

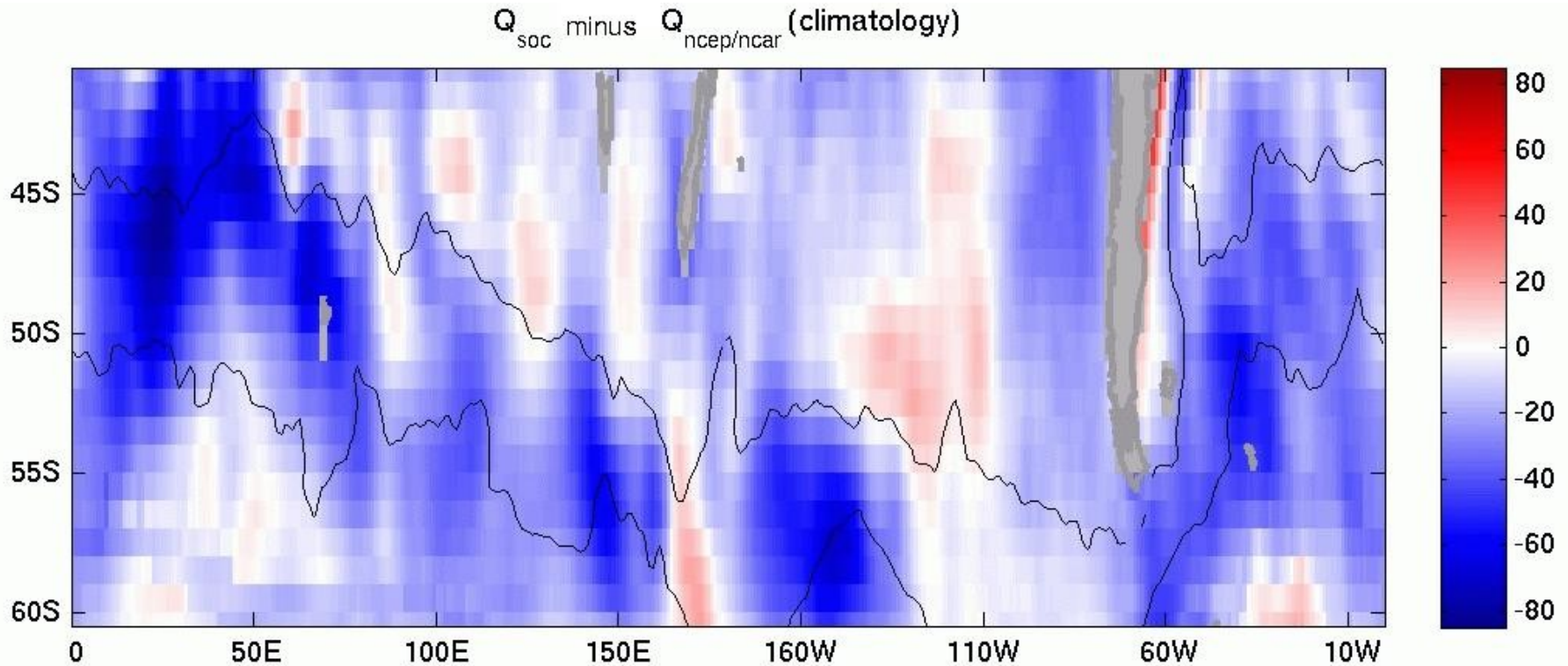
US CLIVAR High-Latitude Surface Flux Working Group

Update for US CLIVAR Summit, July 2009, Annapolis



Photo: Peter Guest, SHEBA, 1998,
http://www.weather.nps.navy.mil/~psguest/sheba/pictures/maui_rescue.html

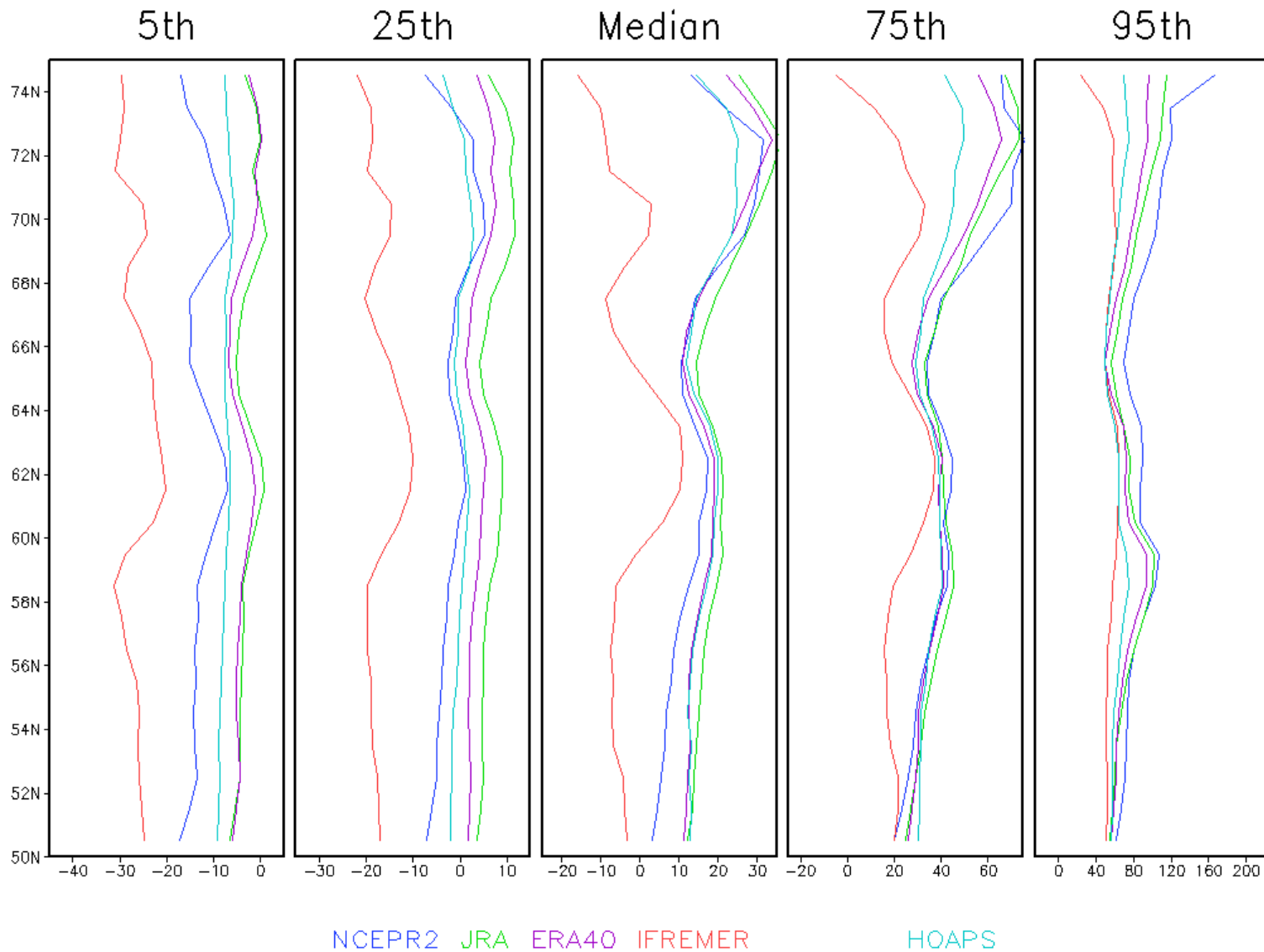
Motivation 1: Heat Flux Differences in the Southern Hemisphere



Flux differences in W m^{-2}
Heat budget imbalance about 1 W m^{-2}
(Courtesy of Shenfu Dong).

Motivation 2

Sensible heat flux in Northern Hemisphere



Working Group Objectives

- Document present state of high-latitude fluxes, considering momentum, heat, freshwater, and CO₂. Focus primarily on ocean-atmosphere and ocean-ice-atmosphere fluxes.
- Organize community workshop to coordinate efforts to improve flux estimates at high latitudes.



Photo: Sharon Escher, SIO

<http://antarcticsun.usap.gov/science/contentHandler.cfm?id=1608>

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

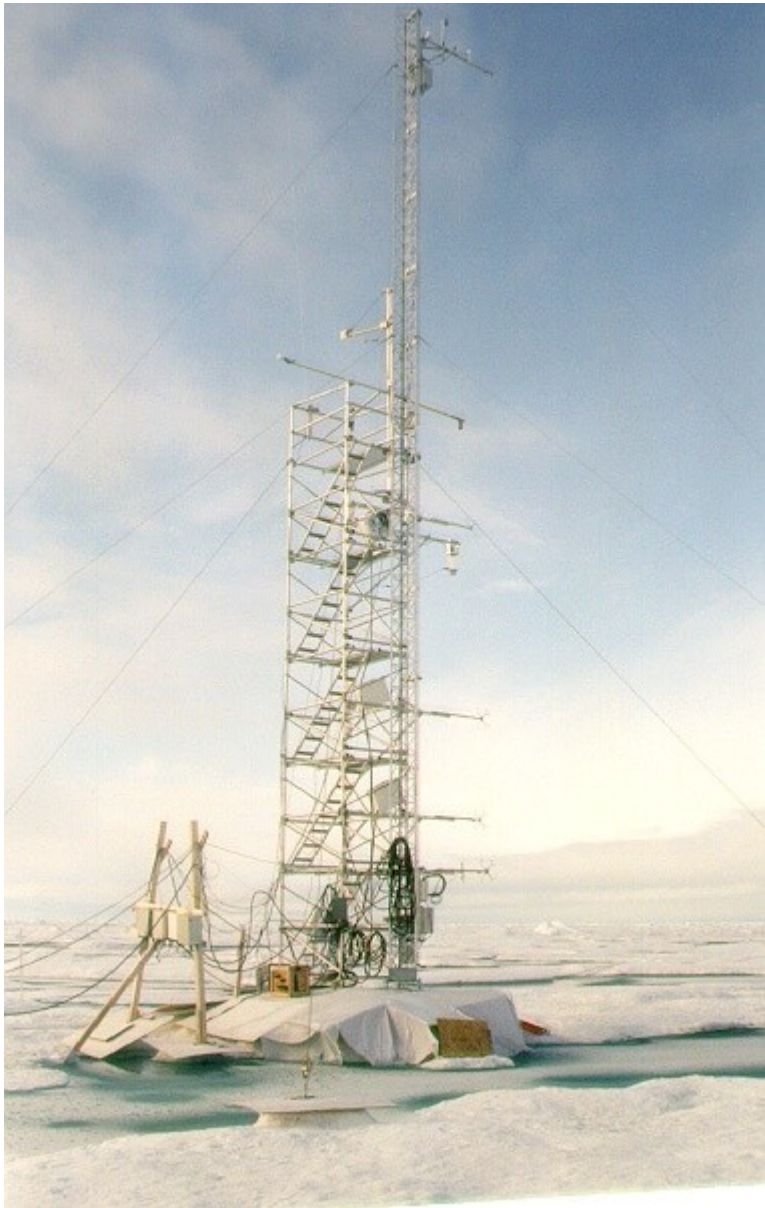
- Since March 2008, 11 telecons, two informal dinners, and a one-day meeting following AMS meeting in Phoenix
- Educated each other about issues with regard to in situ observations, satellite data, numerical weather prediction.
- Newsletter items:
 - US CLIVAR Variations
 - FluxNews
- OceanObs contribution
- BAMS manuscript.



Photo: Peter Guest, SHEBA

<http://www.weather.nps.navy.mil/~psguest/sheba/pictures/artsy.html>

Some of what we've learned

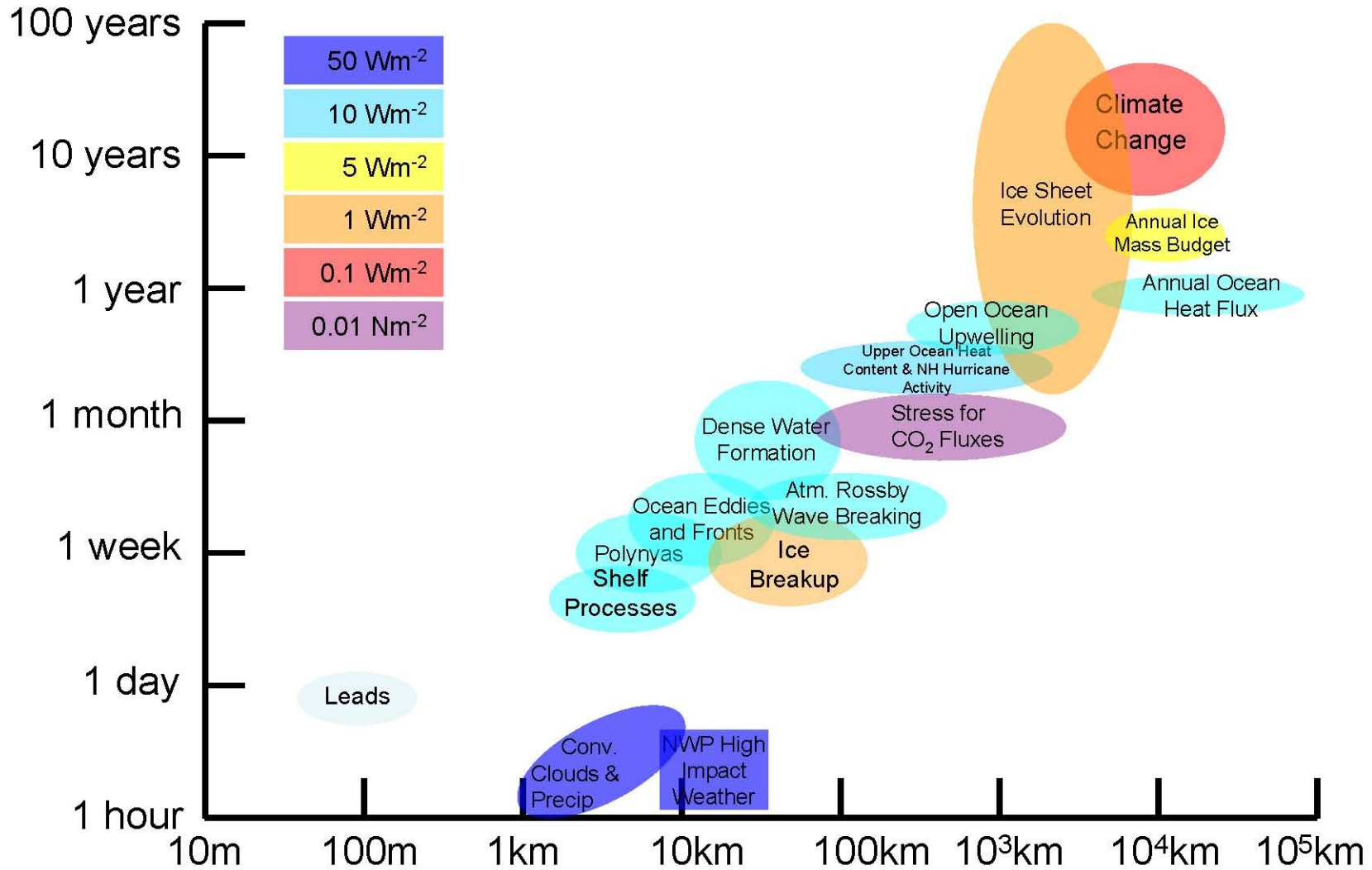


- Surface Heat Budget of the Arctic (SHEBA) deployed instruments for 12 months from ice camp.
- Arguably best regional sampling of surface fluxes in high latitude environments.
- Results may not be helpful in coming decades, since high albedo perennial ice is disappearing.

Other Findings

- Combination of large natural variability and poor in situ sampling makes it impossible (at present) to create regional flux fields from purely in situ products.
- Differences between NWP reanalyses and satellite products for surface turbulent fluxes exceeds 40 W m^{-2} in zonal averages.
 - Probability distributions of fluxes are very different
 - More complicated than a simple bias
 - Regional differences in radiative flux estimates have problems of a similar magnitude
- Analyses of many processes require accuracies of roughly 10 W m^{-2}
 - This accuracy requires improvements on the order of one order of magnitude in accuracy
 - As estimated by biases between modern products

Flux Accuracies and Applications



5 Strategies for Improving Fluxes

- Analyze existing data (mostly basic meteorological variables - temperature and humidity). Ensure data quality and make data more readily accessible.
- Expand field observations. Target direct flux observations and high-quality, high-temporal resolution data needed for satellite calibration/validation.
- Expand use of ships of opportunity and autonomous instruments.
- Make full use of satellite data, and expand the satellite observing system. Improve accuracy of flux related variables (e.g. air temperature, humidity, cloud properties.)
- Improve understanding of the physics underlying air-sea fluxes, and improve parameterizations.

Workshop Plans

- Boulder, Colorado, 17-19 March 2010, NCAR Center Green
- To be held jointly with SeaFlux
- 25+ responses to “doodle” poll to choose date. Capacity of room: 60-70.
- Agenda will focus on the full gamut of concerns: in situ observing system issues, process studies, satellite data, gridded products, and meeting applications requirements.
- Open to the community.

Further Challenges

