

# US CLIVAR High-Latitude Surface Flux Working Group

US CLIVAR Summit, July 2010, Denver



Photo: Peter Guest, SHEBA, 1998,  
[http://www.weather.nps.navy.mil/~psguest/sheba/pictures/maui\\_rescue.html](http://www.weather.nps.navy.mil/~psguest/sheba/pictures/maui_rescue.html)

# Working Group Started with 2 Objectives

- Document present state of high-latitude fluxes, considering momentum, heat, freshwater, and CO<sub>2</sub>. Focus primarily on ocean-atmosphere and ocean-ice-atmosphere fluxes.
- Organize community workshop to coordinate efforts to improve flux estimates at high latitudes.



Photo: Peter Guest, SHEBA  
<http://www.weather.nps.navy.mil/~psgquest/sheba/pictures/artsy.html>

# Membership

- Ed Andreas (associate)
- Cecelia Bitz
- Mark Bourassa (co-chair)
- Dave Carlson
- Ivana Cerovecki (associate)
- Meghan Cronin (associate)
- Will Drennan
- Chris Fairall
- Sarah Gille (co-chair)
- Ross Hoffman
- Gudrun Magnusdottir
- Rachel Pinker (associate)
- Ian Renfrew (associate)
- Mark Serreze
- Kevin Speer
- Lynne Talley
- Gary Wick

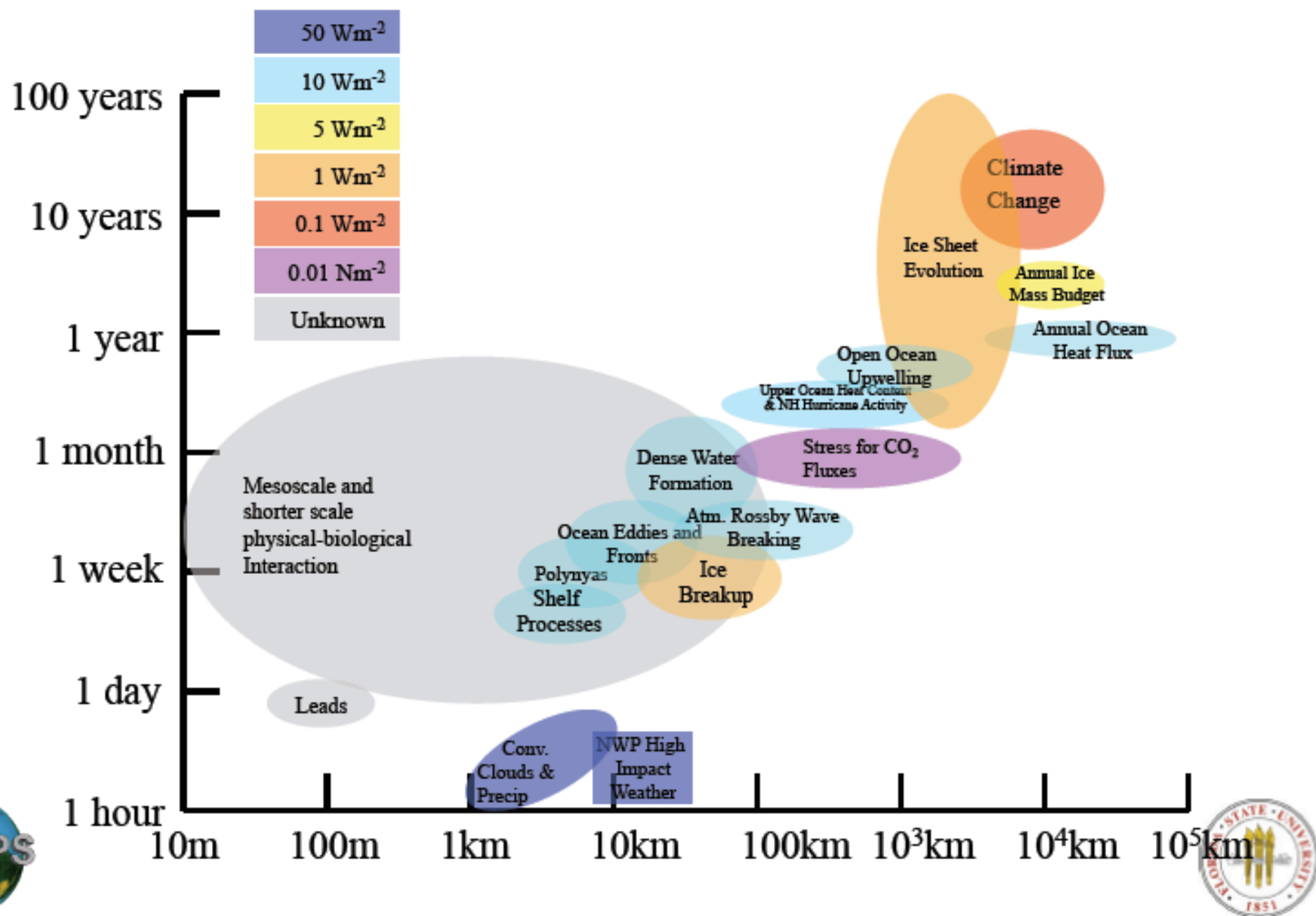
# Documenting State of Fluxes

- Since March 2008, regular telecons, plus a one-day meeting following AMS meeting in Phoenix in January 2009.
- BAMS manuscript summarizing current state of fluxes (in revision)
- Newsletter items:
  - US CLIVAR Variations
  - FluxNews
- OceanObs contribution



Photo: 20 m/s winds as seen from ship.  
Southern Ocean GasEx (Chris Fairall)

# Flux Accuracies and Applications





# Joint US CLIVAR/SeaFlux Workshop



Workshop participants, Day 3

- Open community workshop held in Boulder, Colorado, 17-19 March 2010, NCAR Center Green
- Capacity crowd (70 participants).
- Agenda included plenary talks, separate breakouts on satellite issues (“SeaFlux”) and applications and in situ observations (“CLIVAR”).
- Talks posted on-line:  
<http://www.joss.ucar.edu/events/2010/seafux/agenda.html>

# Workshop Objectives

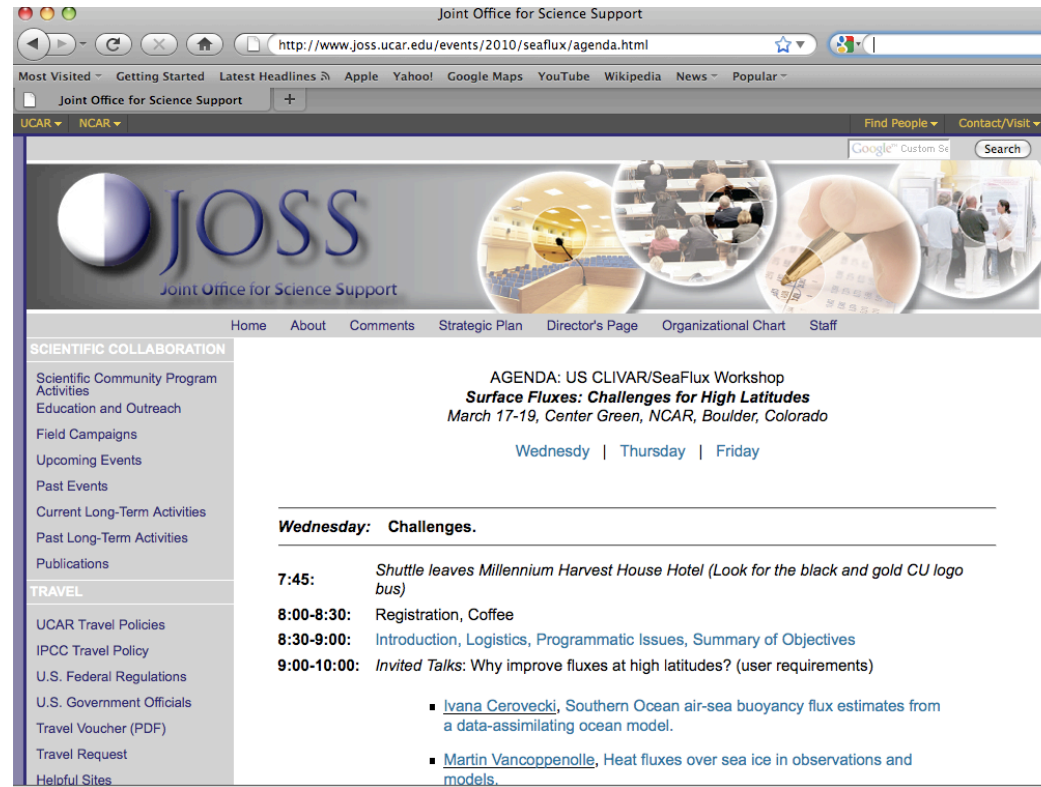
- Share results on applications that rely on fluxes, and look at flux requirements implied by applications.
- Share results on gridded flux products and regional observational (process) studies.
- Disseminate findings.
- Articulate a prioritized plan for improved fluxes.



Photo: Riming on Eppley pyranometer, August 21, 2009  
Southern Ocean GasEx, Chris Fairall

# Disseminate workshop results

- Presentations posted
- *J. Climate* (AMS) special collection (submissions due October 1)
  - Any high latitude surface flux contributions will be considered (need not have been presented at workshop).
- Other AMS journals OK too (*JPO*, *J. Tech*)
- 25 submissions expected
- *US CLIVAR Variations* meeting summary just mailed.
- *EOS* workshop summary in review.



The screenshot shows a web browser window displaying the JOSS (Joint Office for Science Support) website. The URL in the address bar is <http://www.joss.ucar.edu/events/2010/seaflux/agenda.html>. The page features the JOSS logo and a navigation menu with links to Home, About, Comments, Strategic Plan, Director's Page, Organizational Chart, and Staff. A sidebar on the left lists categories like SCIENTIFIC COLLABORATION and TRAVEL. The main content area displays the agenda for the US CLIVAR/SeaFlux Workshop, titled "Surface Fluxes: Challenges for High Latitudes", held from March 17-19 at the Center Green, NCAR, Boulder, Colorado. The agenda is organized by day, with Wednesday's challenges starting at 7:45 AM. Key activities include shuttle travel, registration, coffee, an introduction, and invited talks by Ivana Cerovecki and Martin Vancoppenolle.

Joint Office for Science Support

<http://www.joss.ucar.edu/events/2010/seaflux/agenda.html>

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- Field Campaigns
- Upcoming Events
- Past Events
- Current Long-Term Activities
- Past Long-Term Activities
- Publications

TRAVEL

- UCAR Travel Policies
- IPCC Travel Policy
- U.S. Federal Regulations
- U.S. Government Officials
- Travel Voucher (PDF)
- Travel Request
- Helpful Sites

AGENDA: US CLIVAR/SeaFlux Workshop  
**Surface Fluxes: Challenges for High Latitudes**  
March 17-19, Center Green, NCAR, Boulder, Colorado

Wednesday | Thursday | Friday

**Wednesday: Challenges.**

**7:45:** Shuttle leaves Millennium Harvest House Hotel (Look for the black and gold CU logo bus)

**8:00-8:30:** Registration, Coffee

**8:30-9:00:** Introduction, Logistics, Programmatic Issues, Summary of Objectives

**9:00-10:00:** Invited Talks: Why improve fluxes at high latitudes? (user requirements)

- Ivana Cerovecki, Southern Ocean air-sea buoyancy flux estimates from a data-assimilating ocean model.
- Martin Vancoppenolle, Heat fluxes over sea ice in observations and models.



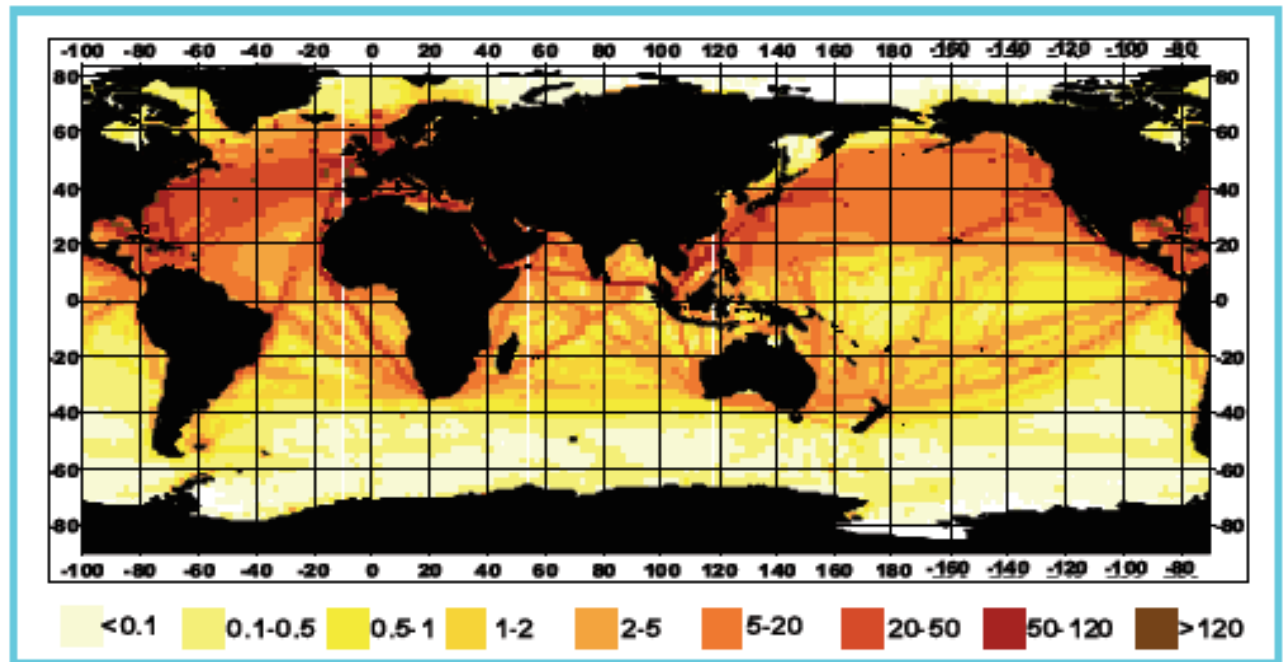
# Workshop Consensus Strategies for Improving Fluxes

- ***More routine observations:*** Moorings, or routine ship-board observations of momentum and turbulent heat fluxes.
- ***More process studies:*** Arctic and Antarctic observations desirable.
- ***New satellites:*** Prospect of obtaining momentum, latent heat, sensible heat, radiative fluxes through a well-defined set of sensors, possibly in multi-satellite formation (“Flux Train”).
- ***Improved access to observations and reanalyses:*** Good meta-data, quality control and uncertainty information.
- Data providers suggested need for ***improved data users***. More caution urged on selecting data products appropriate for application and testing multiple data products (rather than using first one located.)
  - Data providers should provide easily interpreted information to aid in these decisions

# Need for observations

- Historic observations sparse, but it will be crucial to analyze historical data carefully and to make use of new data as it becomes available
- New buoy observations are under development (Agulhas, and have been advocated in planning documents)
- Since workshop, Fairall et al. have suggested instrumenting a NOAA ship operating in Bering Sea.

## ICOADS VOS data: 1880-2007

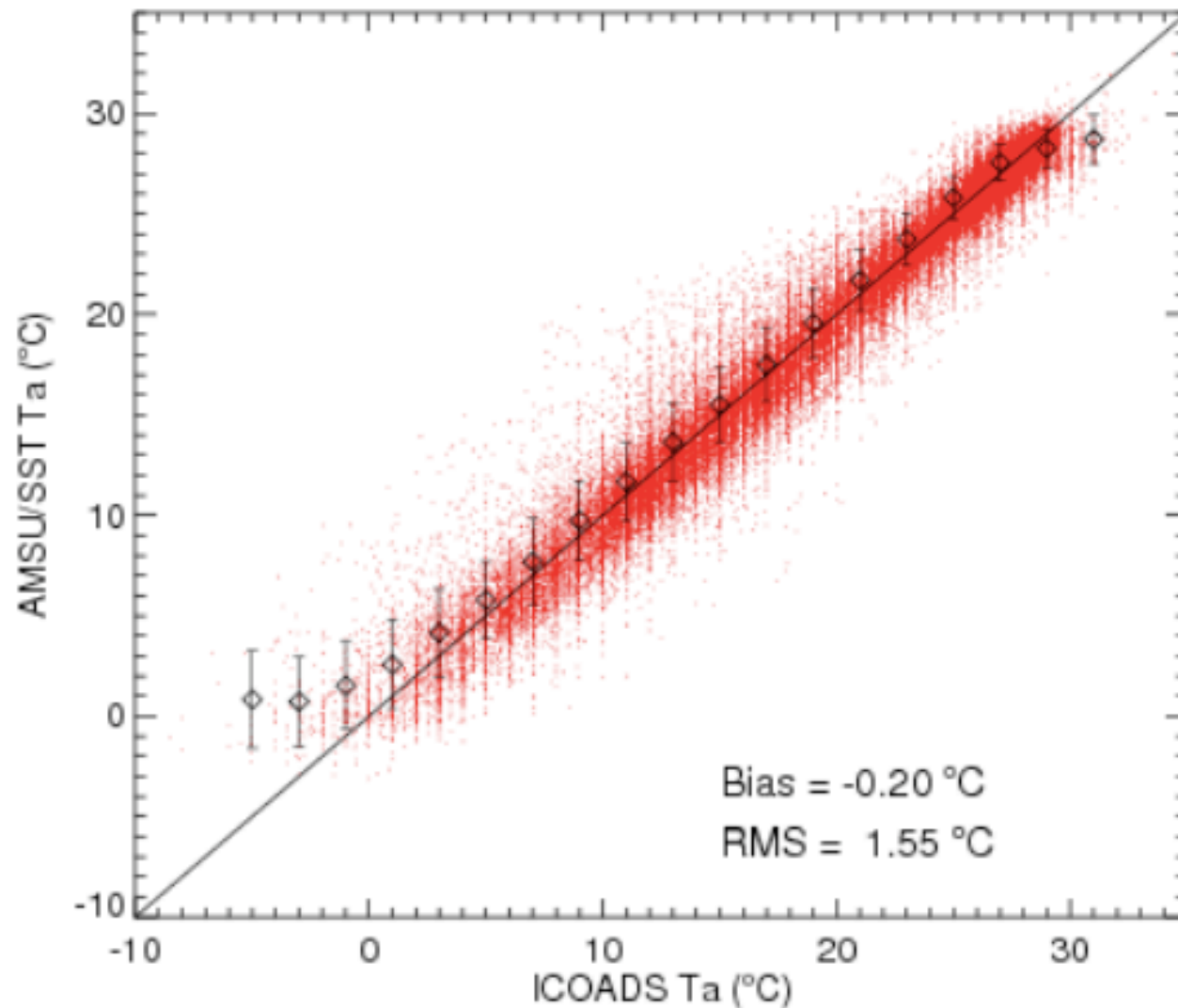


Sampling is  
inhomogeneous  
in space and in time!

# Satellites: Prospects for heat flux as well as momentum

## Example Retrievals of 10m Air Temperature

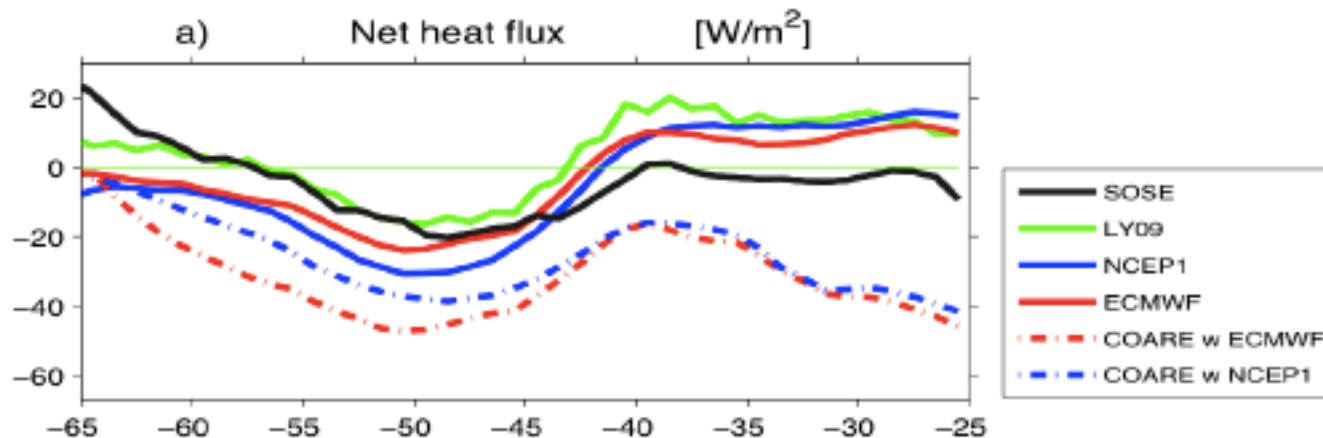
Jackson and Wick Ta Validation 1999



- Multiple linear Regression technique
- Pretty good for most conditions
- Issues for very low temperature and very high temperatures

# Next generation gridded products: SeaFlux

- SeaFlux focused on gridded products, with substantial contributions from satellite observations and reanalysis.
- Assessment crucial. US CLIVAR may be able to help with flux assessment (e.g. a Flux Intercomparison Project or a flux component in a future Model Intercomparison Project). IESA workshop in Baltimore may be a good forum ....
- All users can help make sure flux products are put through tests with a variety of applications.



*Example flux comparison: Zonal average, 2005-07 (Cerovecki et al., 2010)*

*SOSE (Southern Ocean State Estimate); LY09 (Large and Yeager, 2009)*



# Steaming ahead ....



Photo: Chris Fairall, Southern Ocean GasEx