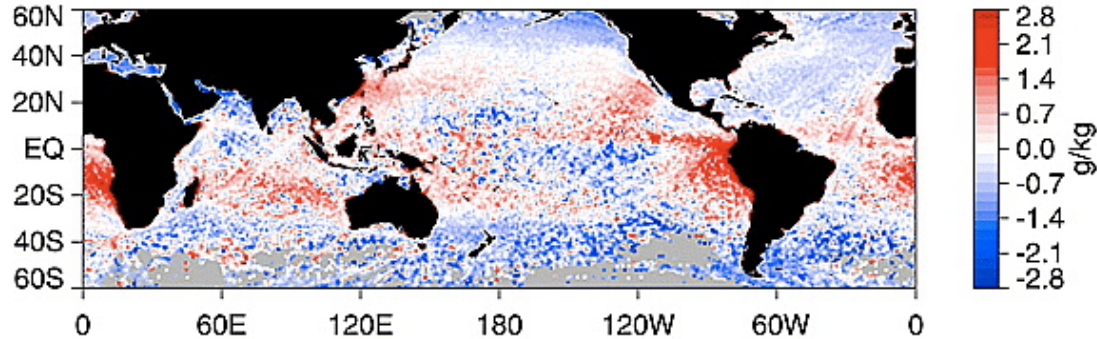
# Retrievals of $q_a$



# Jackson et al. 2009 multiple sensors

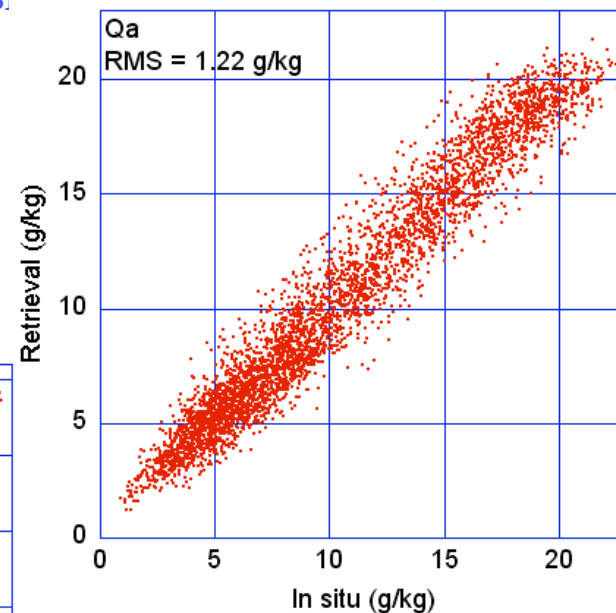
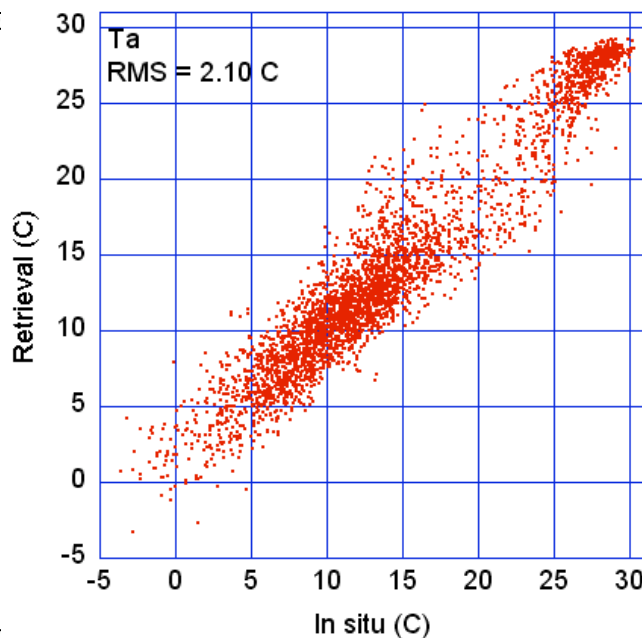
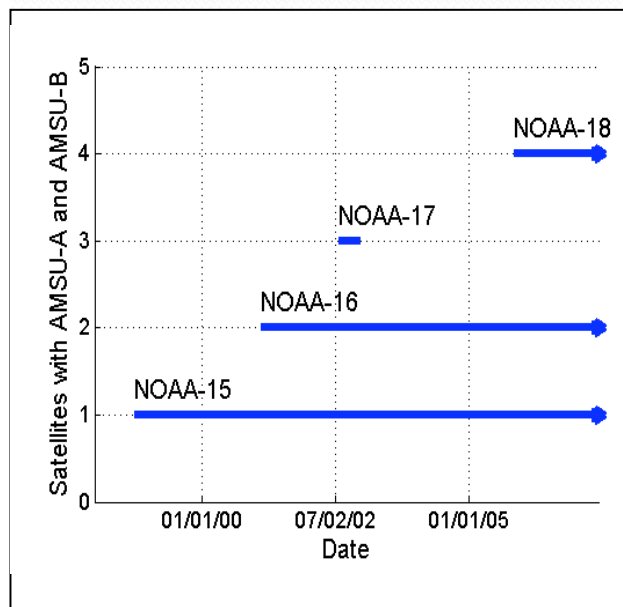
Jackson - 2008JD011341

AMMlc - ICOADS Qa (1999-2006)



# NCDC Ta & Qa Retrievals: Validation

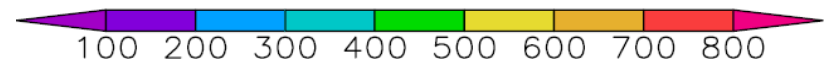
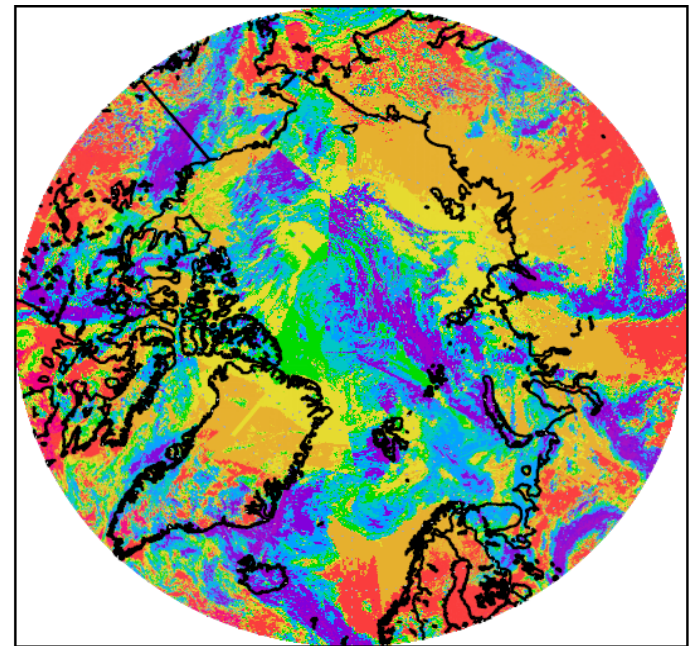
- Neural Network from AMSU
- Validation dataset: Collocated global buoy and ship observations used in training dataset
- **Global** and **All-Season** RMSE:
  - Qa 1.22 g/kg
  - Ta 2.10°C



# Radiative fluxes

- There is a need in **high resolution** information on radiative fluxes at high latitudes that responds to changes in surface conditions.
- Such information can be obtained from satellite observations such as MODIS.
- Multiple overpasses from this polar orbiting satellite allow to represent the diurnal cycle.

**SW radiative fluxes at 5-km from Terra using 28 orbits from overpasses around 10:30 am (Local Time), July 1, 2005)**



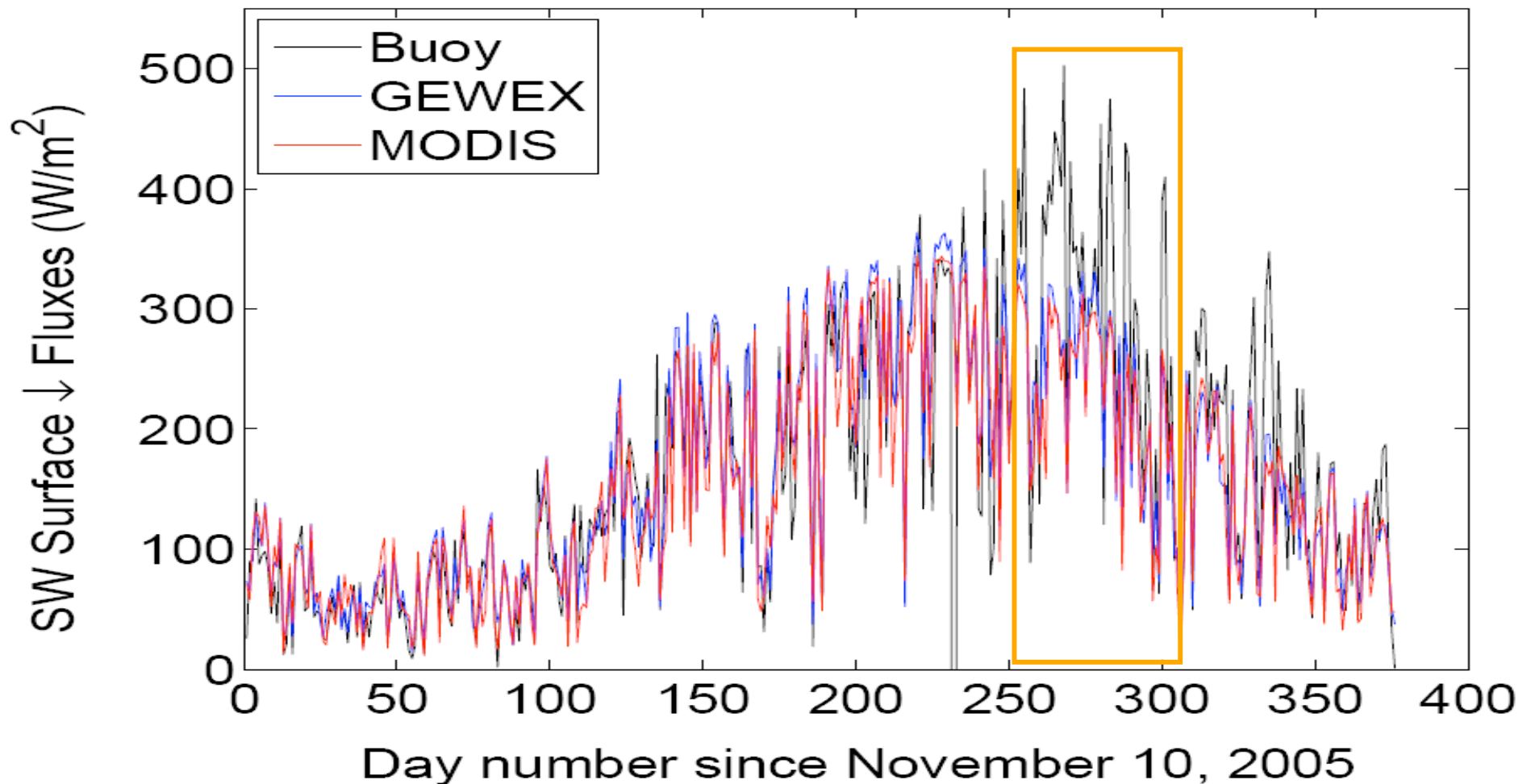
**W/m\*2**



# Evaluations against CLIMODE buoy, Atlantic

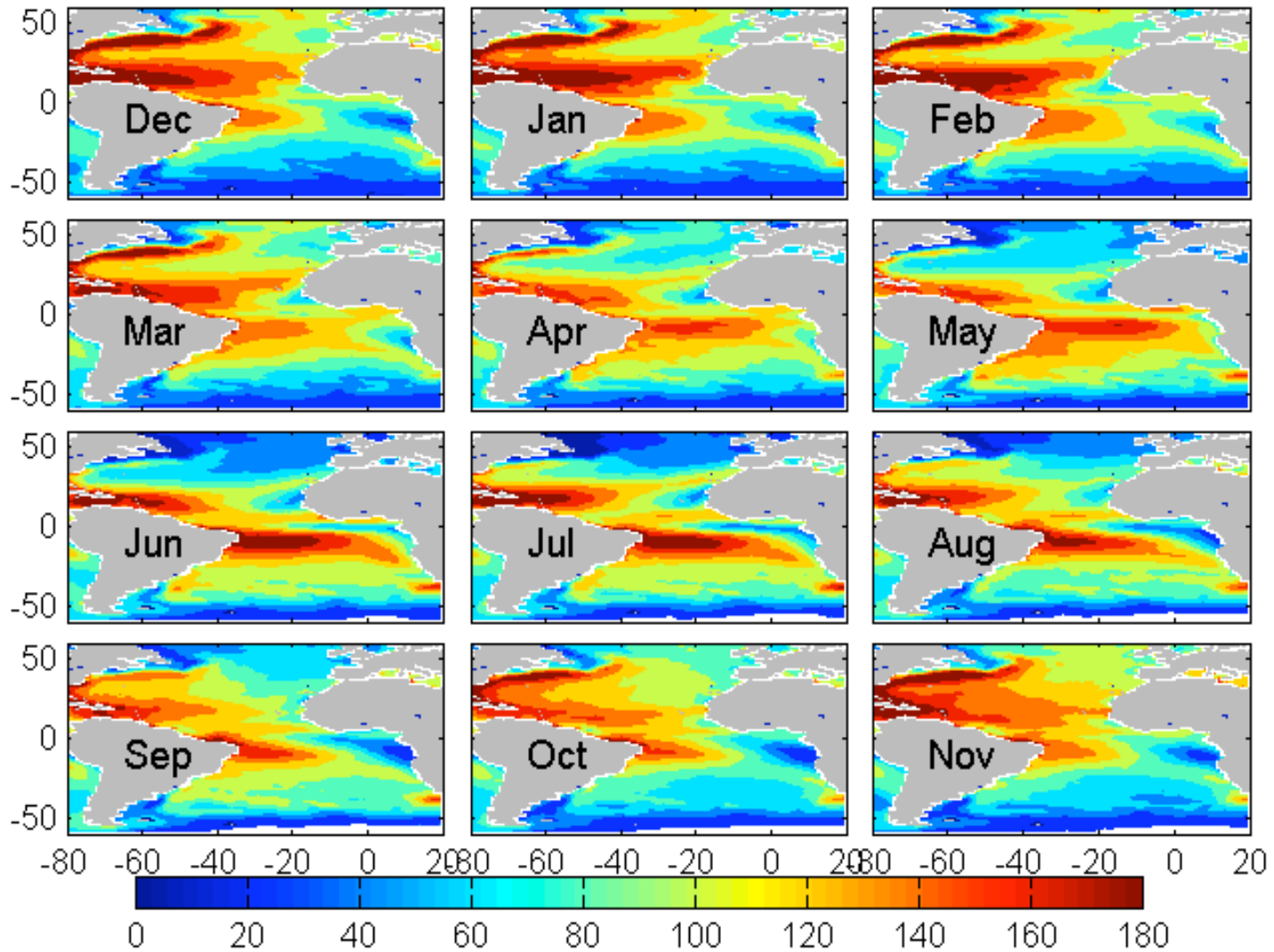
Daily averaged values calculated for period of 11/11/2005 – 11/19/2006.

**Satellite estimates of radiative fluxes can help in quality control of buoy observations**





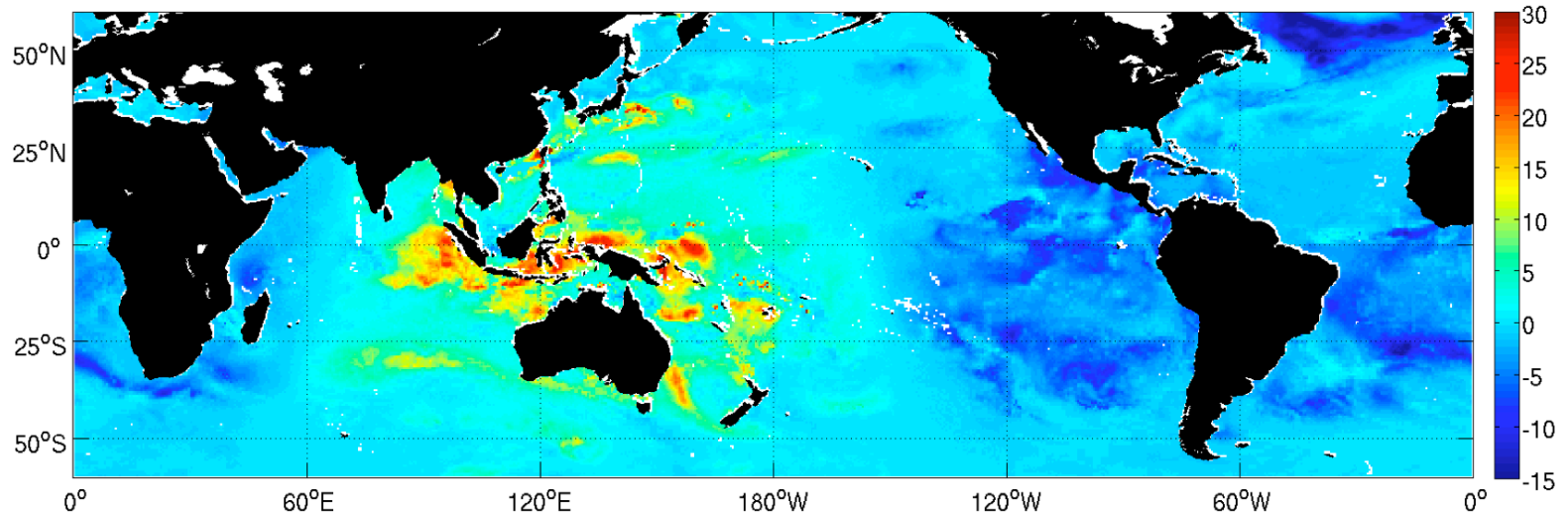
# IFREMER Monthly Mean of Latent Heat Flux: 1992 - 2008



Bentamy

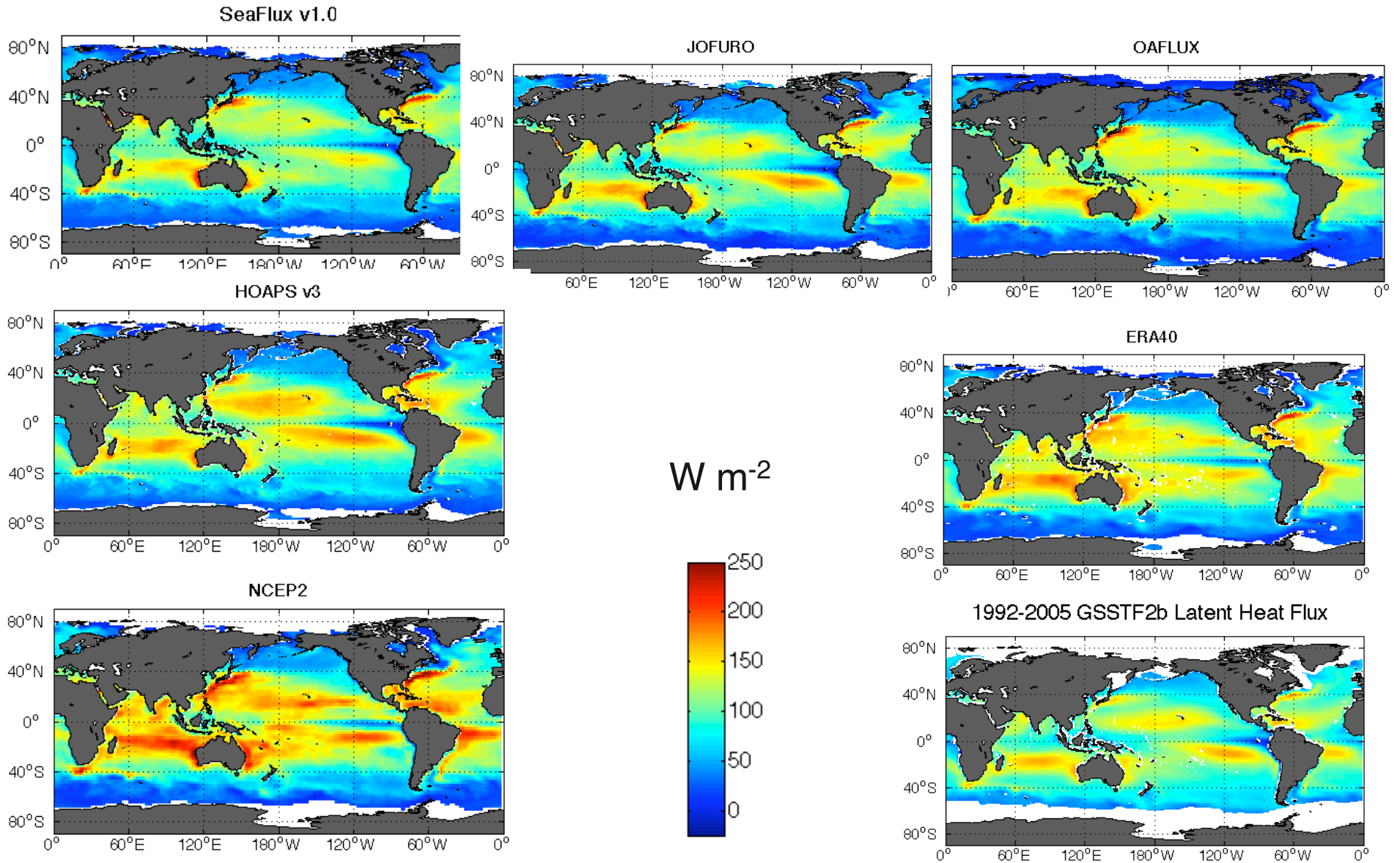
# Sea surface temperature diurnal variability

01/15/1999 06Z, Snapshot Difference, Dsst-Constant Dsst ( $W/m^2$ )

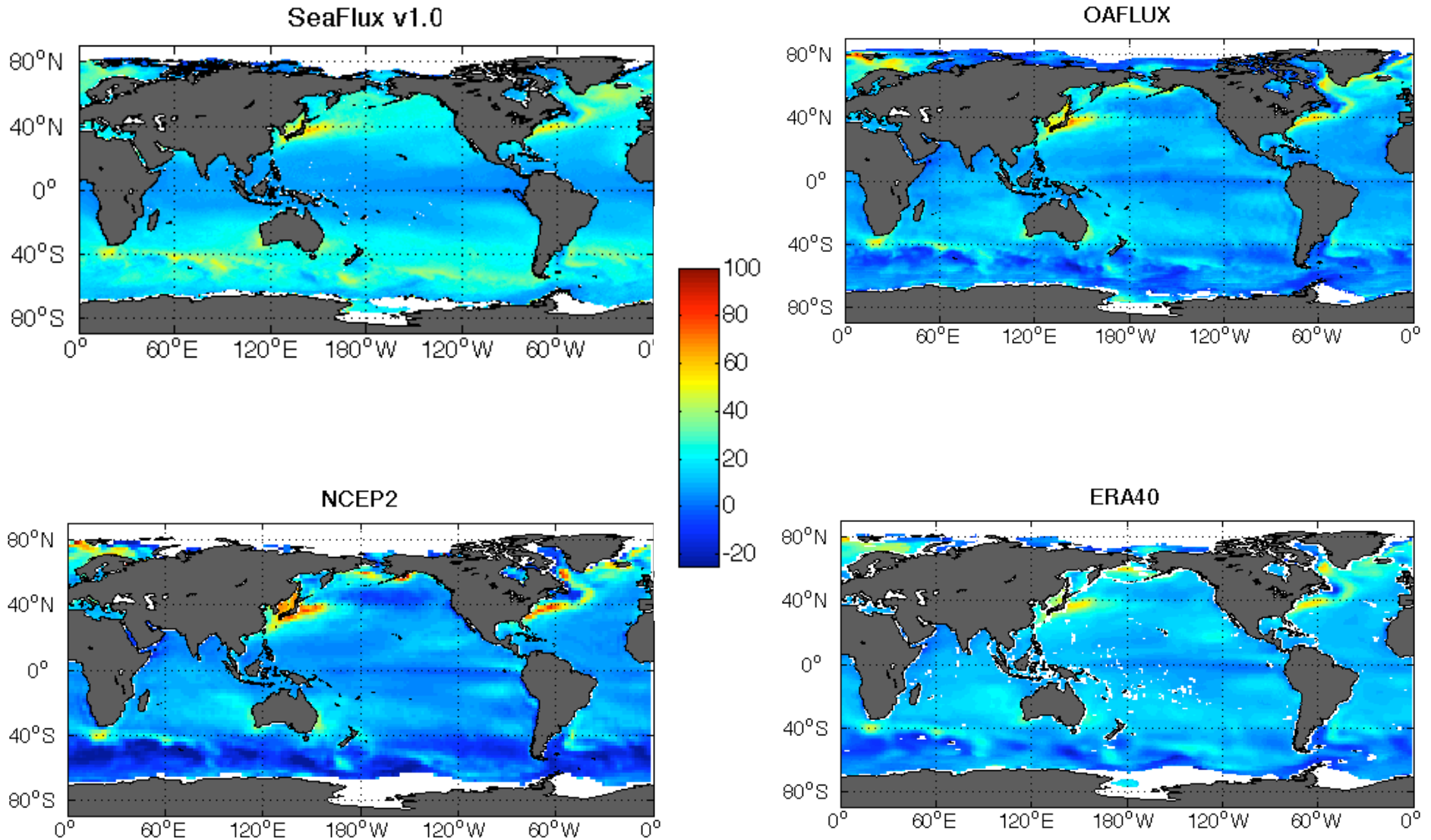


- Have not yet done an analysis of importance of sub-daily variability in winds, air temperature and humidity on mean fluxes
- Clear that more observations at varied times of the day will provide better mean fluxes

# Latent Heat Flux: 1999-2005



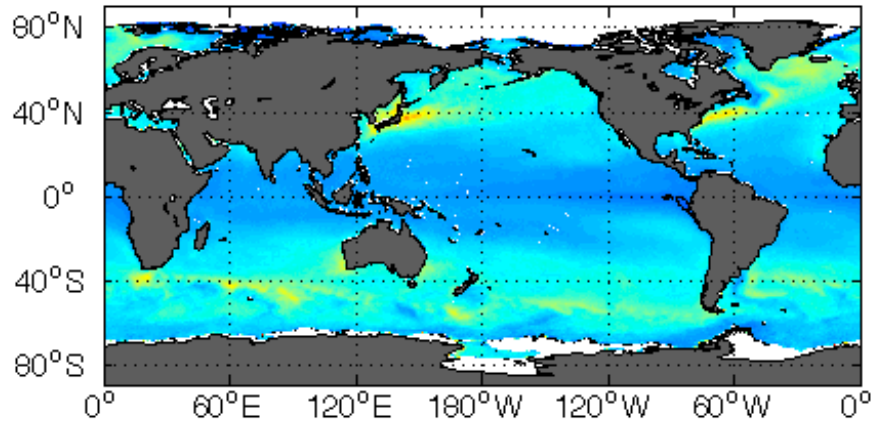
# Sensible Heat Flux: 1999



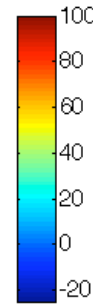
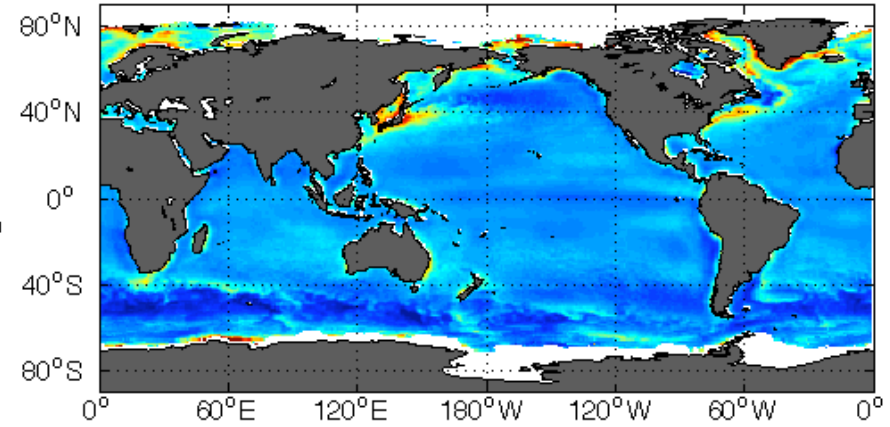


# Sensible Heat Flux: 1999

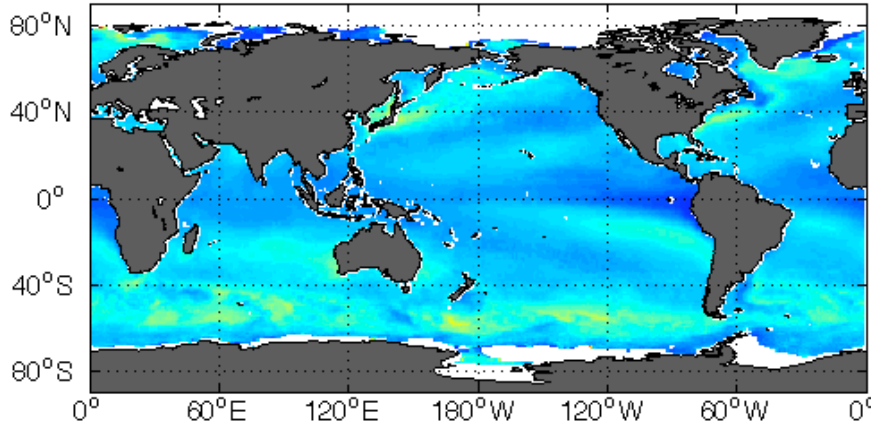
SeaFlux v1.0



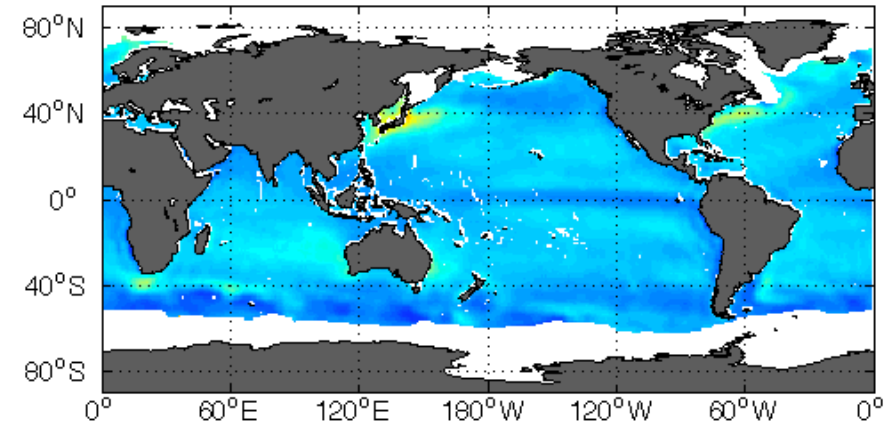
JOFURO



HOAPS v3

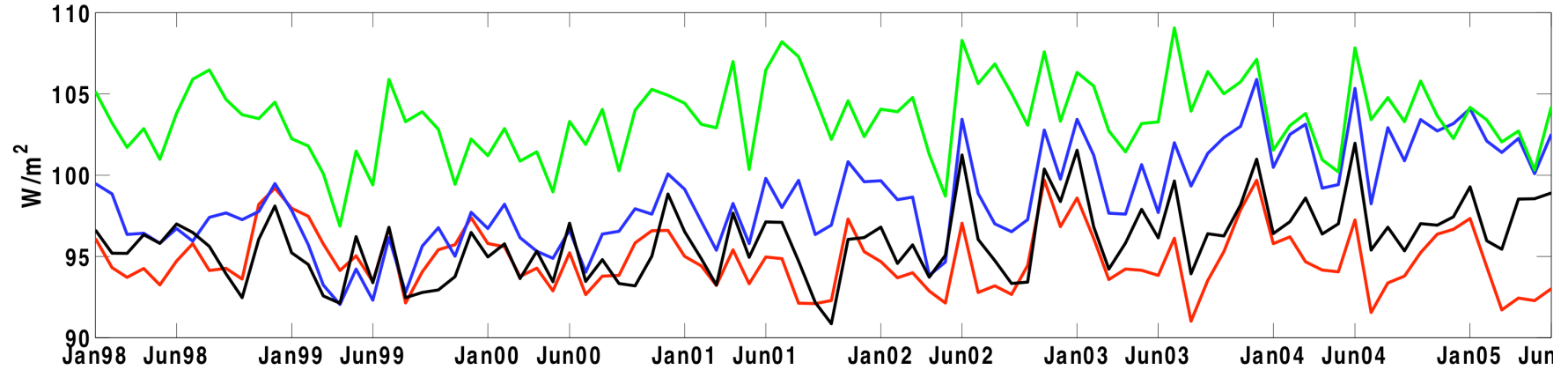


GSSTF2b

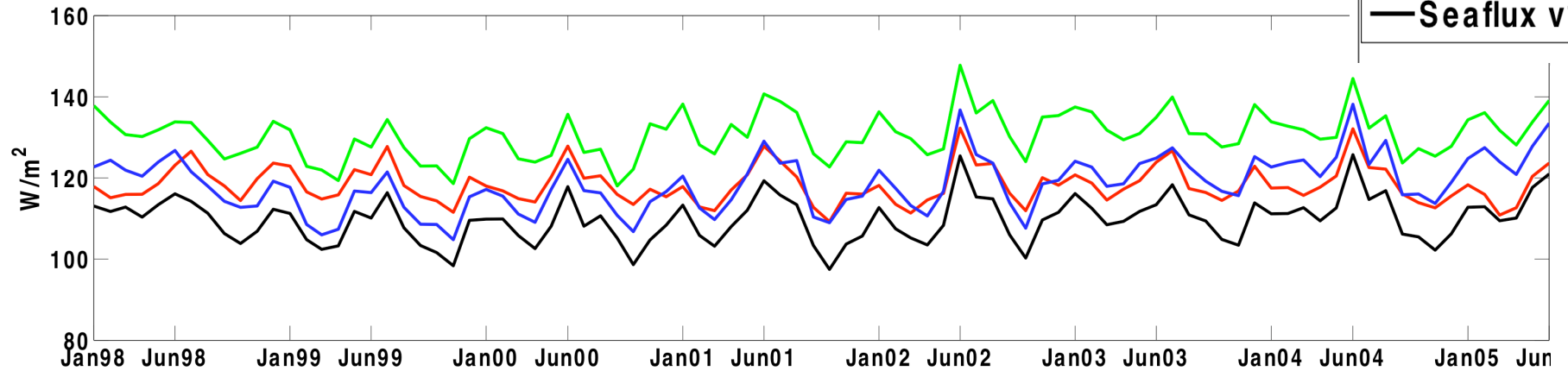


# Trends in LH Flux

## Global

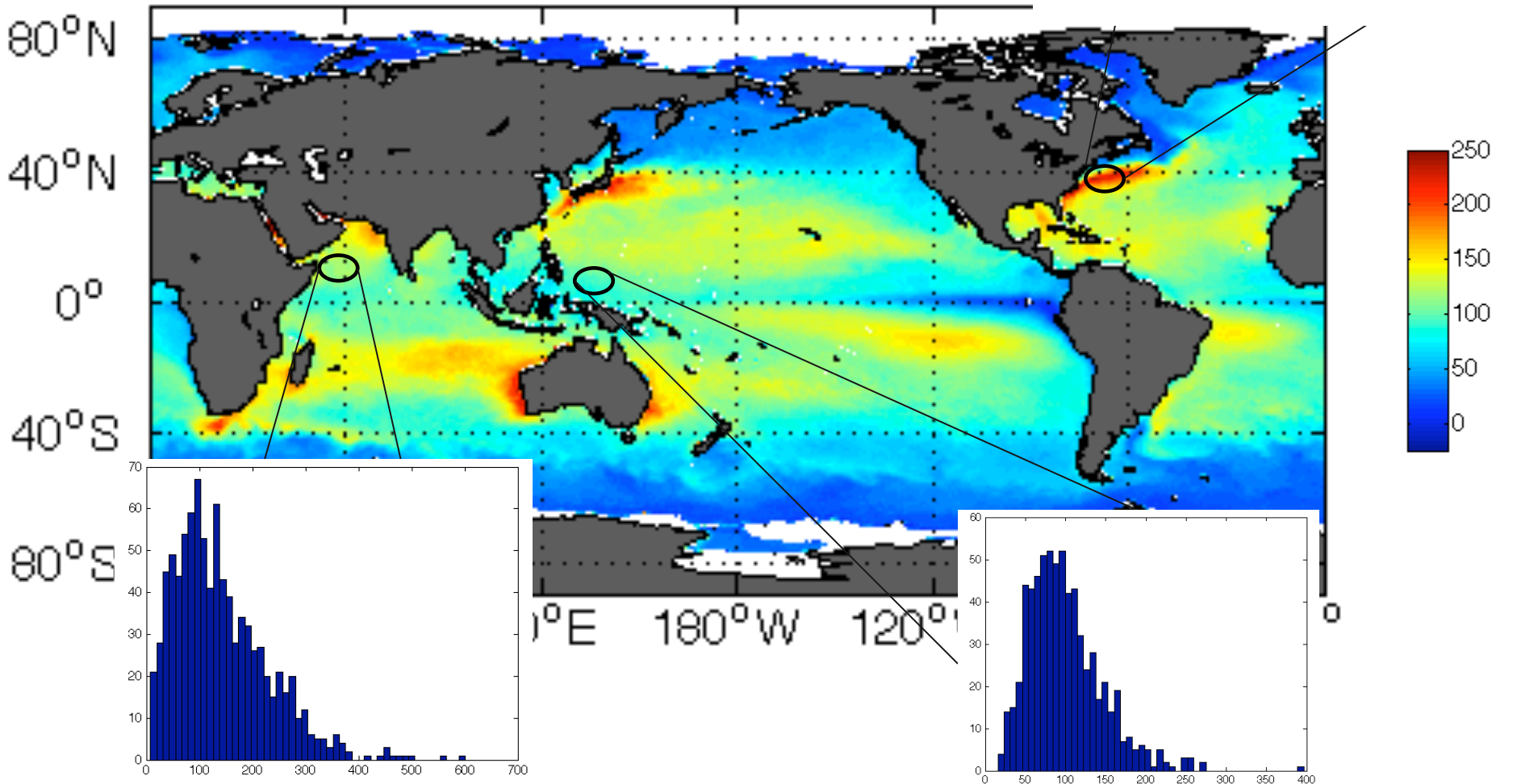


## Tropics



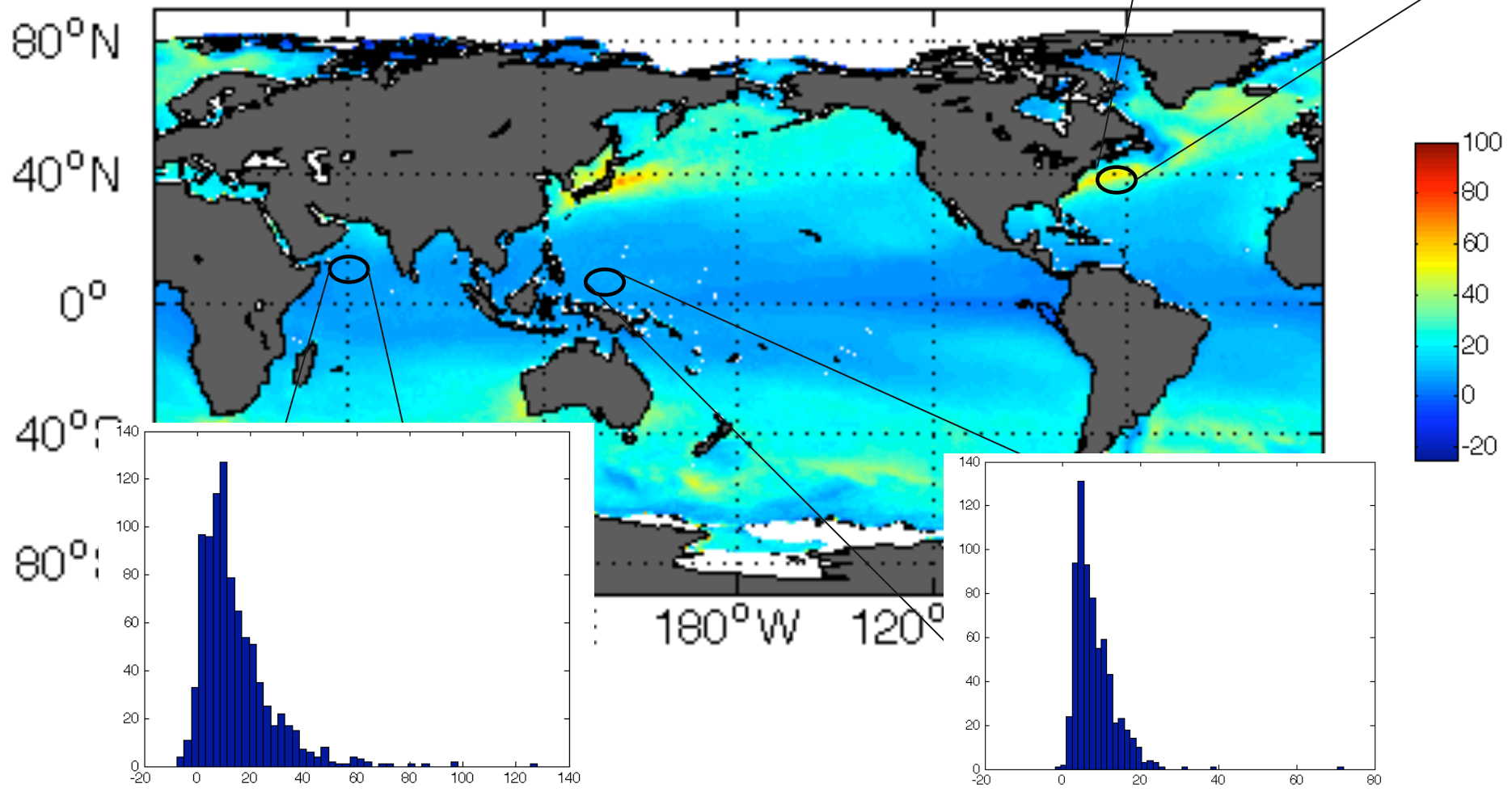
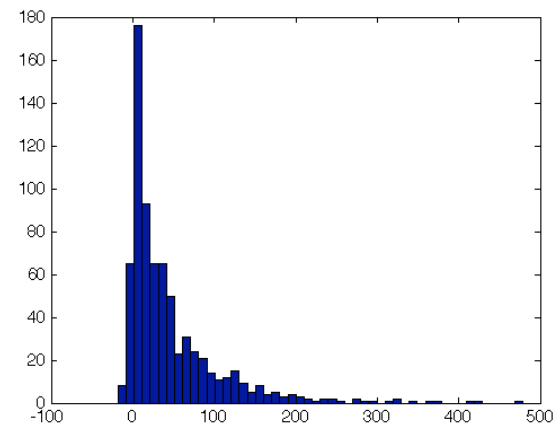
- O Aflux v3
- Jofuro 2v3
- Hoaps v3
- Seaflux v1

# Latent Heat Flux: 1999 Average





# Sensible Heat Flux: 1999 Average

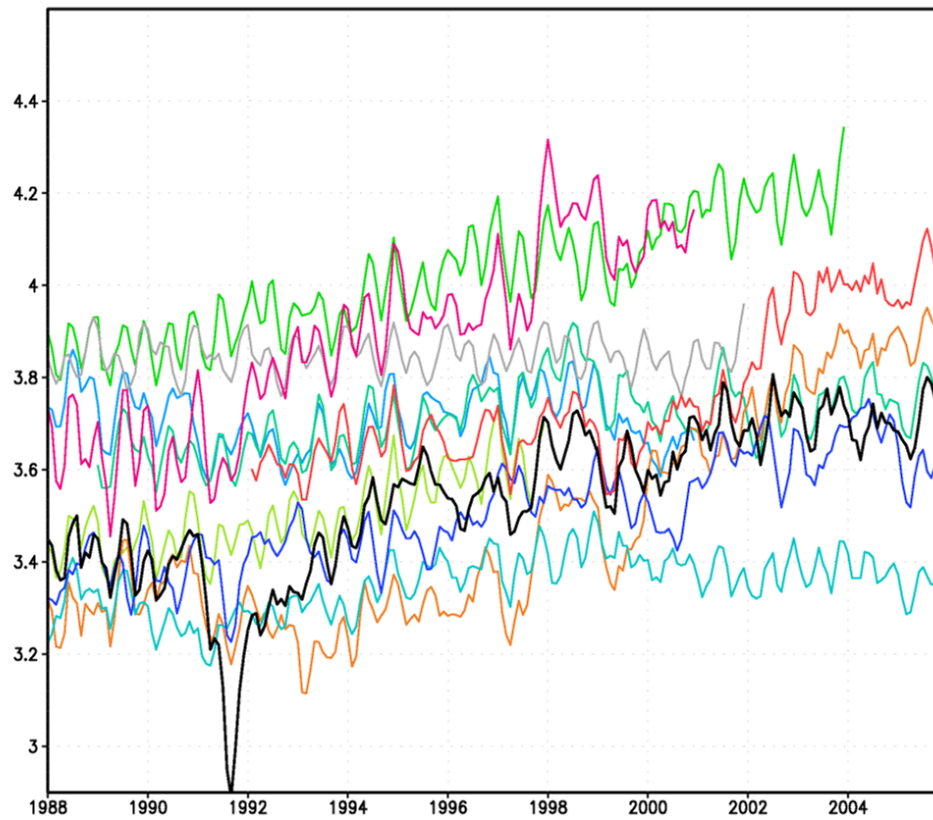


# Issues that we need to address

- Trends in latent heat flux (evaporation) are different between the various datasets: what is the source of this
- How best to combine multiple satellites and still retain (or improve) statistics (trends, variability)
- How to grid/interpolate?
- We've found issues with some products regionally, so although global statistics are good, we don't know what is happening in high latitudes with low air temperatures, specific humidities, cloud characteristics
- No one is touching ice fluxes
- More analysis of currently existing data that isn't being used

# Global Ocean Evaporation [mm/d]

- HOAPS-3
- J-Ofuro2
- GSSTF2
- NOCS V2
- OAFUX V3
- IFREMER V3
- NCEP 1
- NCEP 2
- ERA-40
- ERA-int
- ECHAM



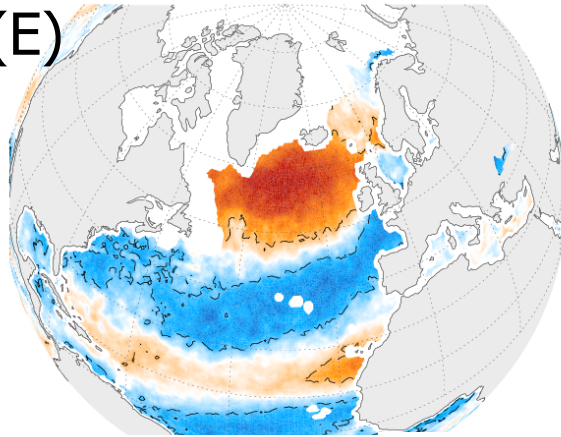
<http://www.hoaps.org>

[info@hoaps.org](mailto:info@hoaps.org)

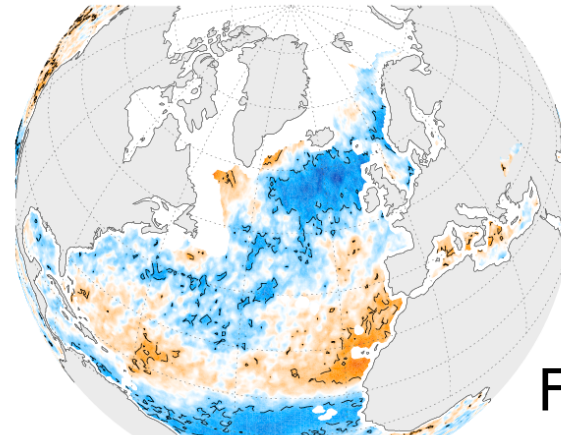
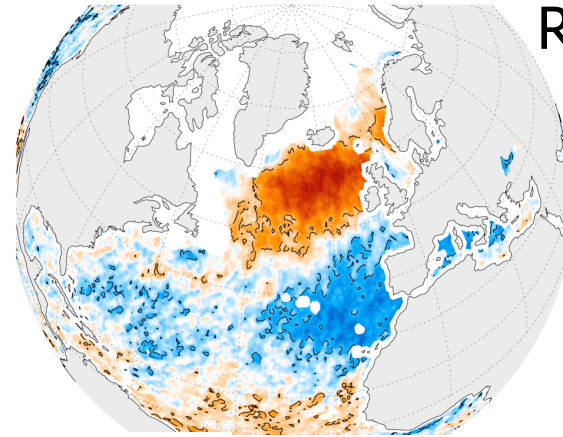
# HOAPS Freshwater Flux Variability

Correlation with NAO Index

EVAP (E)



RAIN (P)

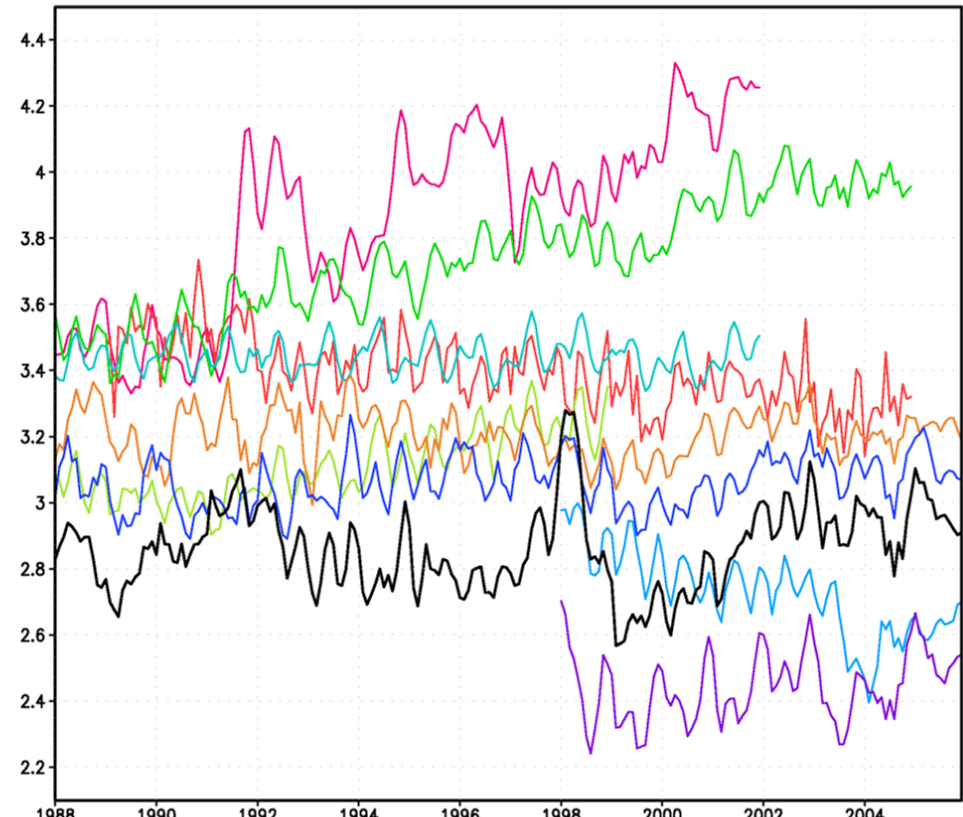


Freshwater Flux (E-P)



# Global Ocean Precipitation [mm/d]

- HOAPS-3
- TRMM 3B43
- CMAP-ENH
- GPCP-V2
- GSMaP V484
- ERA-40
- ERA-int
- NCEP
- NCEP-2
- ECHAM



<http://www.hoaps.org>

[info@hoaps.org](mailto:info@hoaps.org)

# We need:

- Further measurements of near-surface properties in high latitudes
- Collaboration with modelers: which of these remaining differences really matter? What time/space scales make a difference to the modeling?

Dong et al. 2010

