

SeaFlux Intercomparisons

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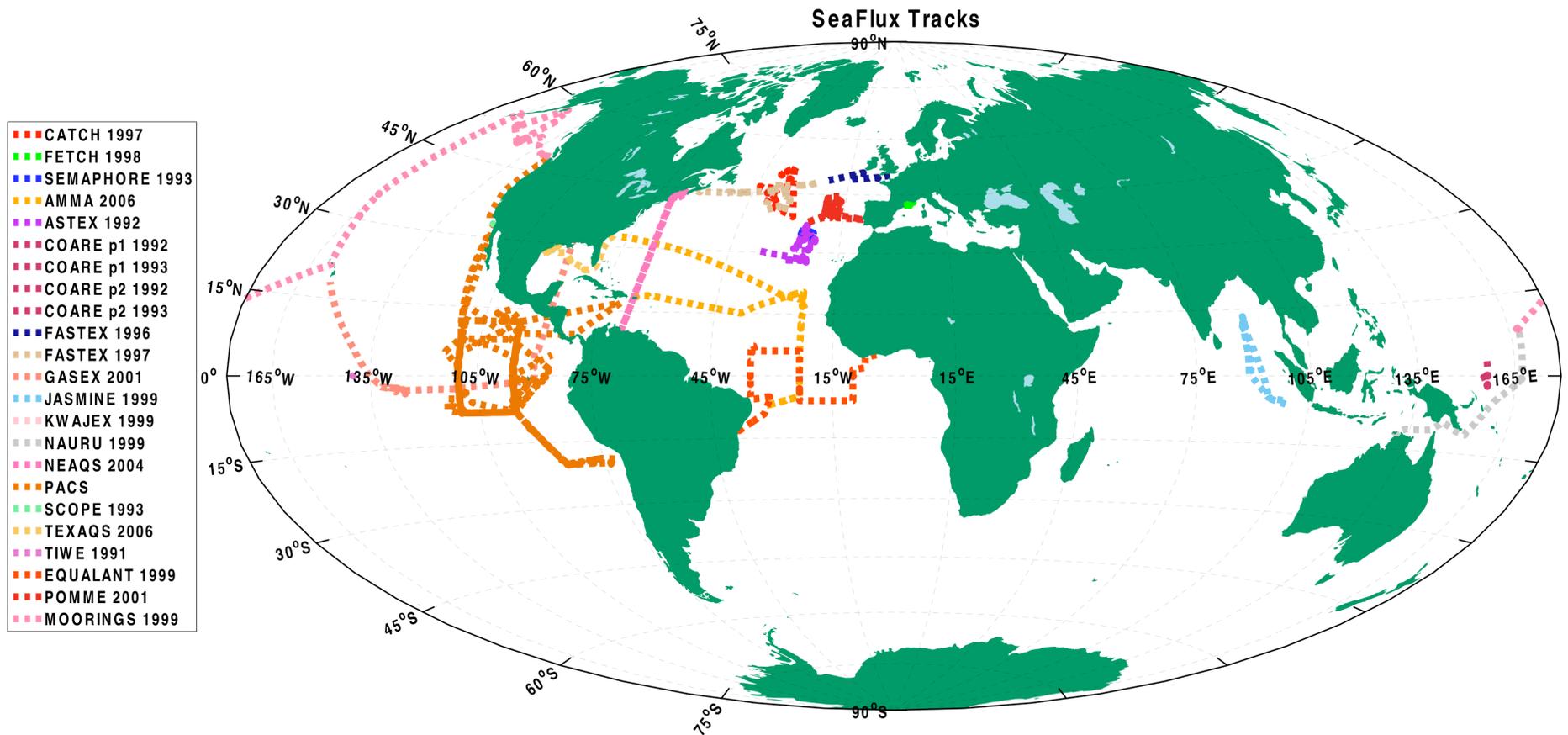
*2009 Annual NEWS PI Meeting
Baltimore, MD
2-3 December 2009*



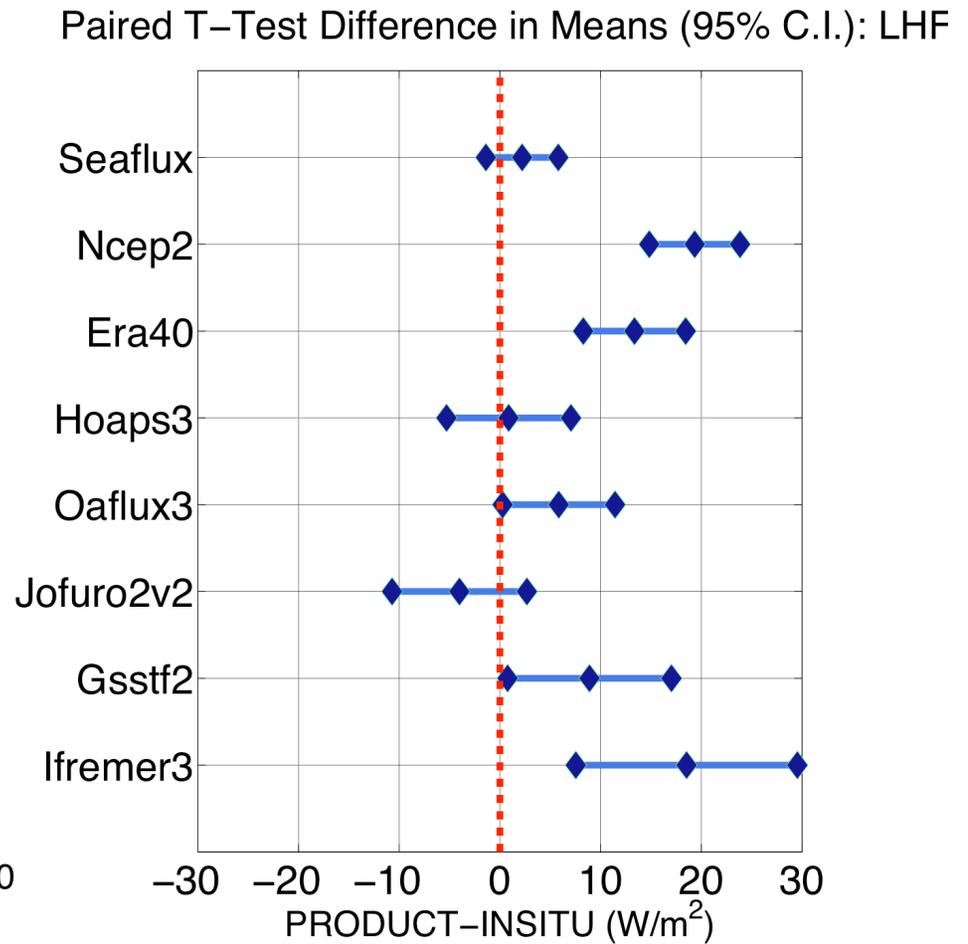
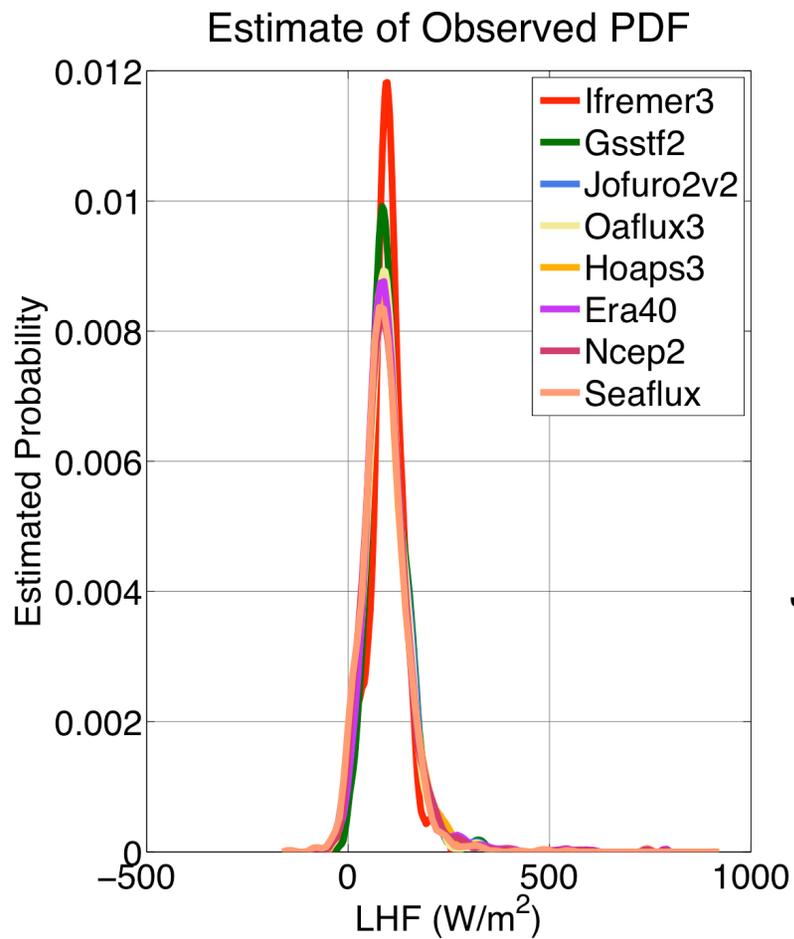
Intercomparison datasets

- Goddard product: GSSTF/2 (currently working with new GSSTF/2b product out of NASA)
 - Daily, 1°, input variables and turbulent fluxes
 - July 1987 - December 2000; global oceans (2b version goes through 2007)
- IFREMER product (funded by ESA)
 - Weekly, 0.25°, input variables, turbulent fluxes
 - Currently available: 1992 – 2006; global oceans
- Japanese Ocean Flux datasets: J-OFURO2 (J-OFURO3 now available, some results shown here)
 - Input variables, fluxes, radiation
 - Daily, 1°, 1988 – 2005; global oceans
 - Satellites, JMA model analyses
- HOAPS-III
 - Twice-daily, 0.5°, 1987 - 2005, global oceans
 - July 1987 - December 2005

In situ direct flux measurements

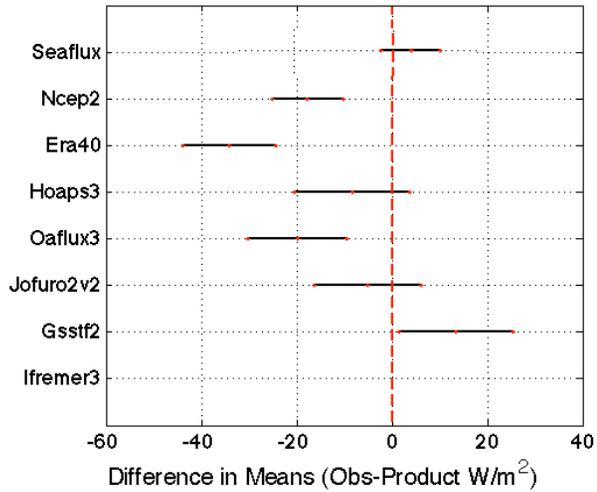


Latent Heat Flux

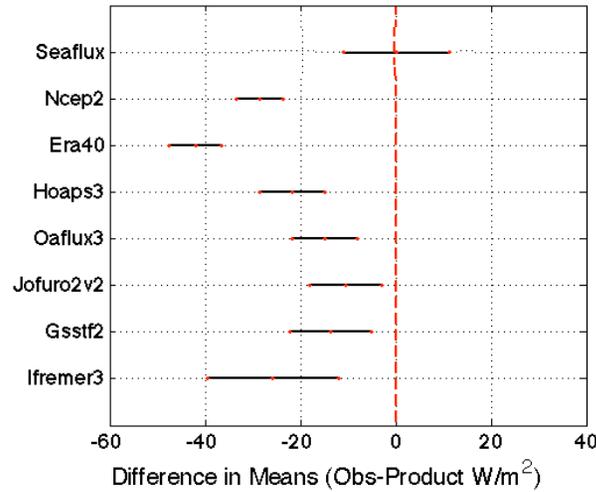


Latent Heat Flux

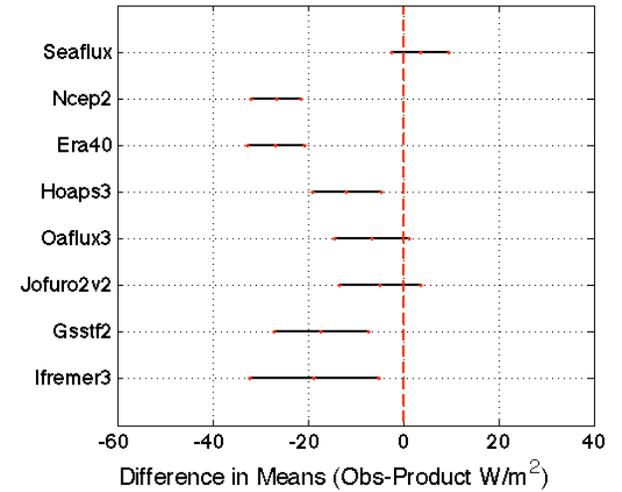
Wind Speeds 0 – 4 m/s



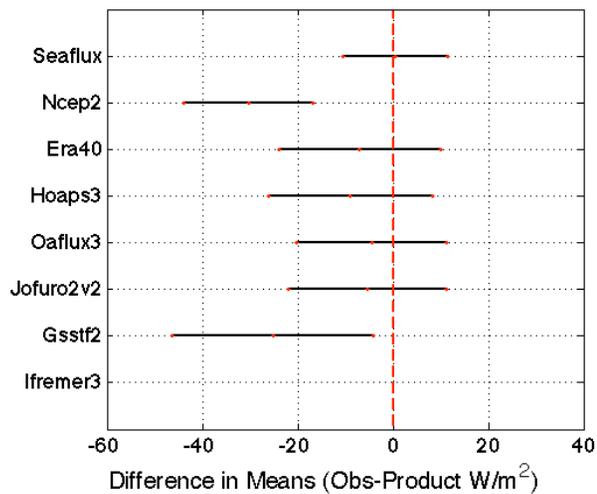
Wind Speeds 4 – 6 m/s



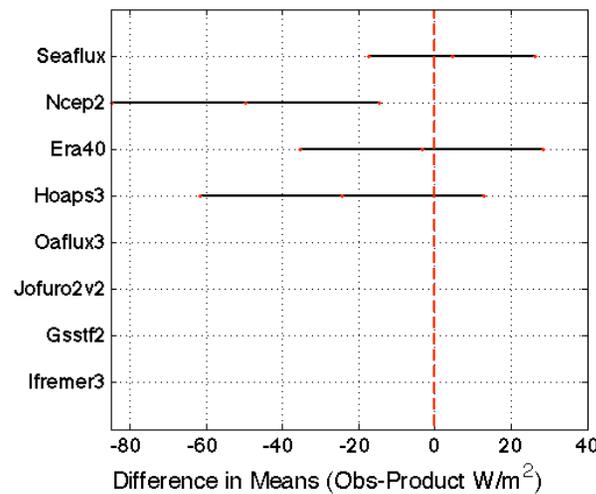
Wind Speeds 6 – 8 m/s



Wind Speeds 8 – 10 m/s

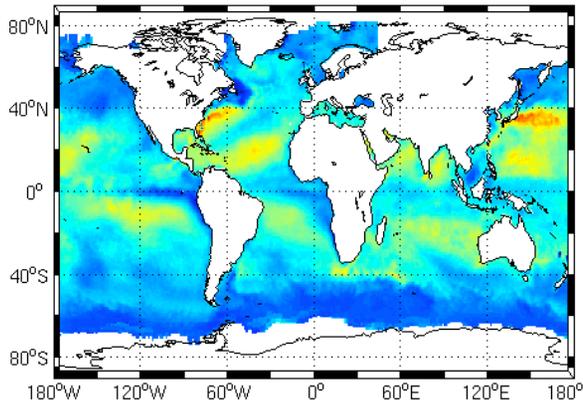


Wind Speeds 10 – 12 m/s

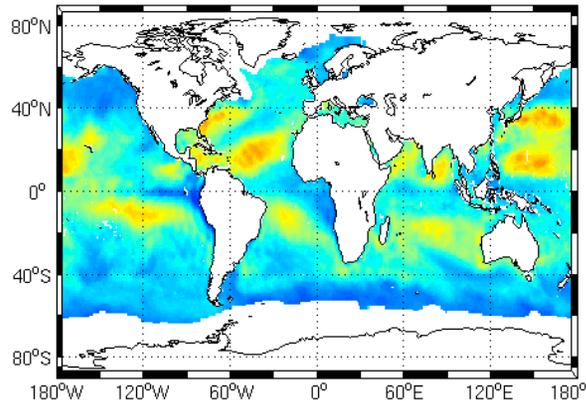


Global level comparisons - LHF

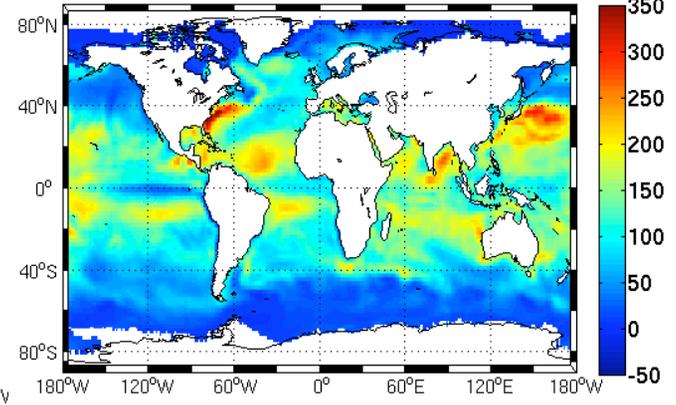
LHF (W/m^2) : JOFURO-2



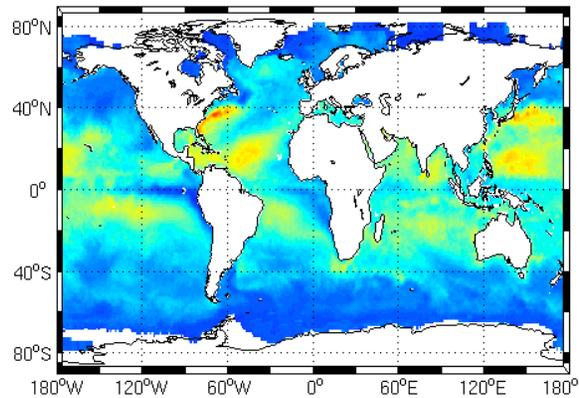
LHF (W/m^2) : GSSTF2



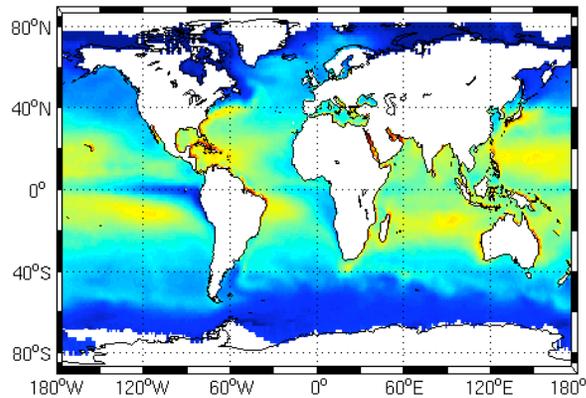
LHF (W/m^2) : NCEP-II



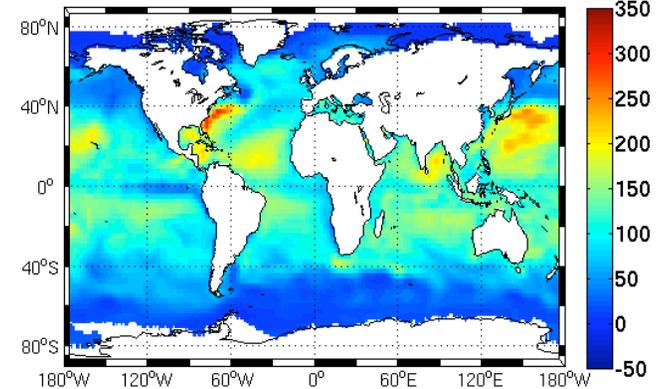
LHF (W/m^2) : HOAPS3



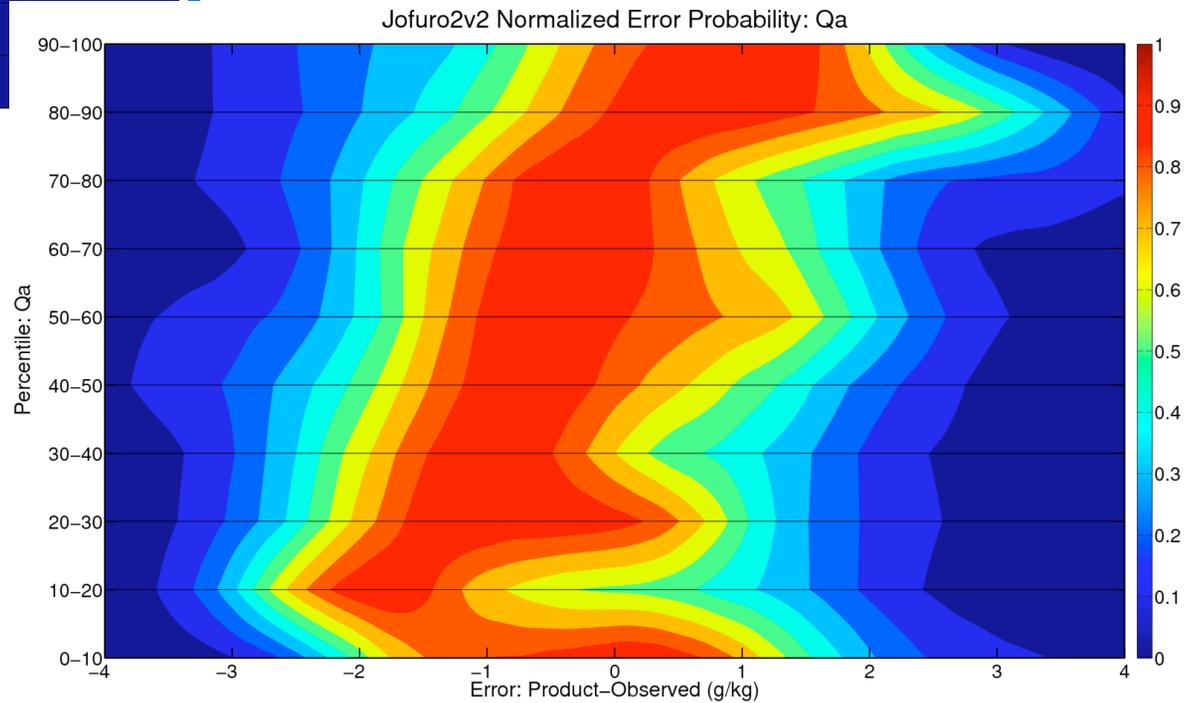
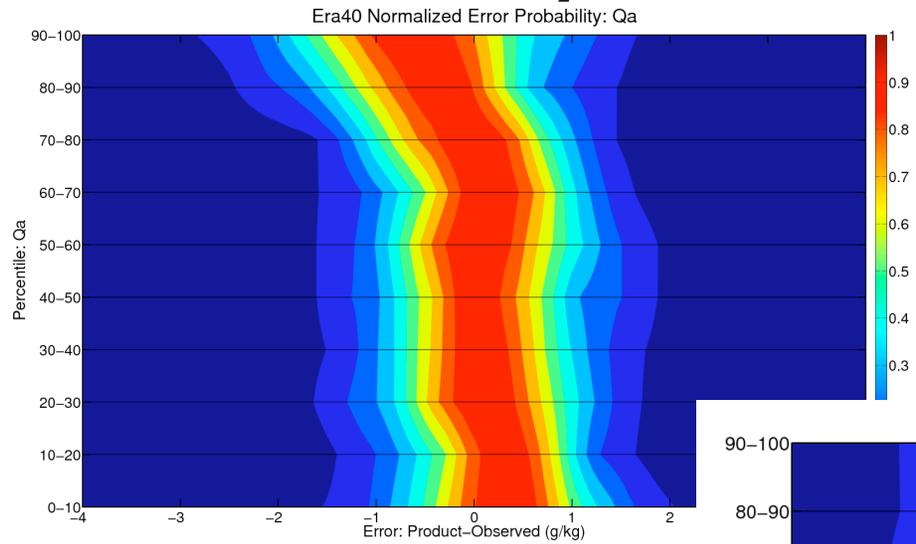
LHF (W/m^2) : IFREMER



LHF (W/m^2) : ECMWF

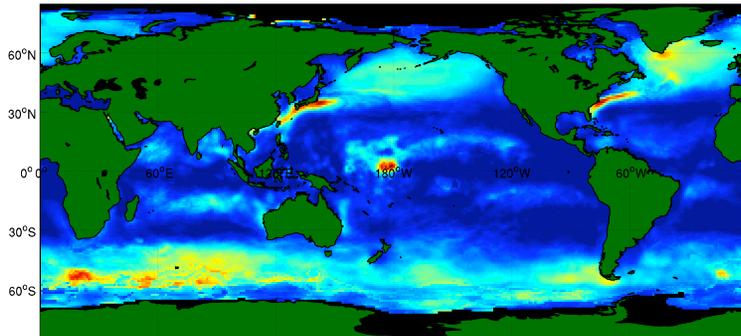


Determining systematic/random uncertainty

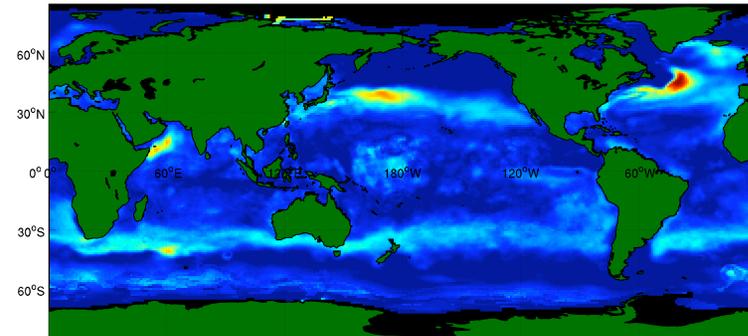


LHF Annual Mean Uncertainty

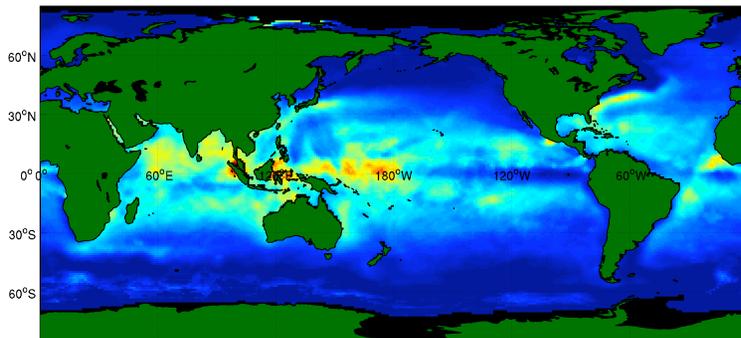
ERA40



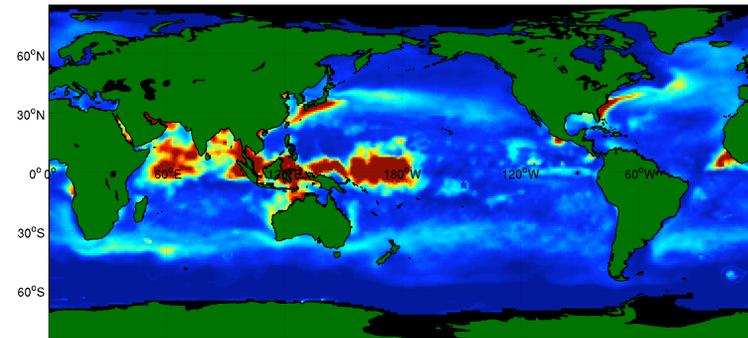
HOAPS3



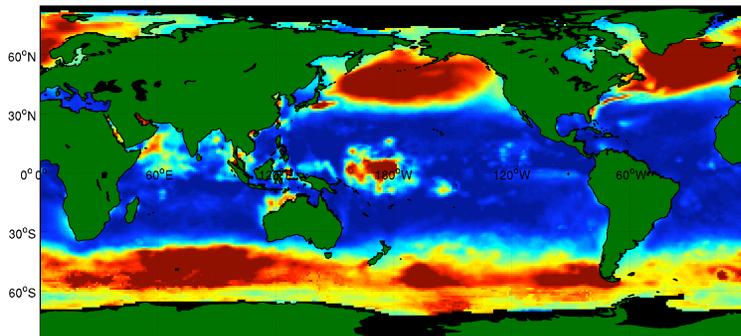
NCEP2



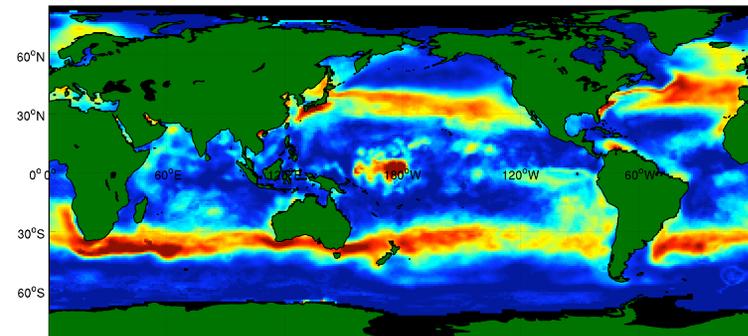
IFREMER3



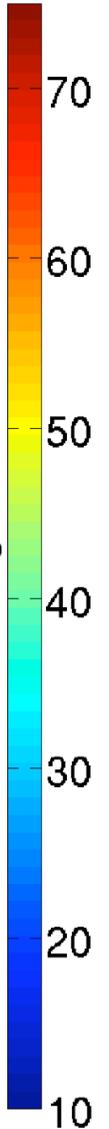
GSSTF2



JOFUROV2

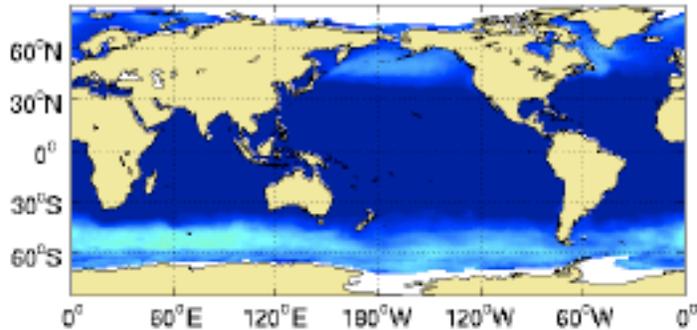


W m⁻²

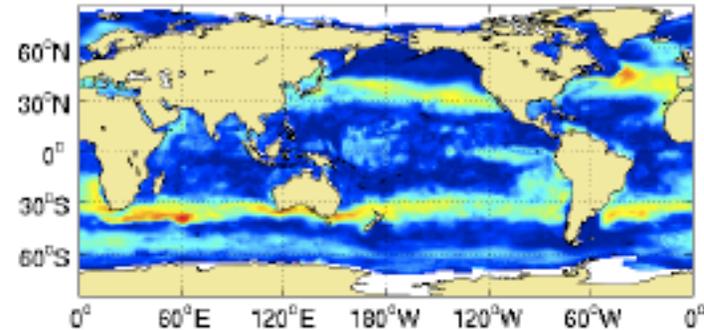


Systematic uncertainties: $(q_a - q_s)$

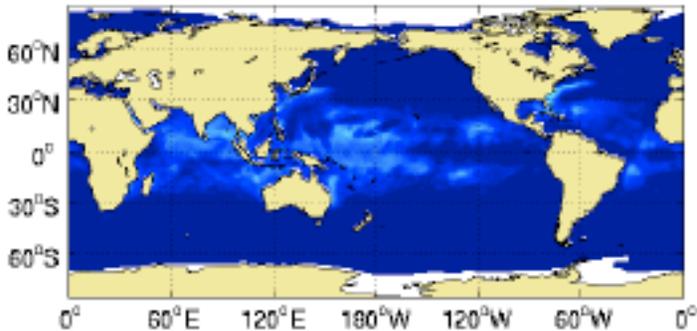
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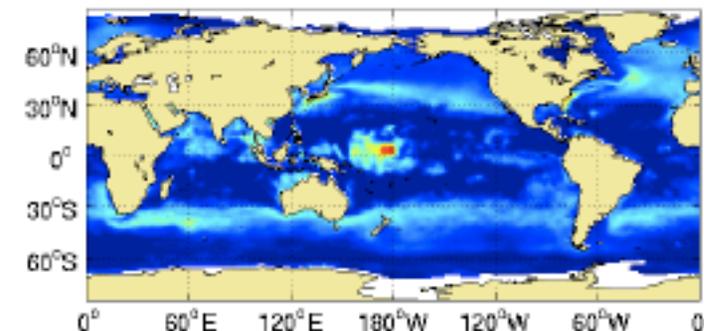
HOAPS3



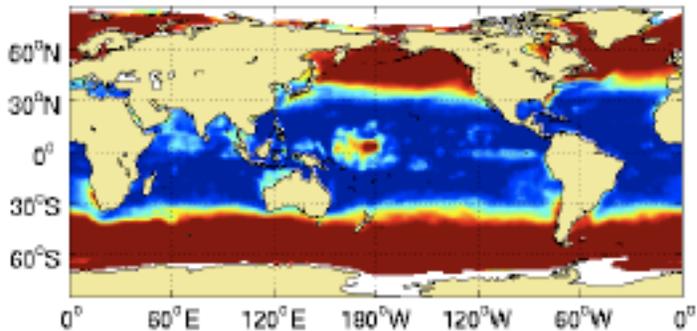
NCEP2



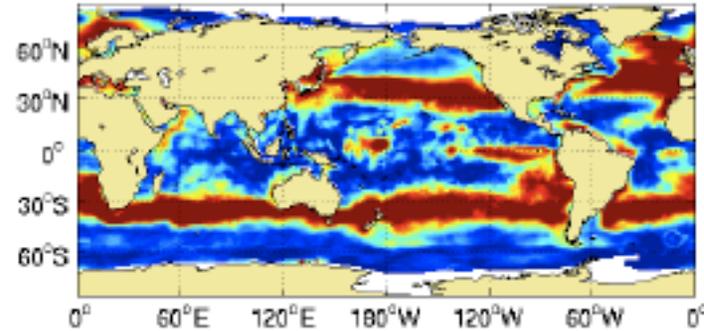
IFREMER3



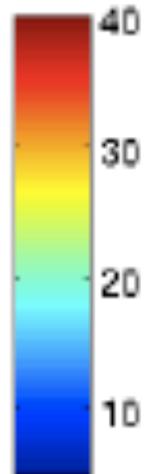
GSSTF2



JOFUROV2

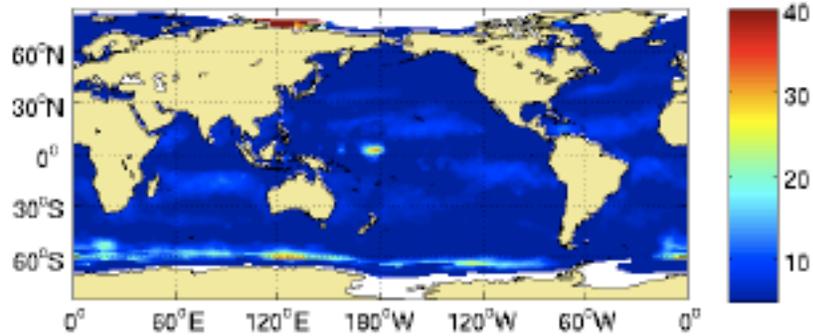


$W m^{-2}$

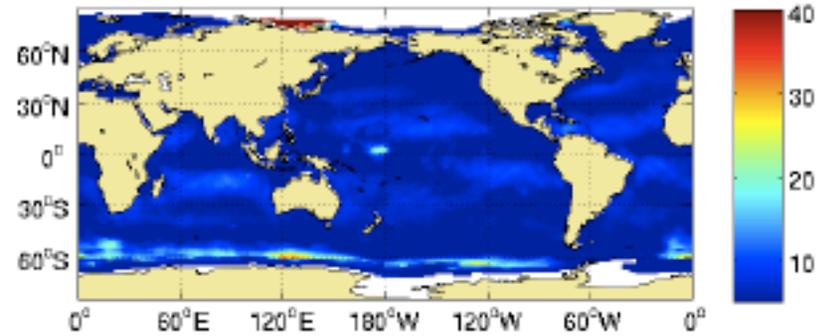


Systematic uncertainties: C_E

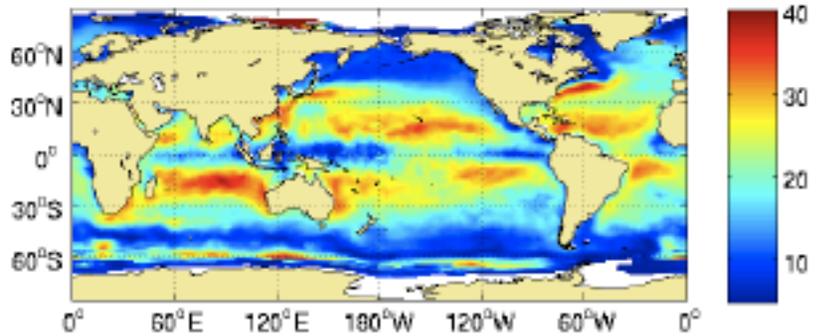
ERA40



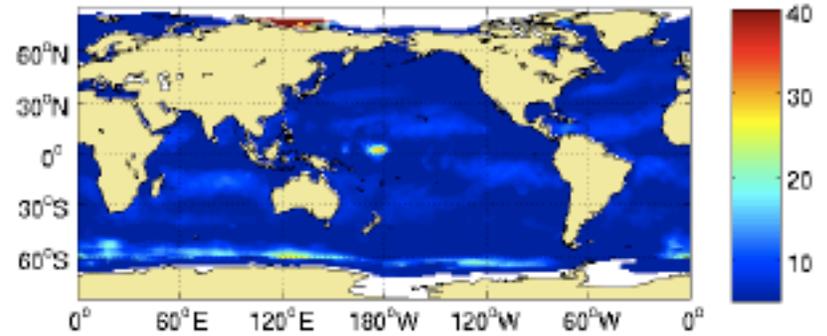
HOAPS3



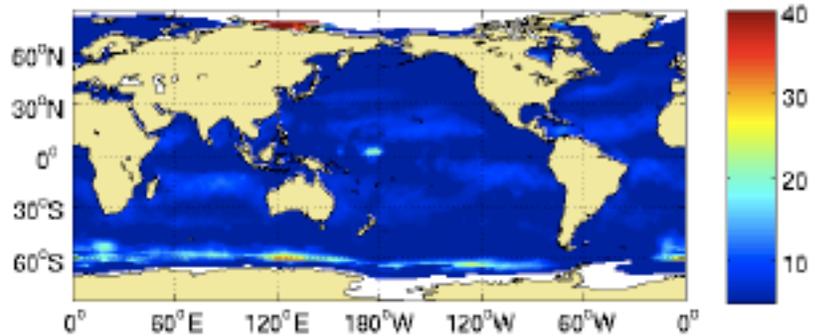
NCEP2



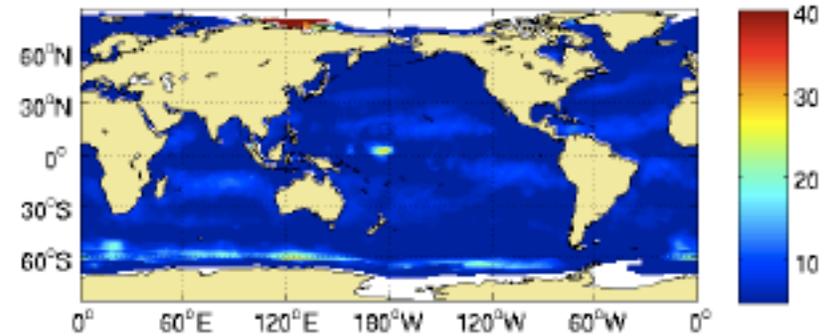
IFREMER3



GSSTF2

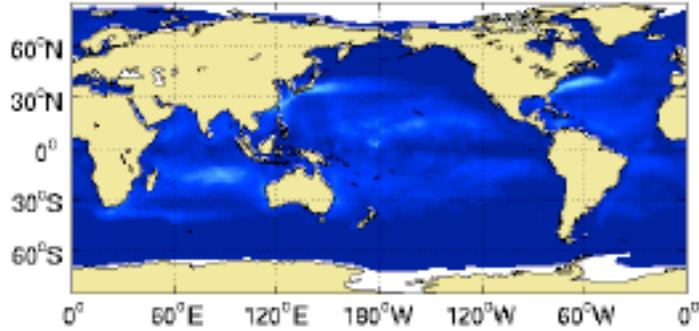


JOFURO2V2

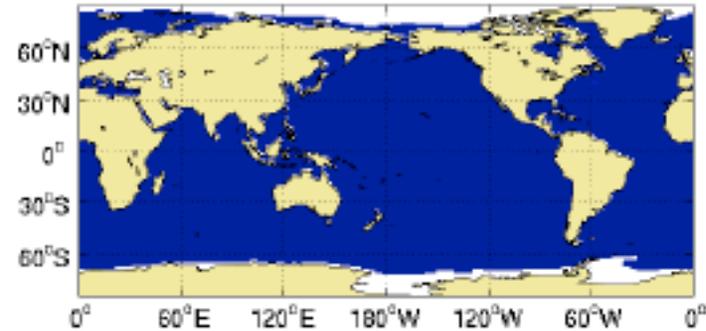


Systematic uncertainties: wind

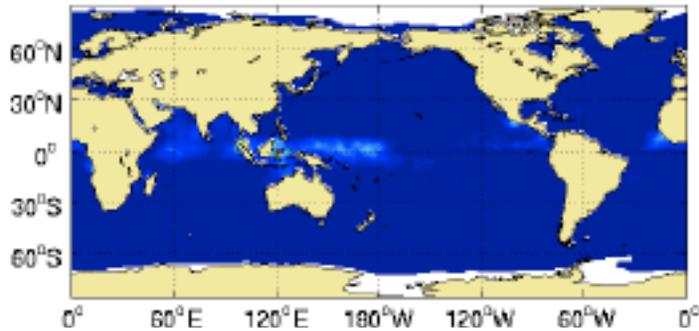
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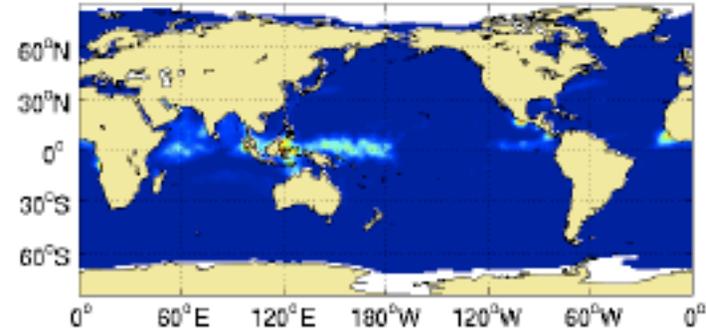
HOAPS3



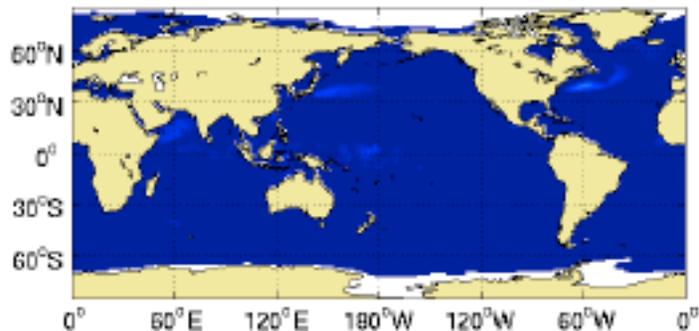
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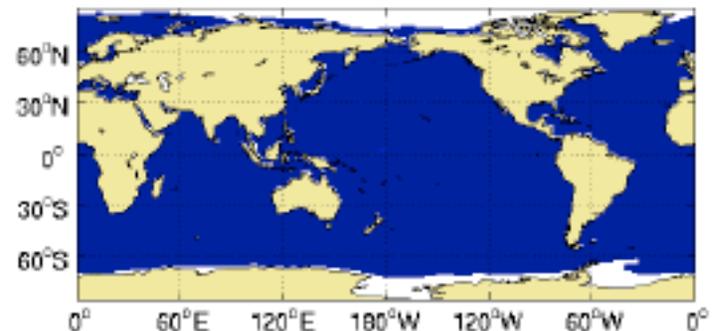
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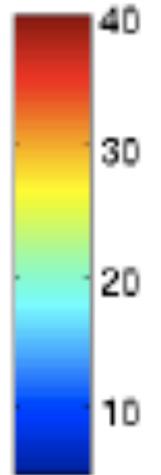
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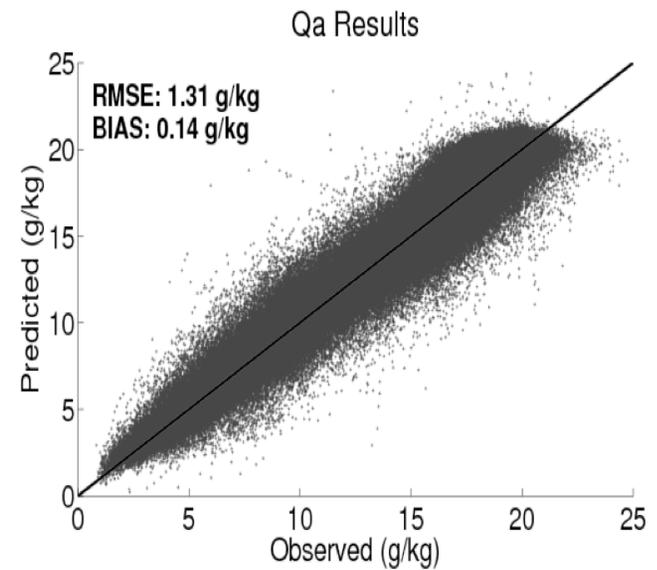
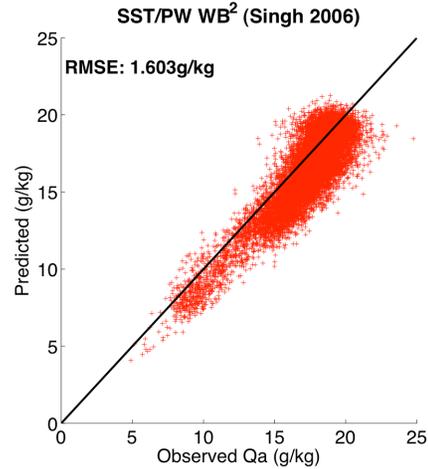
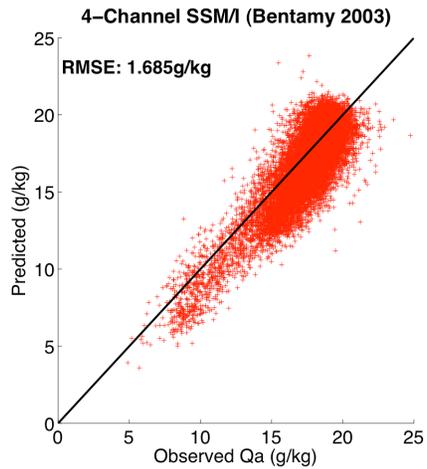
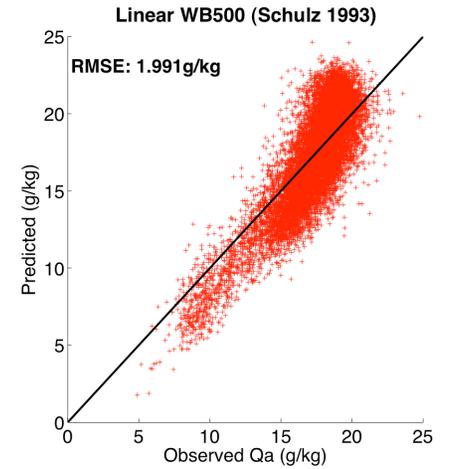
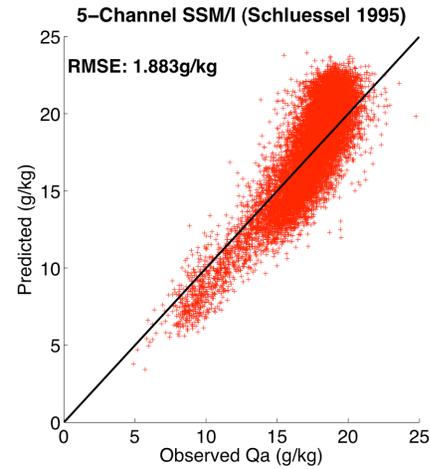
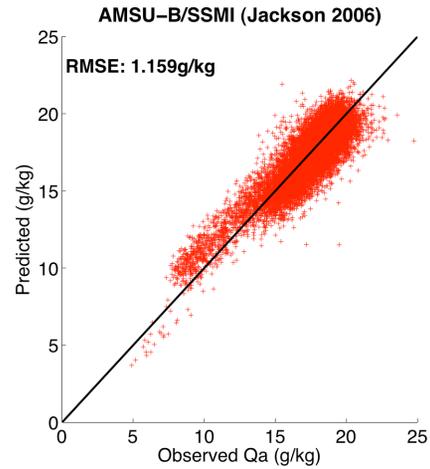
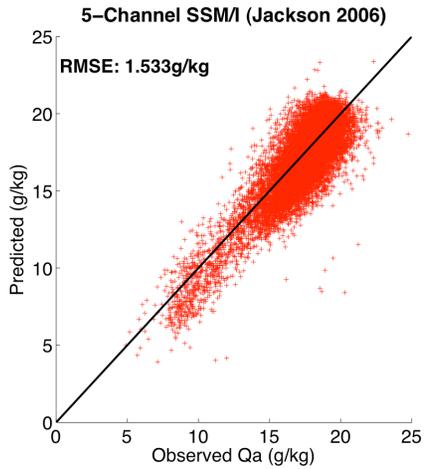
JOFUROV2



$W m^{-2}$

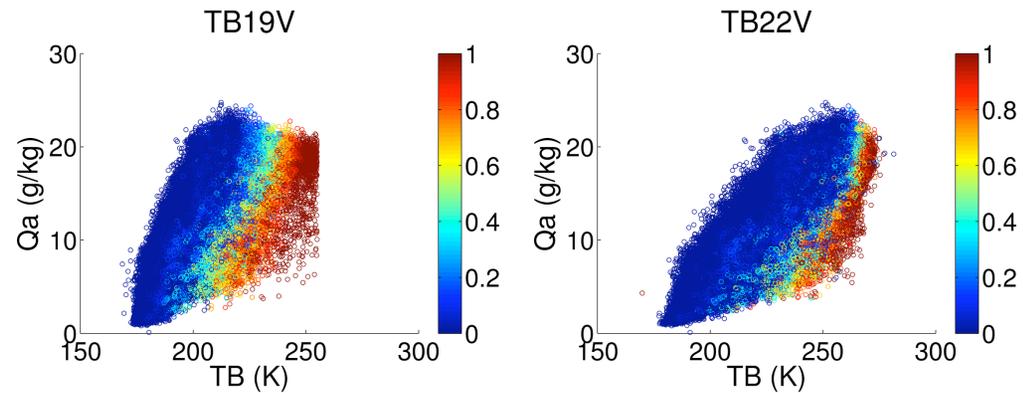


Retrievals of q_a

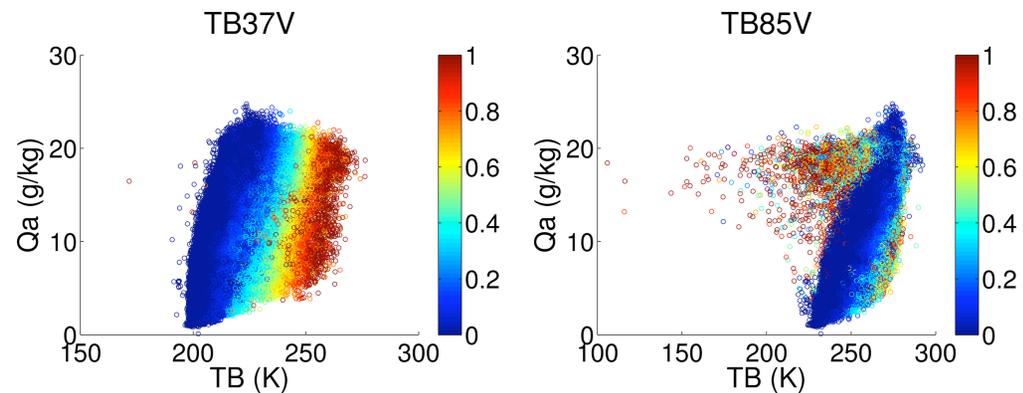


Relationship between q_a and TB

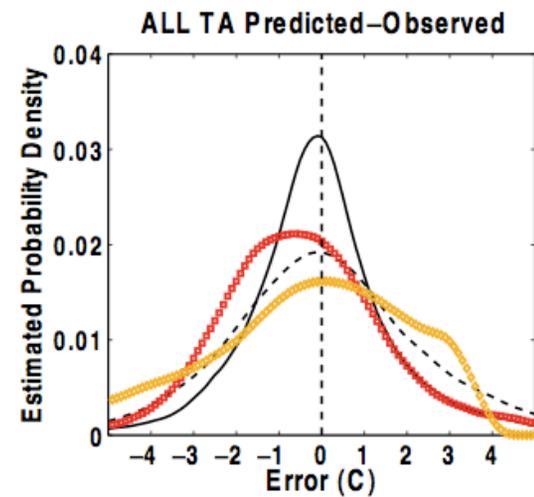
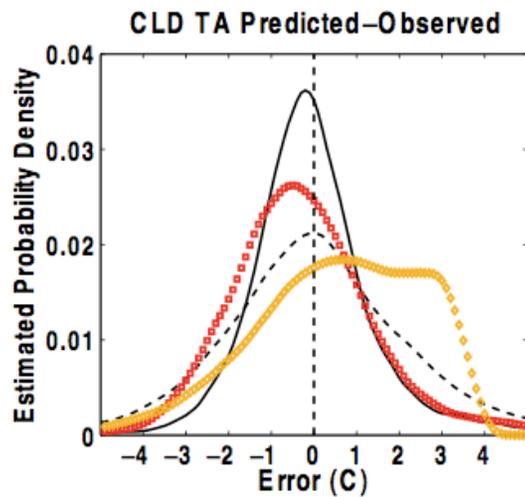
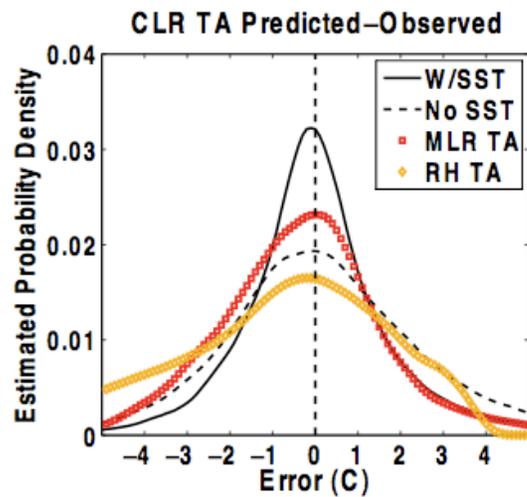
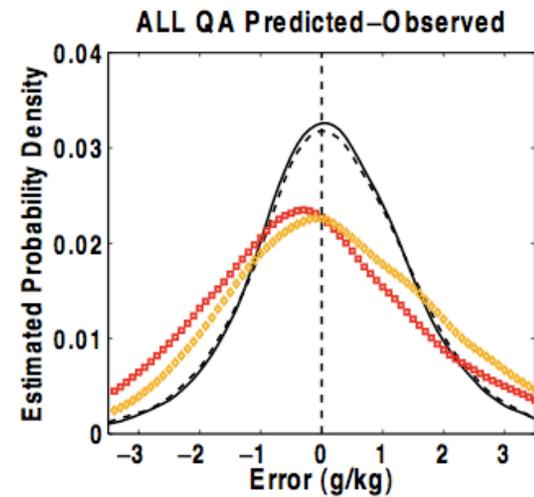
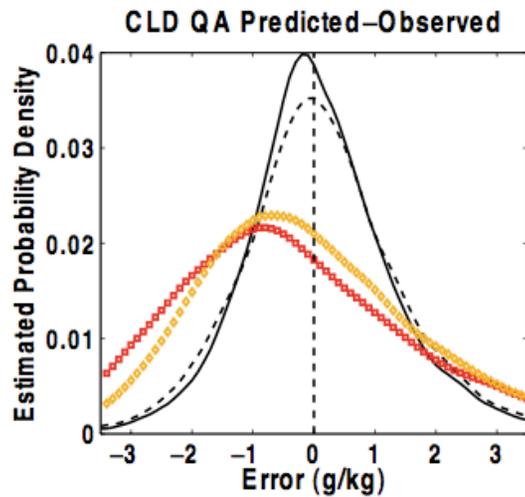
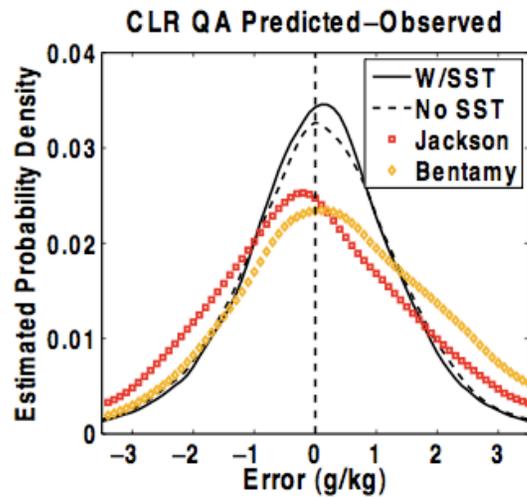
Colors indicate cloud liquid water content



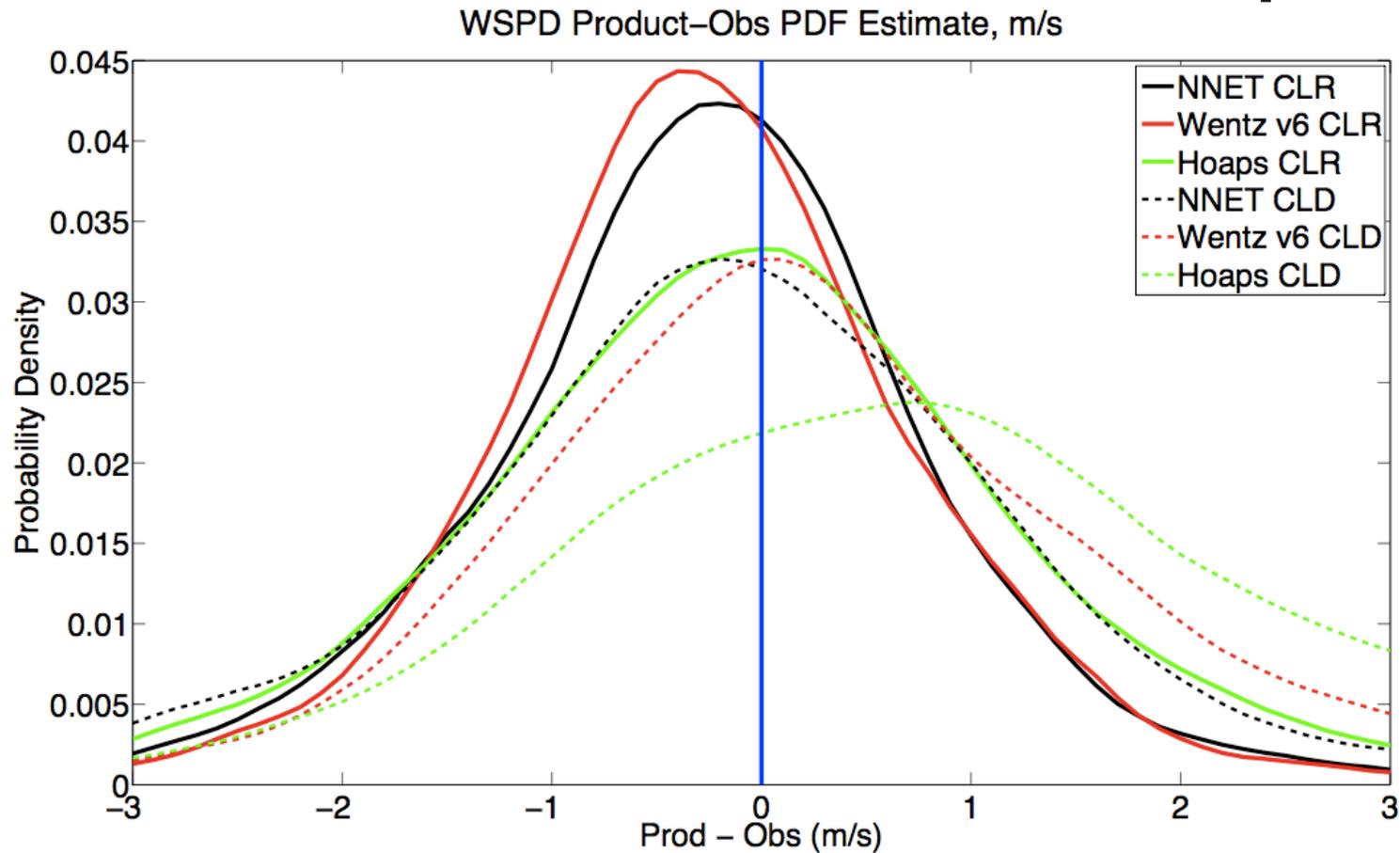
Cloud liquid water warms TBs and causes saturation



Cloudiness effects on T_a , q_a



Cloudiness effects on wind speed

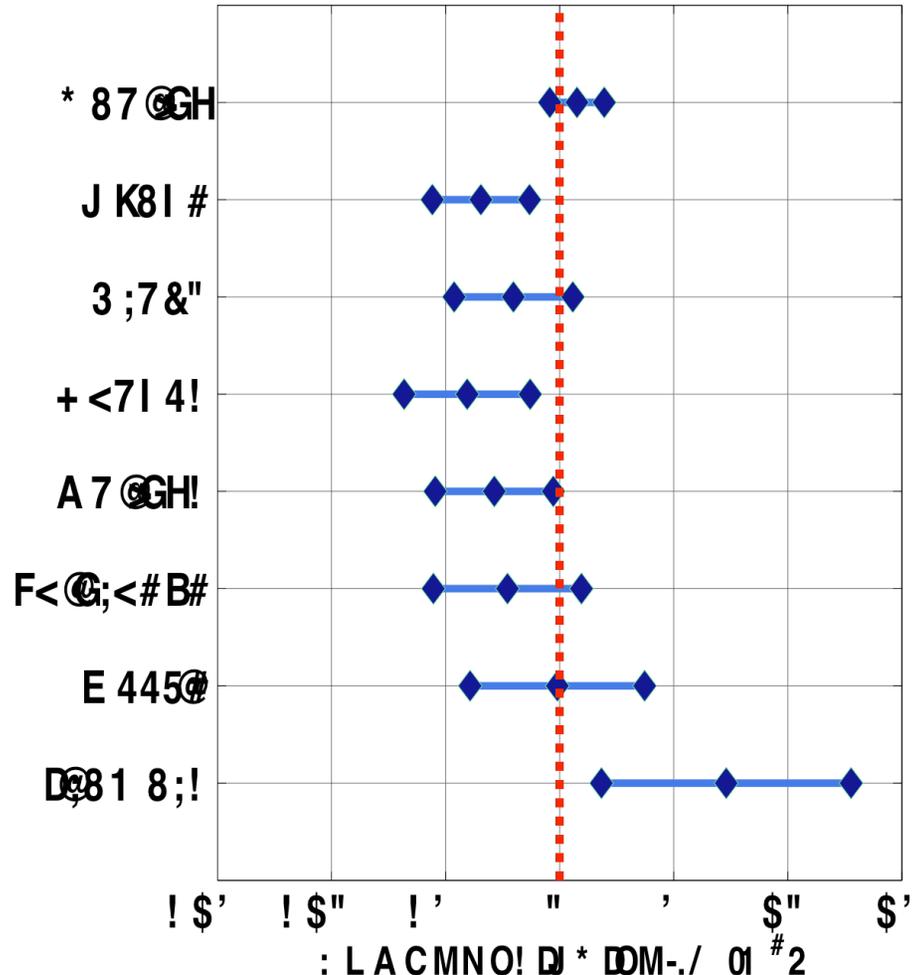
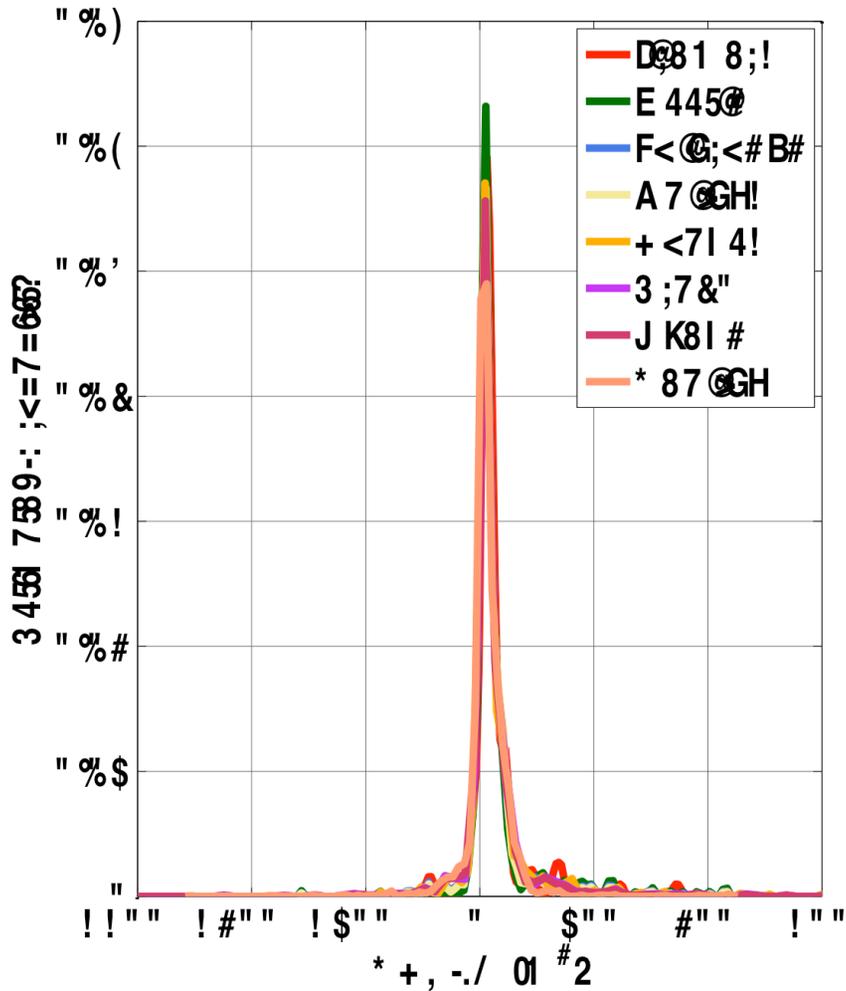


- Additional frequencies with varying cloud liquid water sensitivities would improve retrievals

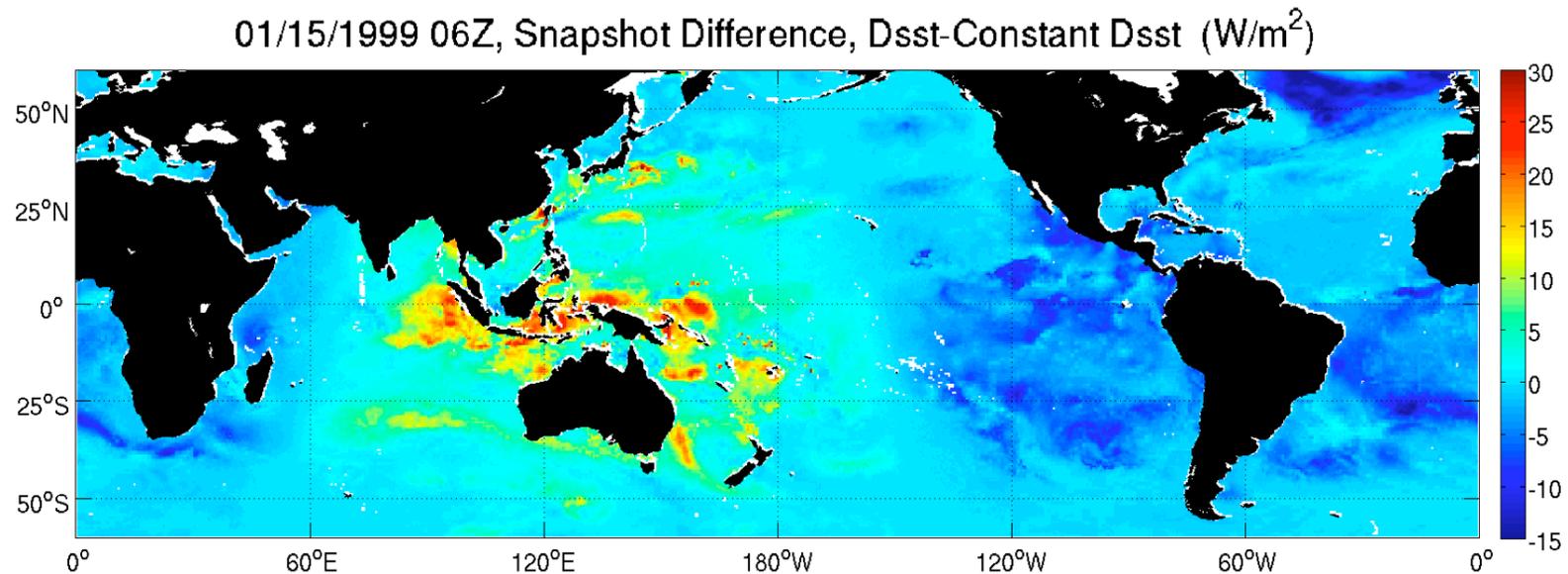
Sensible Heat Flux

3 4 5 6 7 8 9 - : ; < = 7 = 6 6 6 ?

: 7 6 8 9 - 0 ! 0 8 4 5 C 6 @ ; 8 P K 8 - P - Q 8 7 P 4 - . R ' S - N % B 2 F * + ,



Sea surface temperature diurnal variability

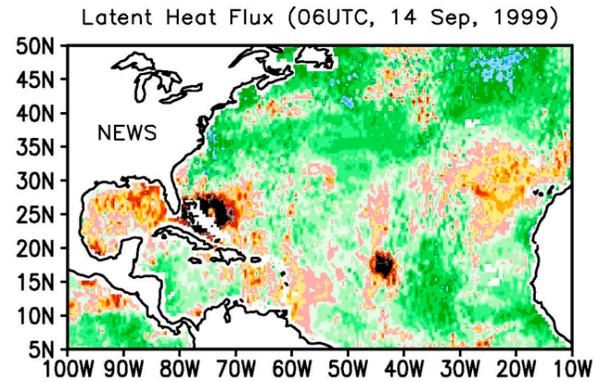


- Have not yet done an analysis of importance of sub-daily variability in winds, air temperature and humidity on mean fluxes
- Clear that more observations at varied times of the day will provide better mean fluxes

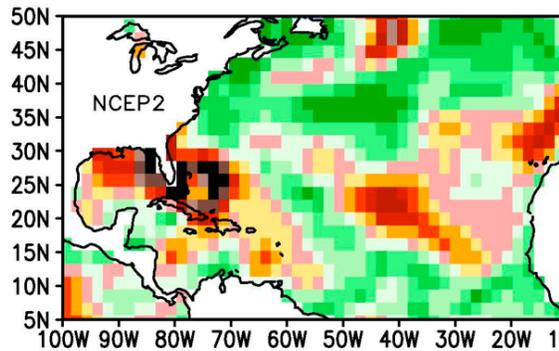
High-resolution satellite ocean surface latent heat fluxes

14 September 1999- Hurricanes Floyd and Gert

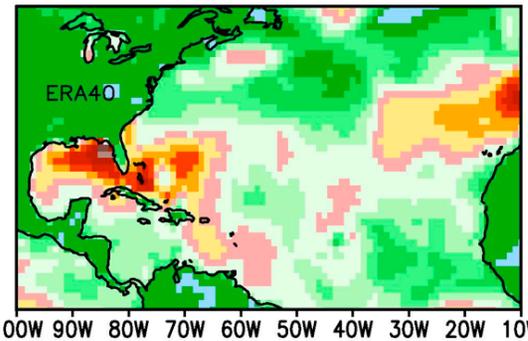
Rain
Cloud liquid water
Resolution
High winds



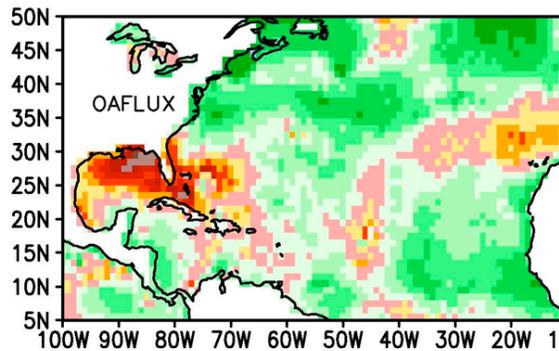
NCEP2
model



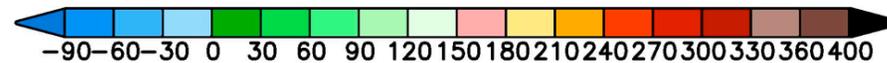
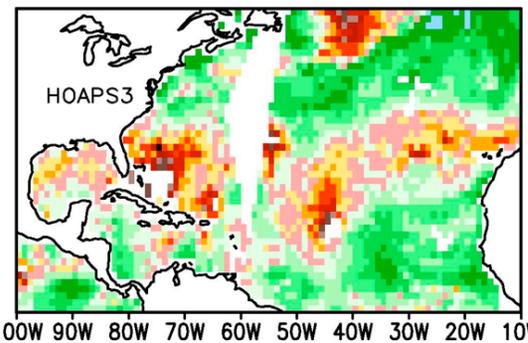
ERA40
model



OAFLUX
Blended



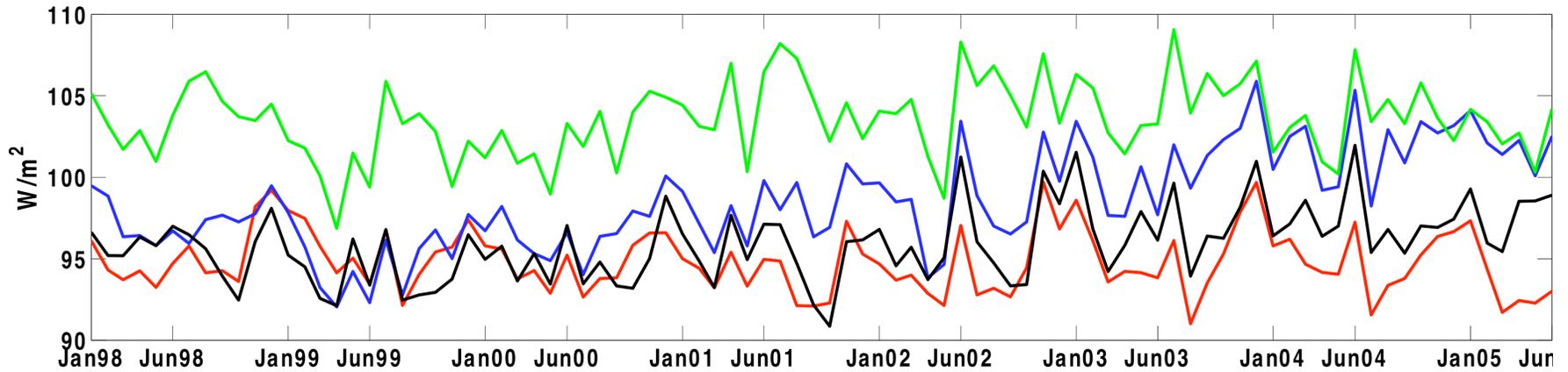
HOAPS3
Satellite



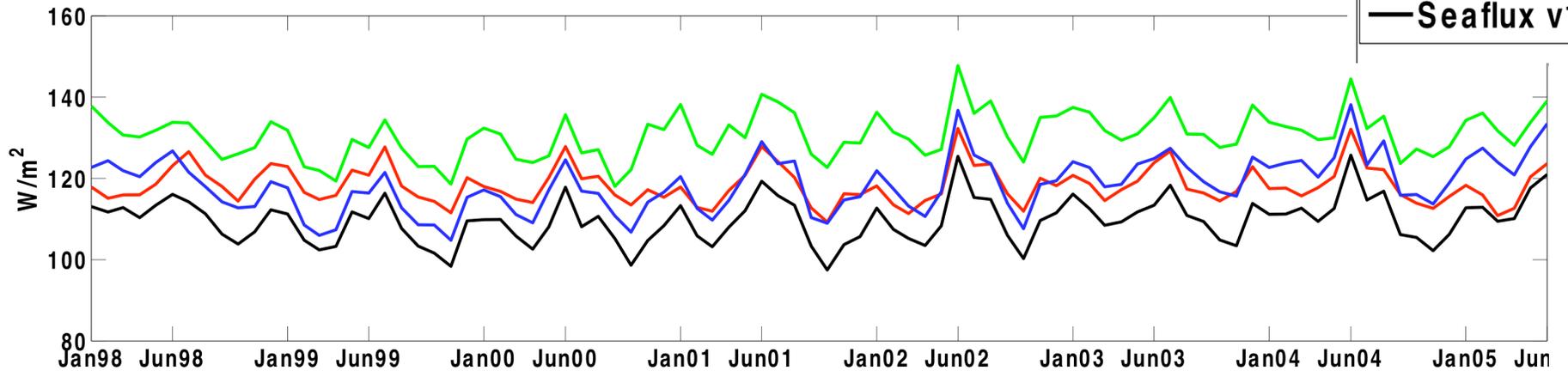
*with
Judy
Curry*

Trends in LH Flux

Global

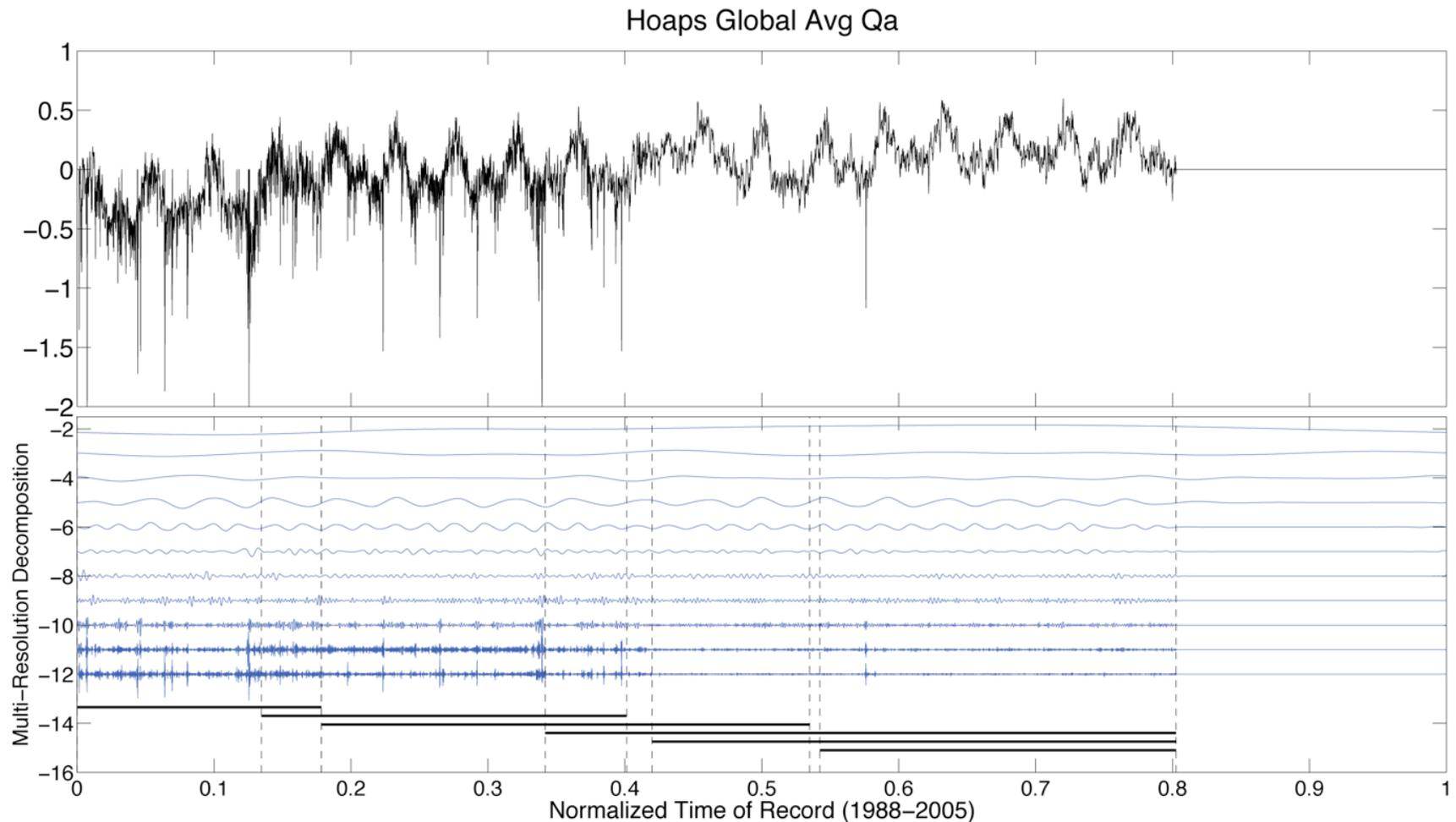


Tropics

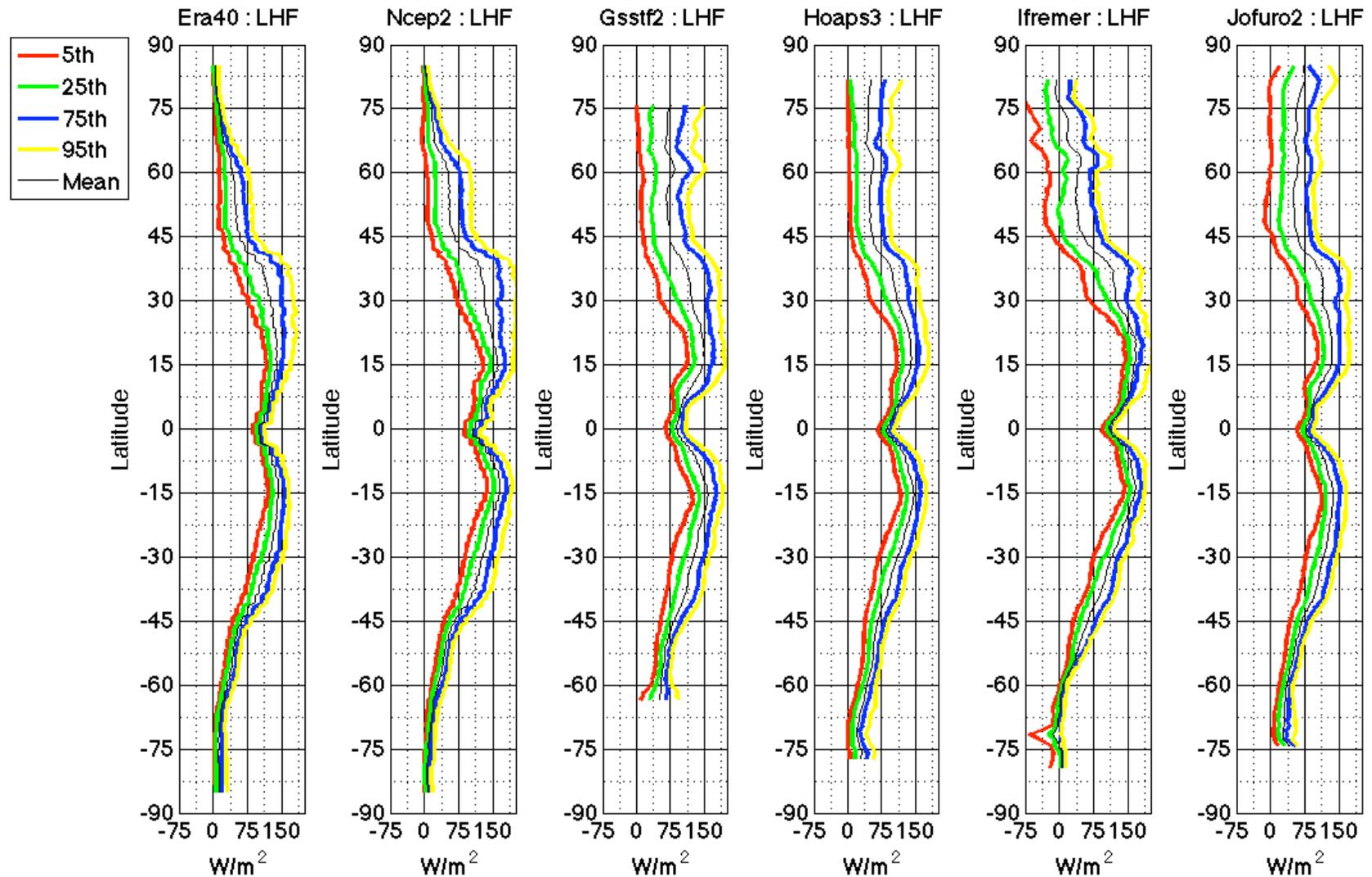


- OAflux v3
- Jofuro 2v3
- Hoaps v3
- Seaflux v1

Number of satellites and coverage affects anomalies

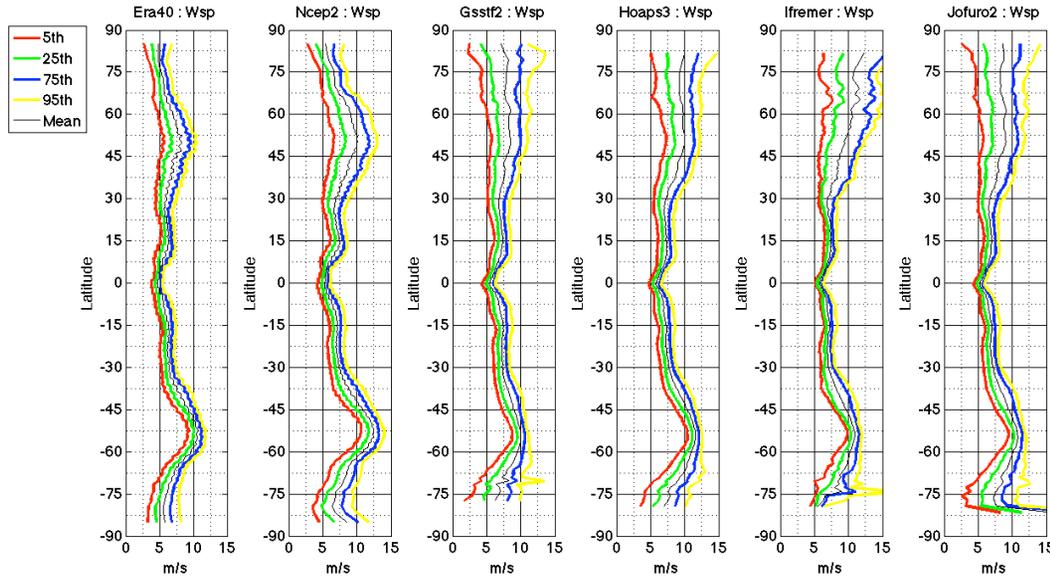


Comparison of extremes: Latent Heat Flux

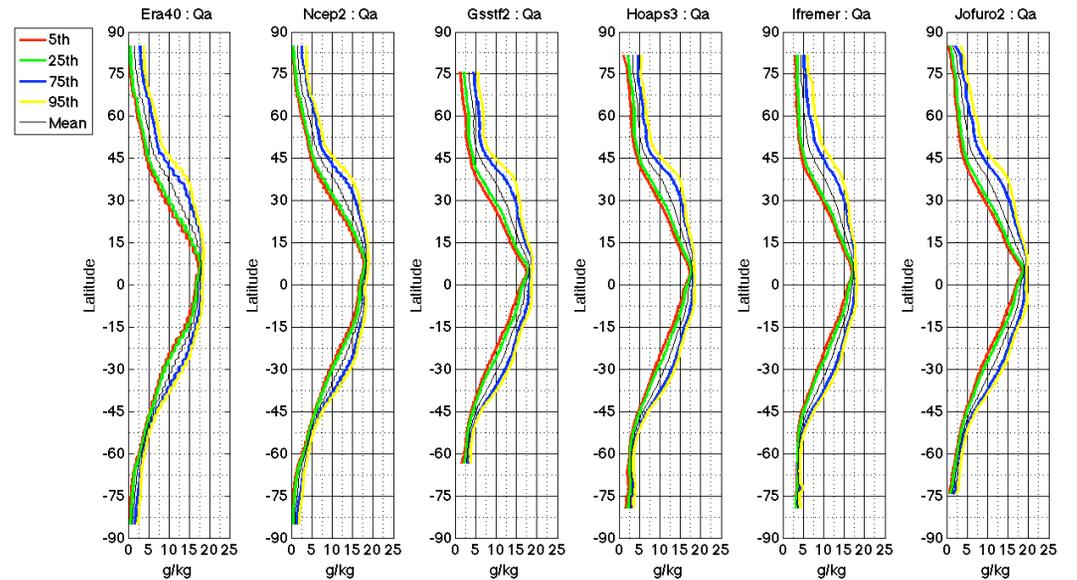


Comparison of extremes

Surface winds



Q_a



Summary

- Differences between products in LH flux smaller than for SH flux
- Errors in q_a fields associated with saturation of SSM/I at high humidities, also with clear/cloudy issues
- Trends vary between products: but within uncertainties

- Further evaluations should be looking outwards towards other types of products: i.e., NEWS budgets
- Fuller evaluation of extremes and their effects on means needs to be performed