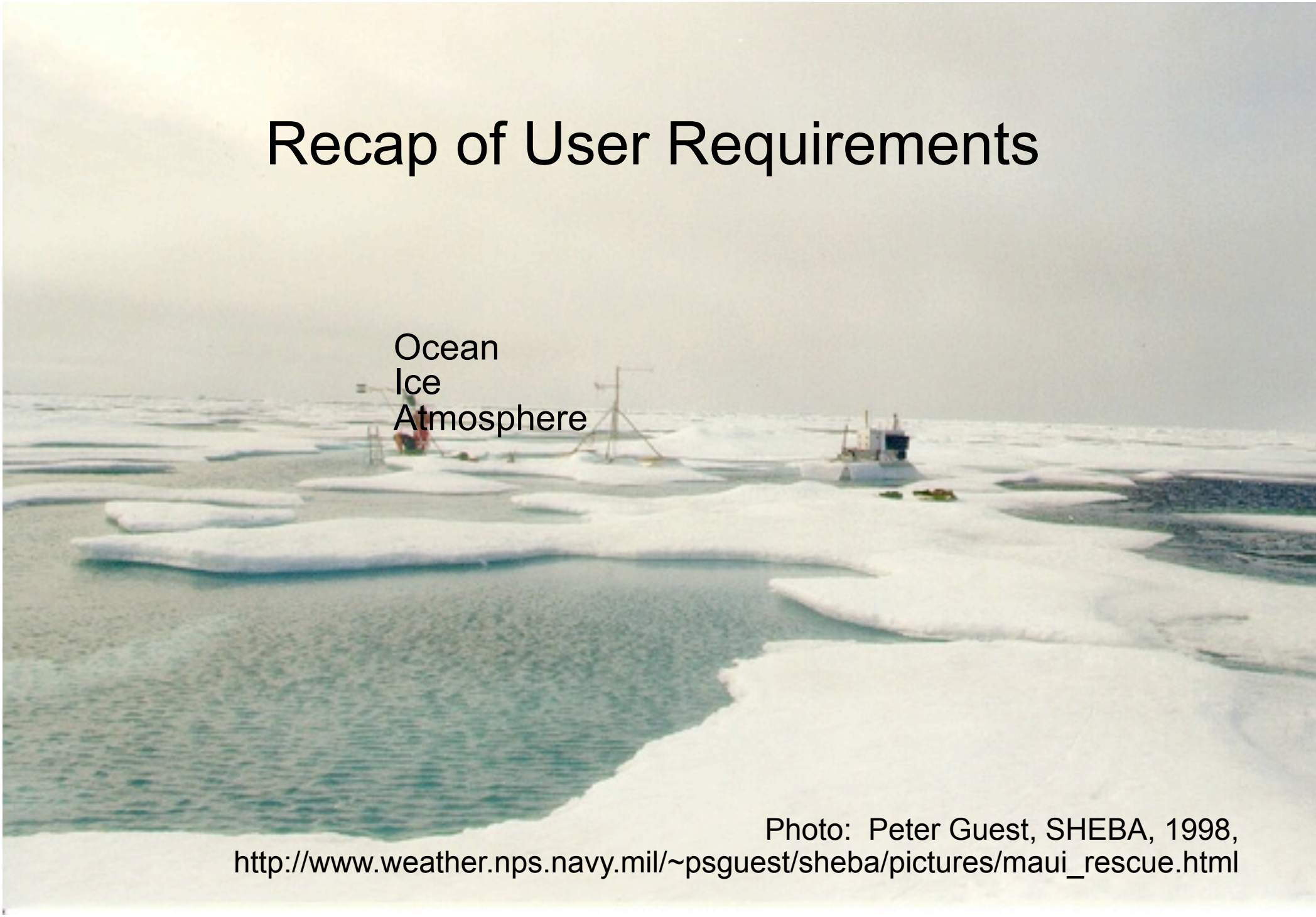
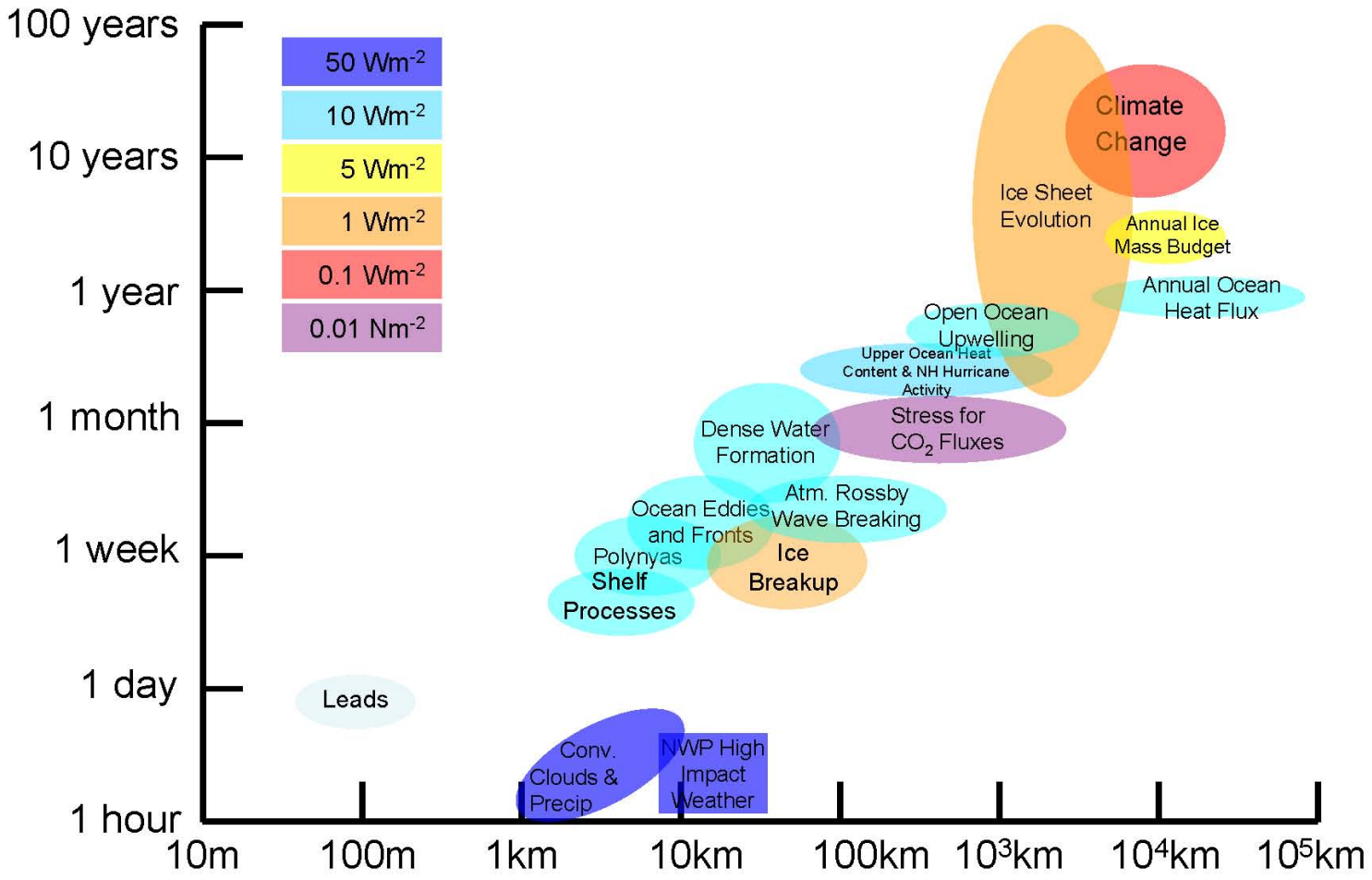
Recap of User Requirements



Ocean
Ice
Atmosphere

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

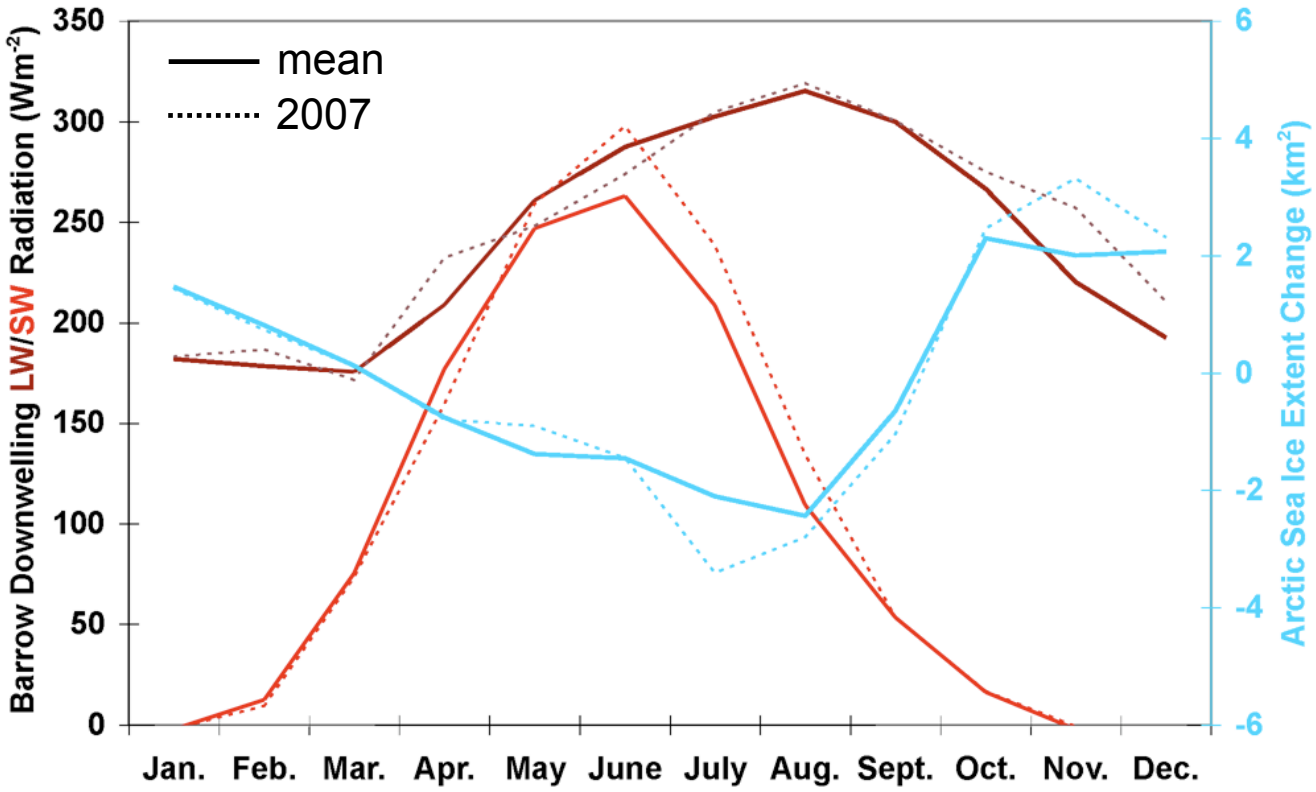
Flux Accuracies and Applications



Applications

- Arctic sea ice loss and links to cloud-free regions (Kay)
- Ice modeling hindcast (Vancopenolle)
- Water mass transformation (Cerovecki)
- Driving ocean models. (Mazloff)
- Assessing mixed-layer depth variability (Chiodi)
- Flux feedbacks (Roberts)

What about direct flux measurements?
(Barrow, AK data)

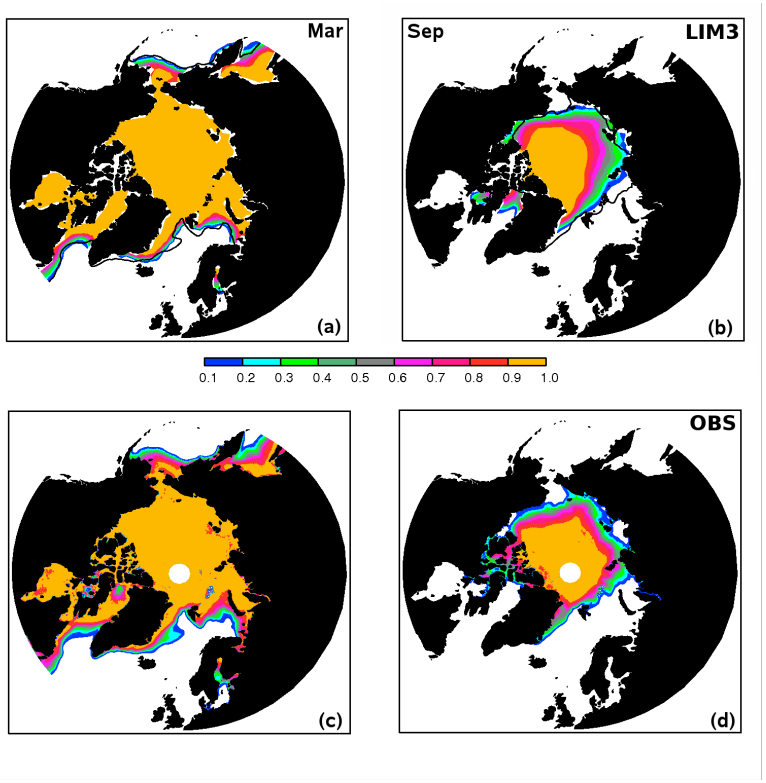


Jennifer Kay

Early ice loss and cloud reductions led to strong shortwave feedbacks during the 2007 melt season.

1979-2006 ice concentration in a hindcast with NEMO-LIM3

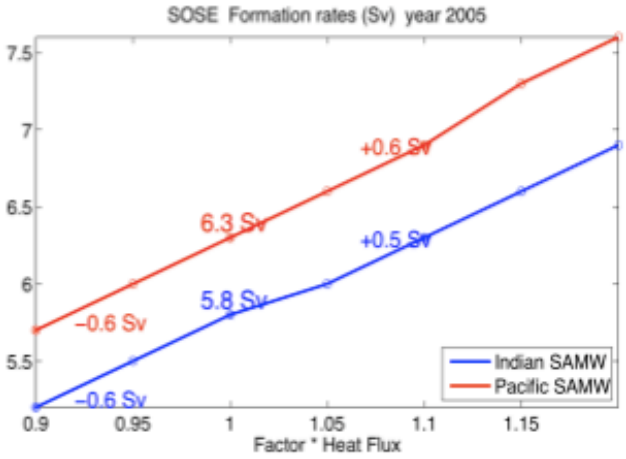
1950-2008 daily atmospheric forcing
+ large-scale ice-ocean model

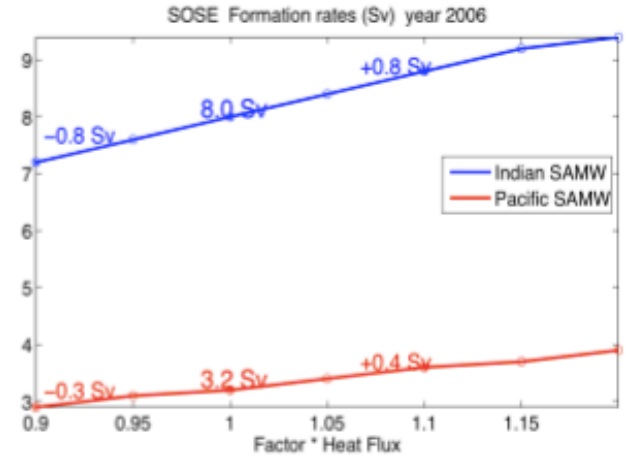


Martin Vancoppenolle

Vancoppenolle et al., 2009

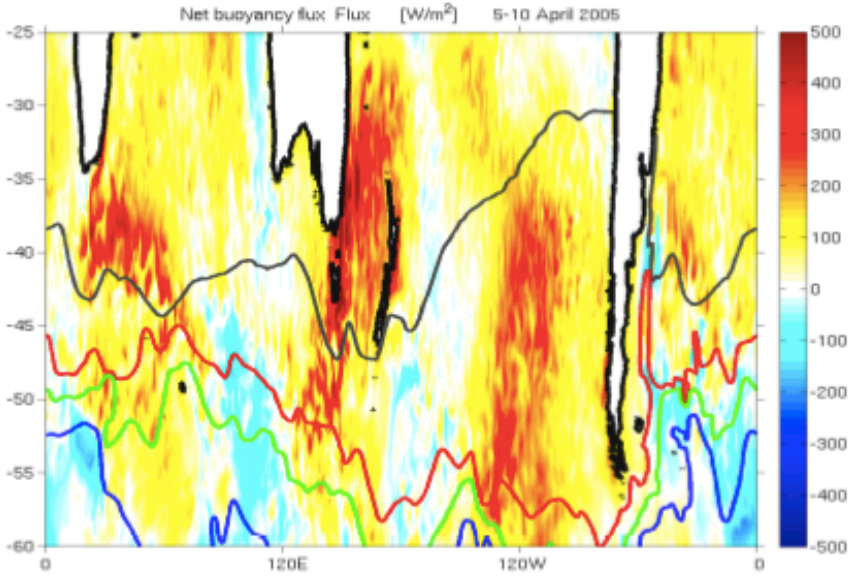
Which air-sea heat flux accuracy do we need?





Transformation=Integral (Buoyancy Flux* Outcrop Area)

Formation(ρ)= Transformation(ρ+Δρ)- Transformation(ρ)



Ivana Cerovecki

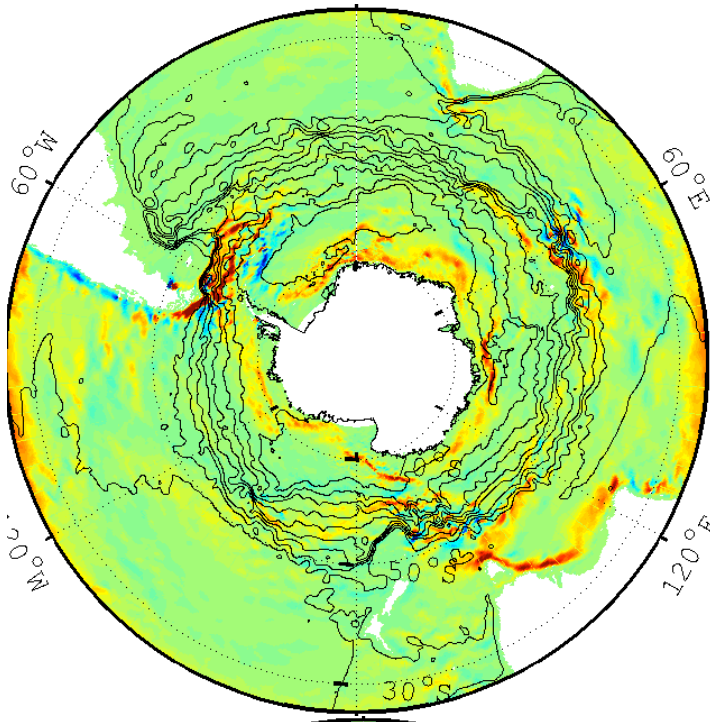
Time average

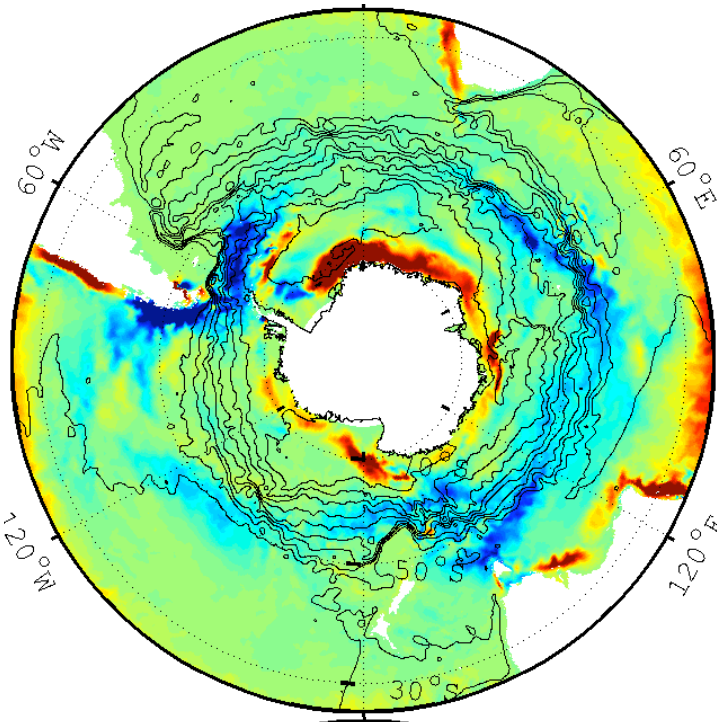
<=Ustress

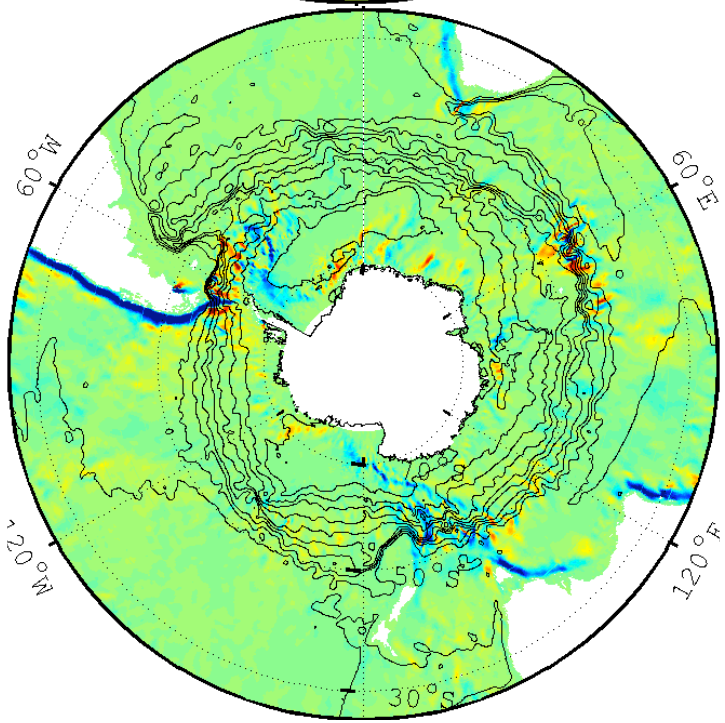
Hflux =>

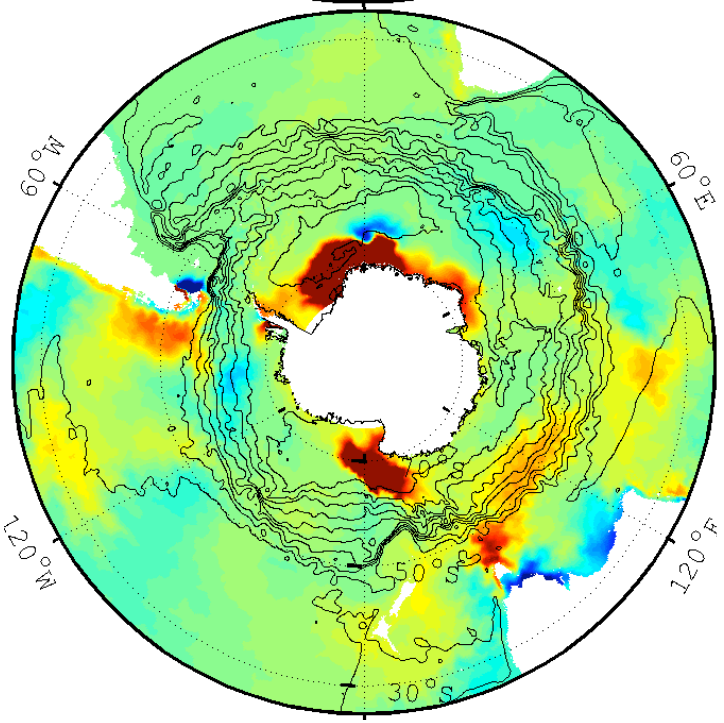
<=Vstress

Sflux =>





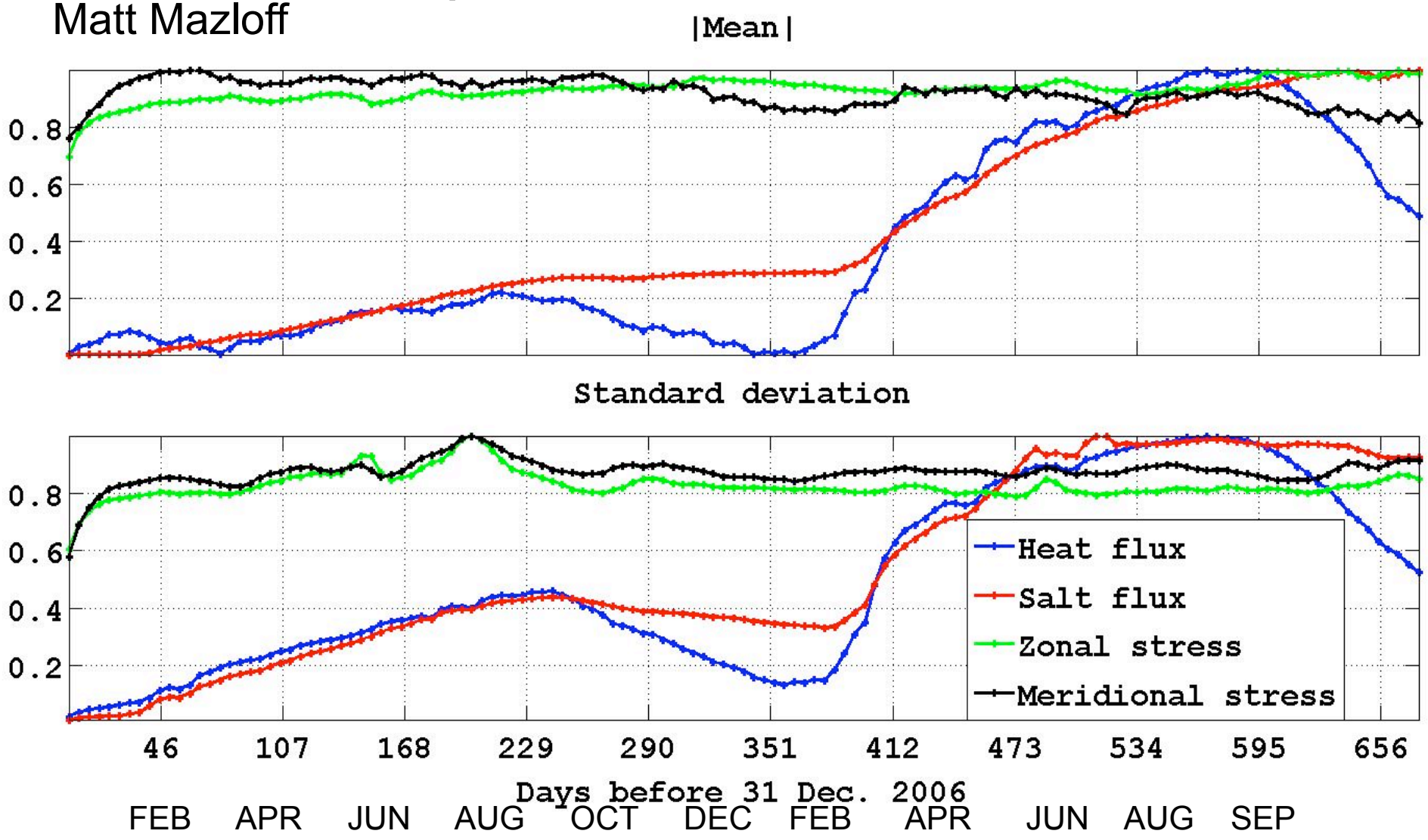




Matt Mazloff

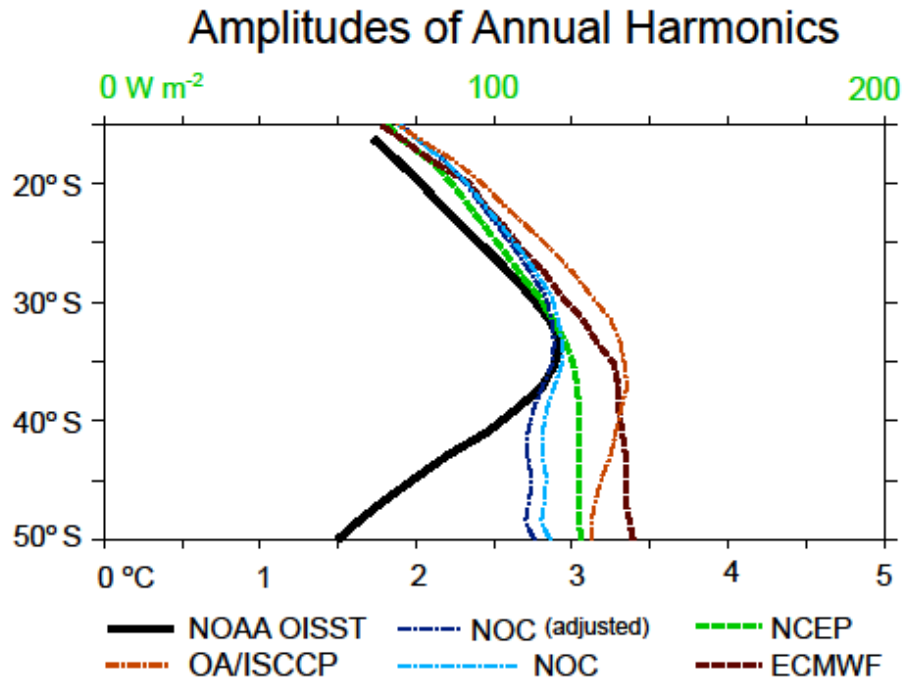
Temporal dependence of ACC transport sensitivity to surface fluxes. Spatial std. dev. & mean

Matt Mazloff



The annual amplitude of surface heating in the Southern Hemisphere

The **annual harmonic of net surface heat flux** dominates heat flux variability, but has different structure than SST (“high latitude fall off”)



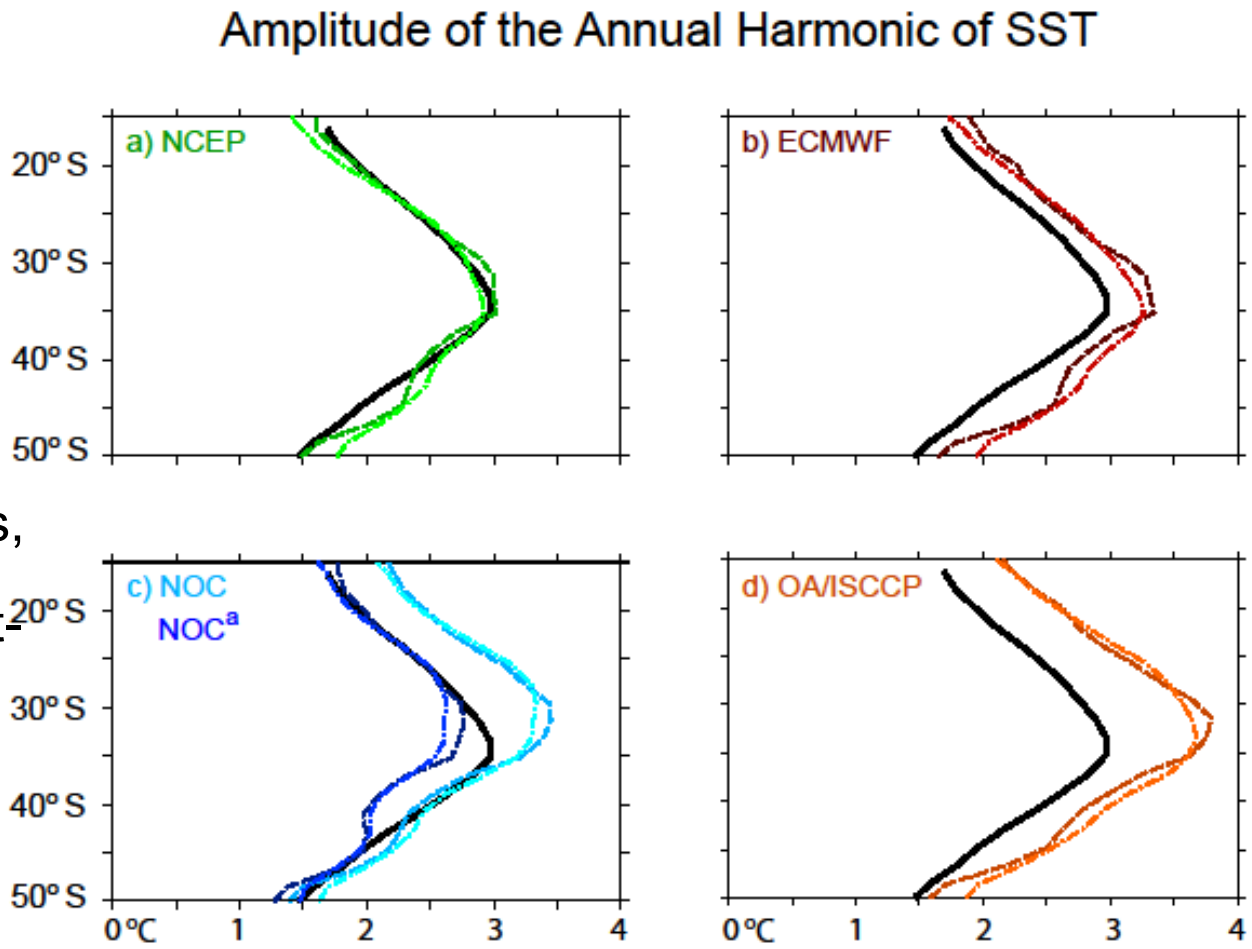
Andrew Chiodi

Mixed layer heating by surface fluxes: specified MLD case

Results suggest that **mixed layer depth variability** (spatial and temporal) **is mainly responsible** for the “high latitude fall-off”

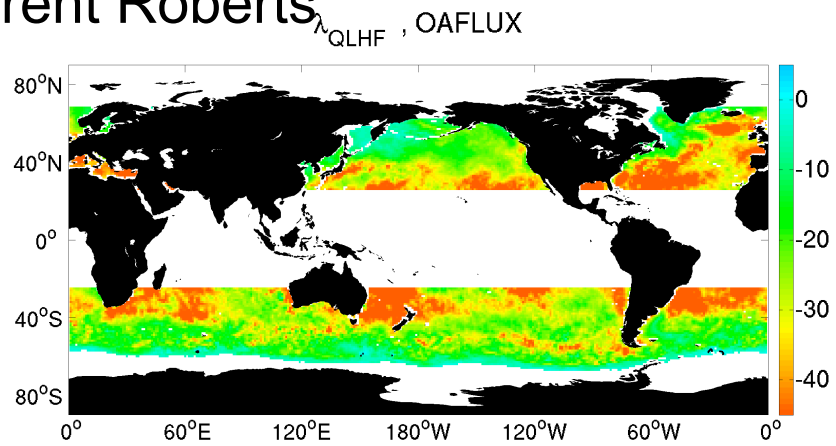
The NCEP/NCAR case produces accurate results, but there is still a need to be sure of the component-wise distribution of surface heat flux (e.g. measure surface solar)

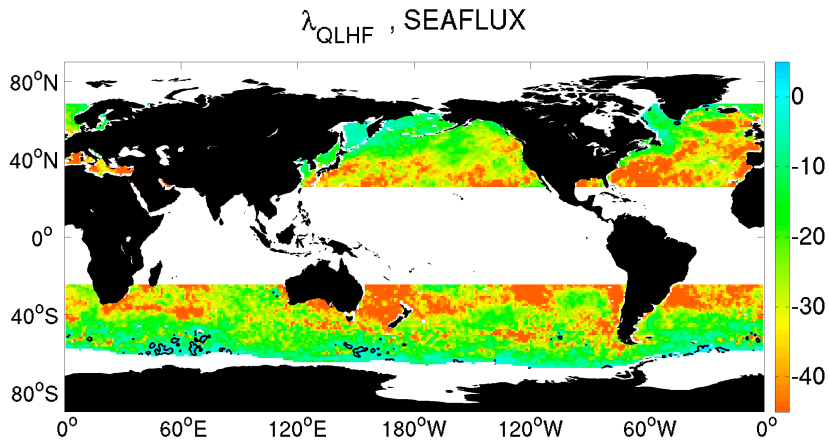
Andrew Chiodi

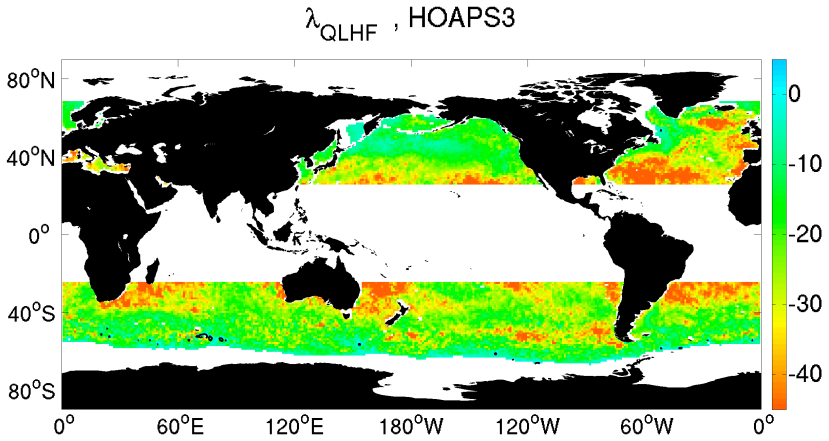


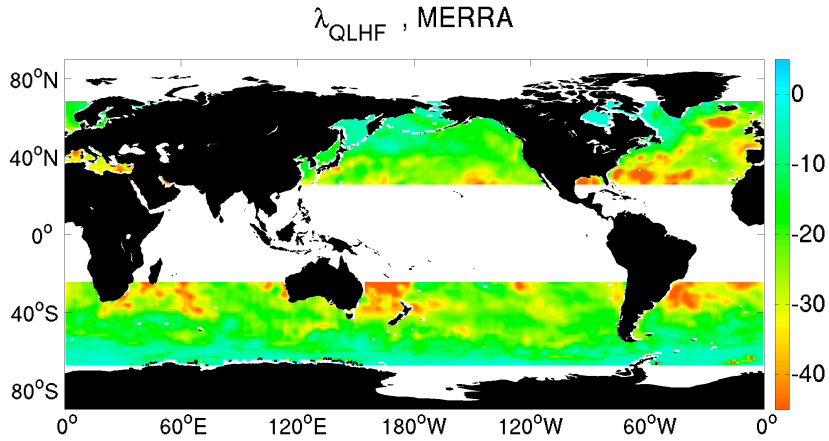
Latent Heat Flux, W/Km^2

Brent Roberts









- The latent heat flux is primarily negative everywhere in the extratropics.
- OAFlux and SeaFlux show roughly the same pattern and amplitude while MERRA appears the least variable and lowest amplitudes.

MERGED USER REQUIREMENTS

Sampling:

- 50-year records OR post-2000 for modern simulations
- Temporal = at least seasonal, monthly meets many needs OR daily.
- Spatial resolution and coverage = at least 3x5 degrees OR highest resolution possible (to drive ½ - ¼° simulations) OR 20 km to match oceanic Rossby radius
- Spatial coverage = 65-90 N OR Global

Precision/accuracy:

- Precision << 5 Wm^{-2}
- Absolute accuracy within 5 Wm^{-2}
- Winter heat flux accuracy matters for ocean heat uptake.
- Freshwater flux matters

Additional requests:

- Don't assume a climatological surface or that Arctic is one environment.
- Evaluate flux uncertainties realistically. Provide errors.
- Make flux data easy to find and document clearly.
- From flux producers: cultivate a culture of hunting down new flux products and cross-comparing, rather than relying on NCEP1… www.ncdc.gov SURFA

Flux Accuracies and Applications