

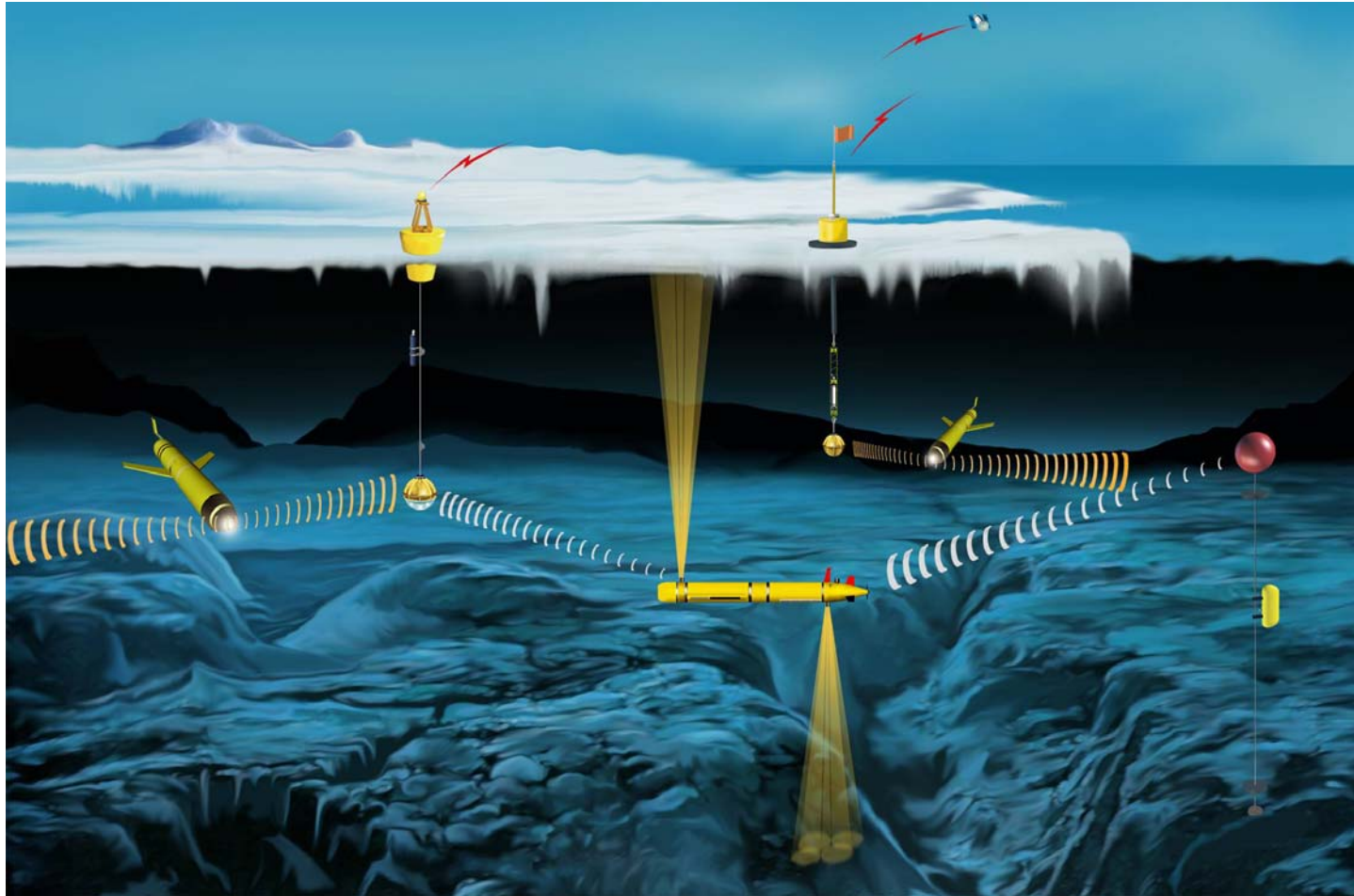
INCORPORATING AIRCRAFT INTO OCEAN OBSERVING SYSTEMS

Dr. Phil McGillivray

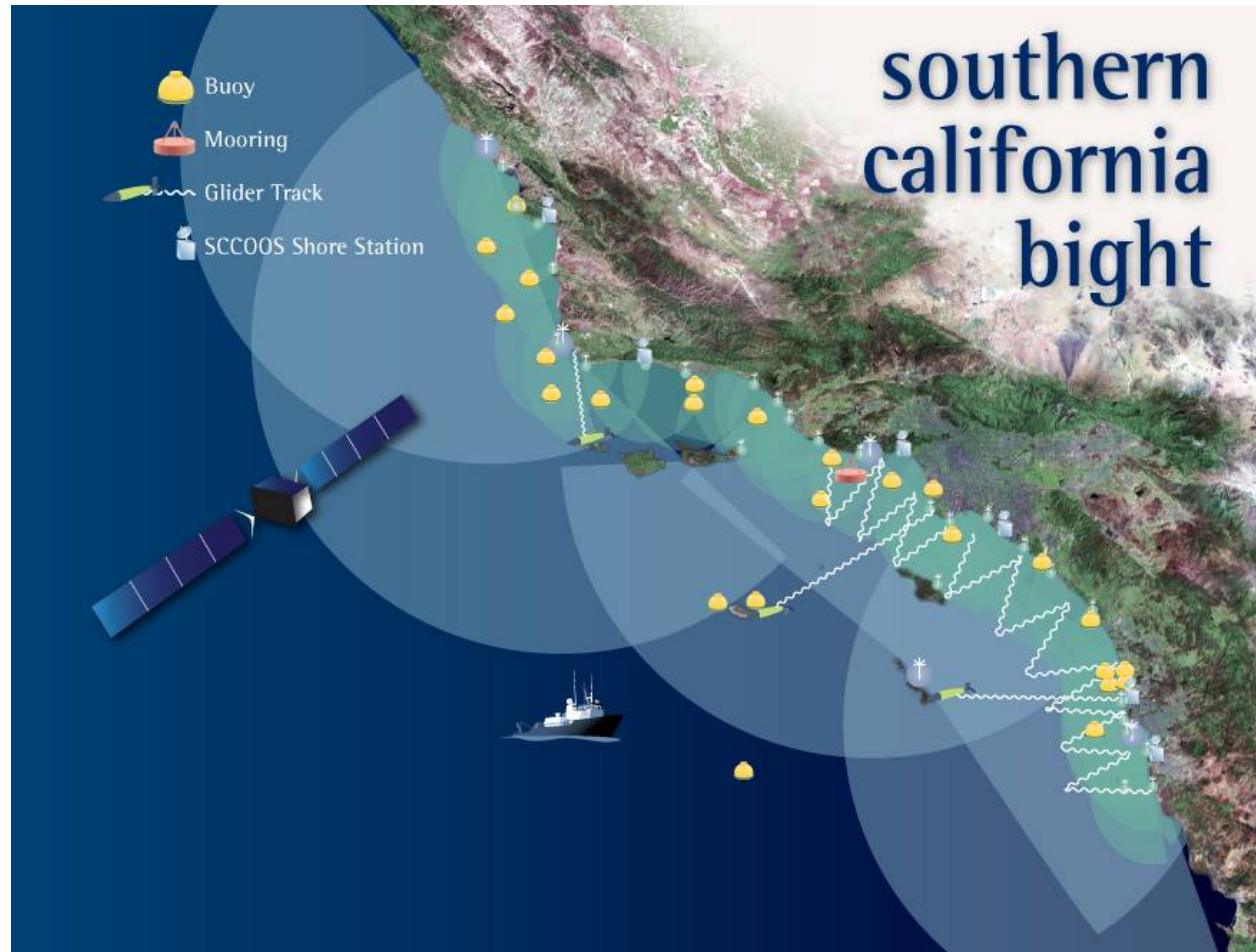
USCG PACAREA & Icebreaker Science Liaison
SCOAR, Monterey, June 22-23, 2010



Navy concept of an Ocean Observatory (from Lee Freitag, WHOI)



The prototype Ocean Observing System: SCCOOS



NASA Aircraft Research, 2010, 2011

- NASA “ICEBridge” aircraft ice studies flown out of Greenland using ice freeboard lidar sensors similar to IceSat 2, which is not scheduled for launch until 2015



ScanEagle Launch from NOAA ship



ScanEagle deployment from NOAA ship



ScanEagle Recovery on NOAA ship



NOAA Manta w shipping boxes



Manta launch system



Ramanathan (SIO) Mantas for black carbon studies



NASA Aerosonde UAS, Svalbard: Jim Maslanik, U. Colo.

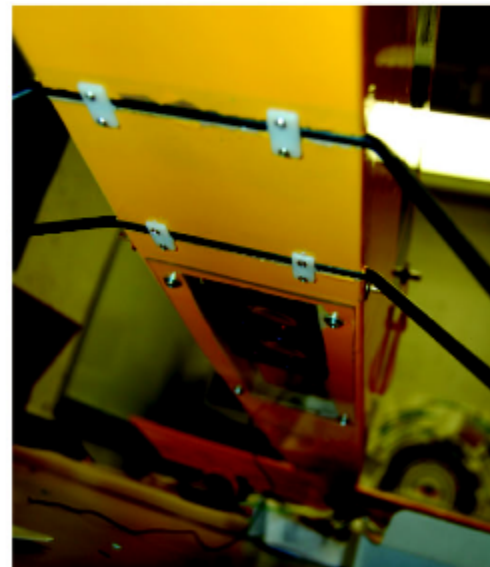




U. of Colorado UAV Laser Profing
System installed in a UAS-capable
Telemaster aircraft at C.U.



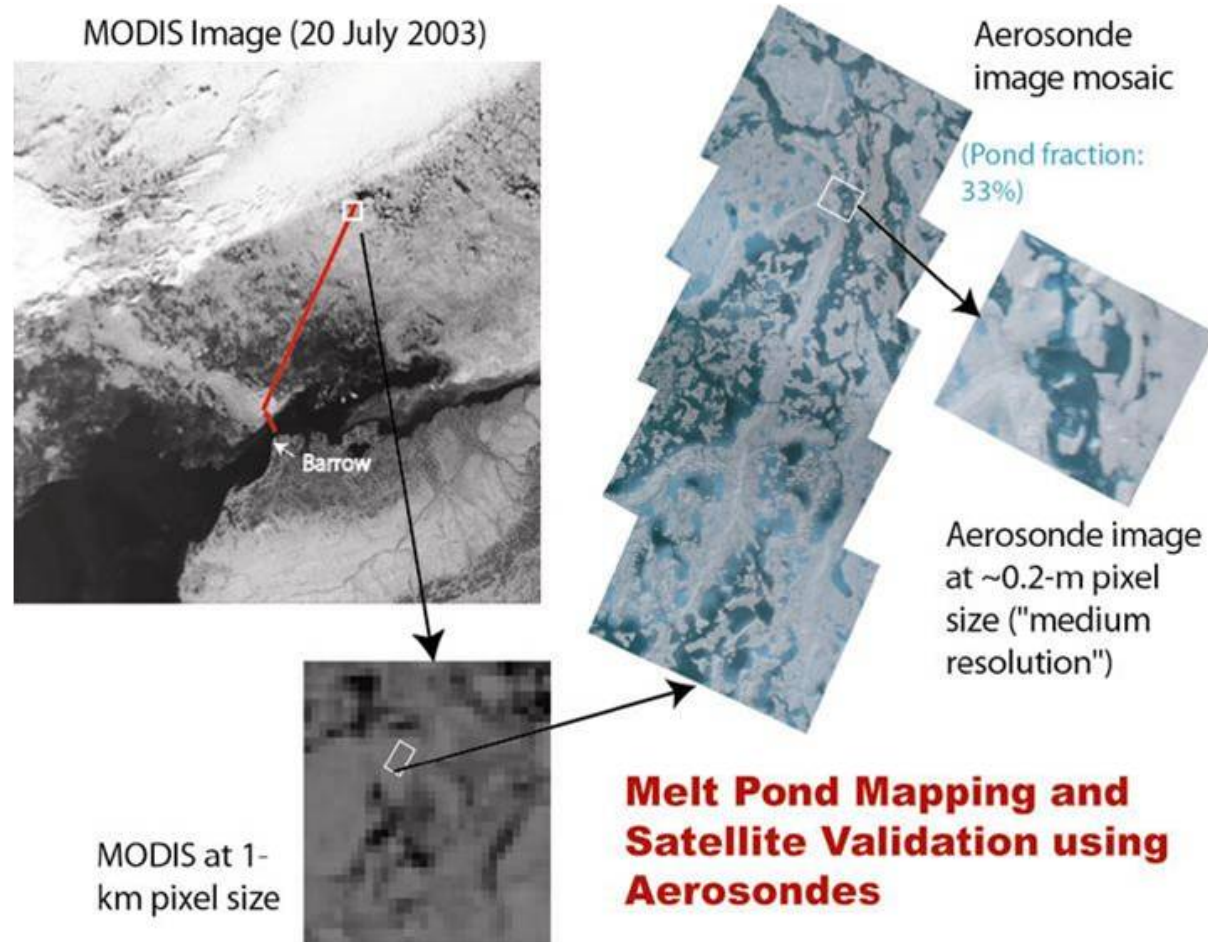
IMU
laser altimeter
electronics (payload computer, GPS,
flash memory data storage)



Aerosonde launch system

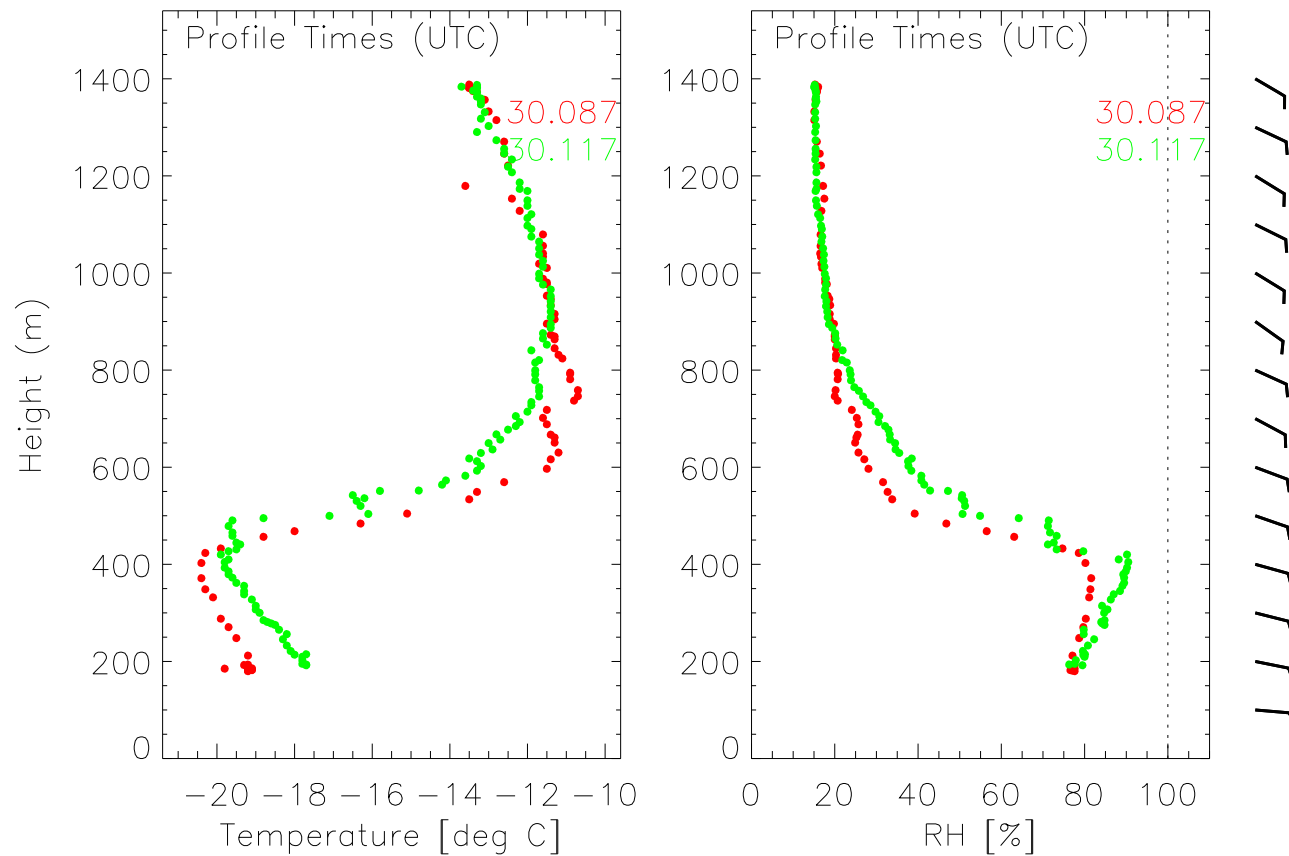


Aerosonde melt pond mapping



Aerosonde T, RH profiles

Flight date: 20030329 Lat/Lon: 71.55 -155.65



One problem: ice up of manned and unmanned aircraft; possibly solved by Battelle electrically conducting carbon nanotube paint. Wind tunnel tests worked, field testing in planning stages.



NOAA NMFS SWFSC Quadrotor for marine
mammal counts, CCALMR (Antarctica),
Wayne Perryman (has 2, summer 2010
test, Channel Islands)



Draganfly COTS Quadrotor



Quadrotor (Nick Roy, MIT) to be mounted on Robo-kayak



EMBLA, Coanda Effect UAS (UK Dept Defence)



Tim Veenstra Flying Fish UAS, used off NWHI for NOAA Marine Debris / Ghost Drift Net project, 2008, restricted to 1 nmi from ship, so not particularly effective, but inexpensive.



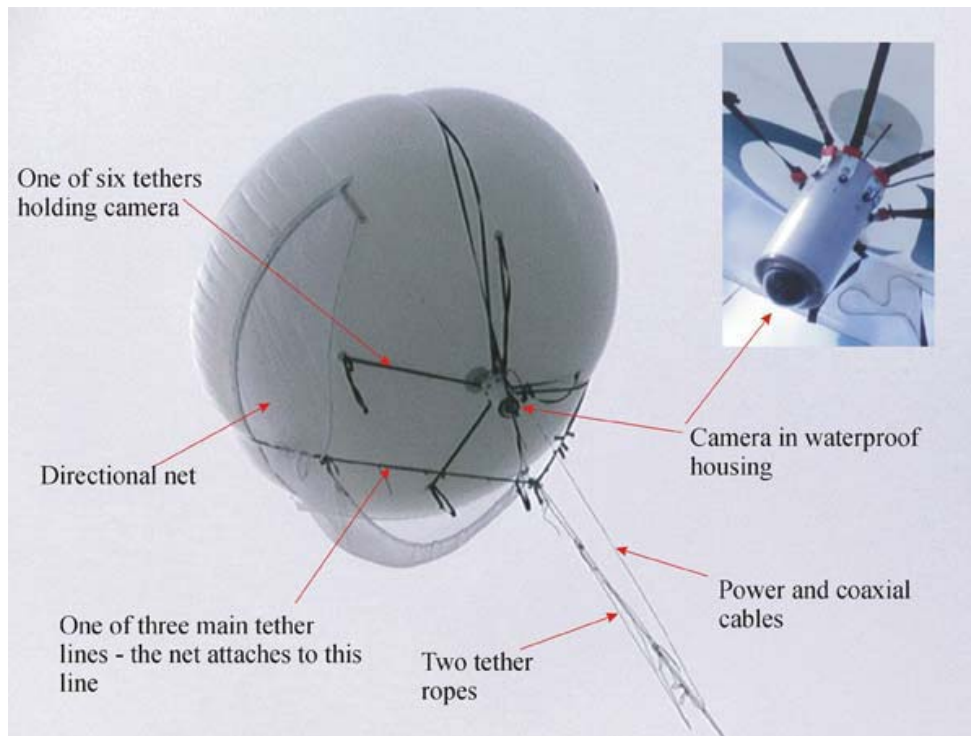
Ion Tiger, Navy funded UAS w
fuel cell battery = quiet, good
endurance



Australian UAS program for cooperative UAS ops (2 aircraft, coordinated searching)



U.Queensland BlimpCam for Dugongs

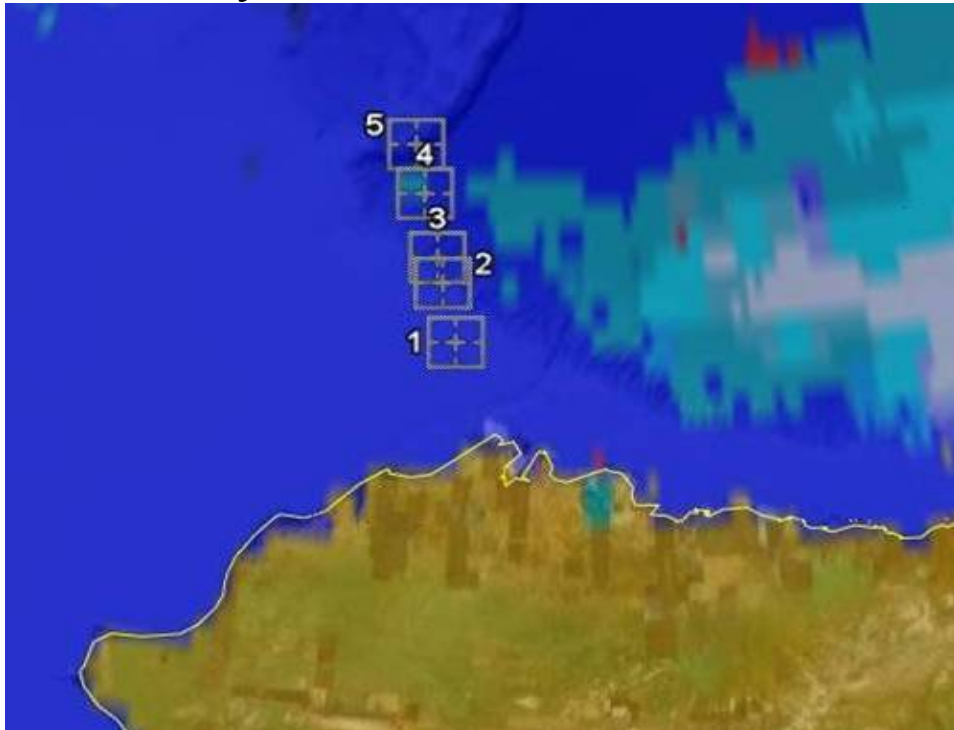


Univ. Michigan relocatable buoy



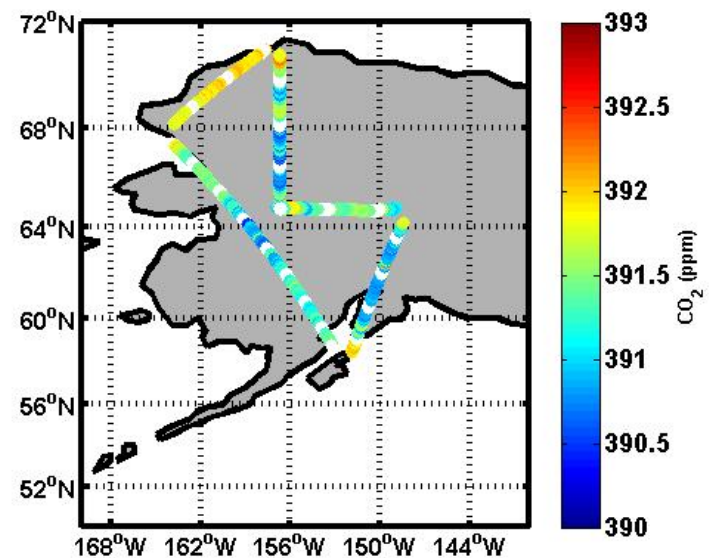
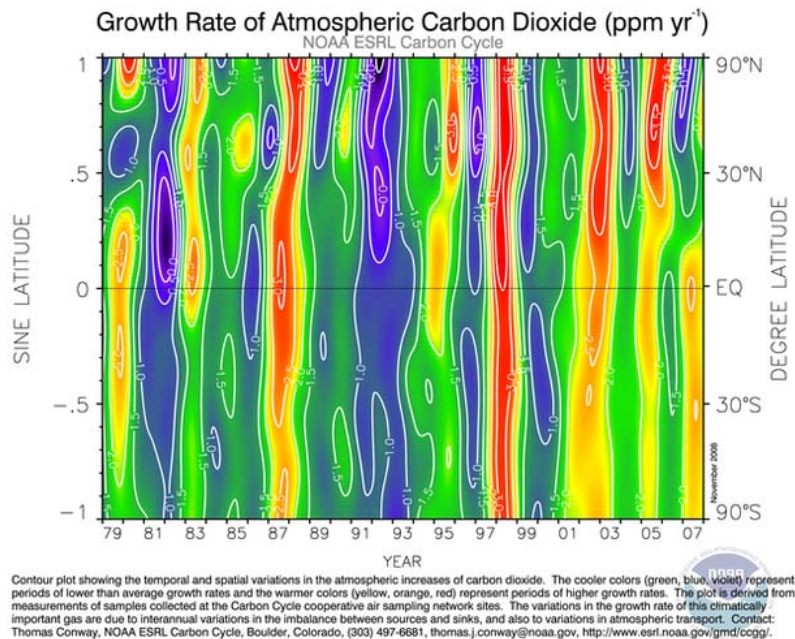
2010 C130 Aircraft Research Plans

- Continue, expand 2009 AXCTD deployments (Jamie Morrison, M.Steele, UW)
- Add deployment of ice buoys in 2010

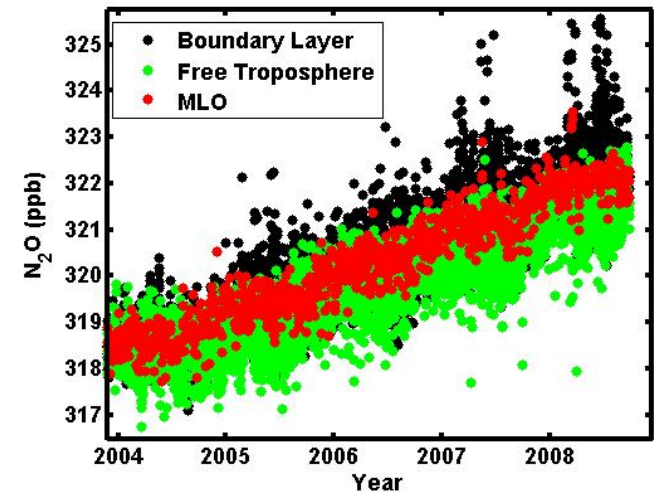
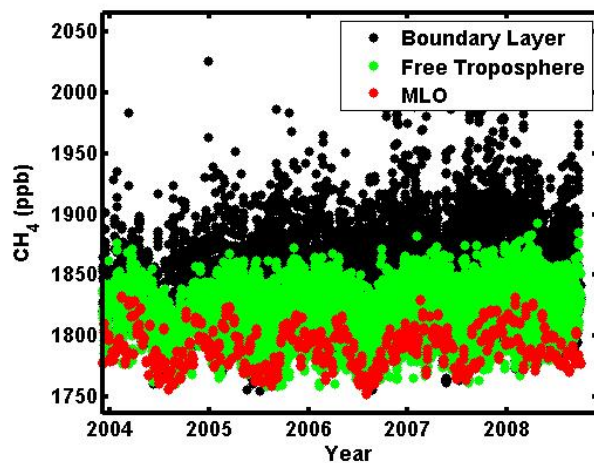
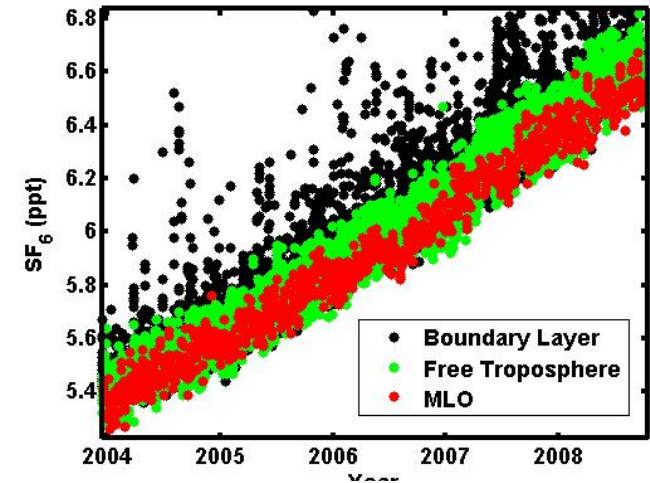
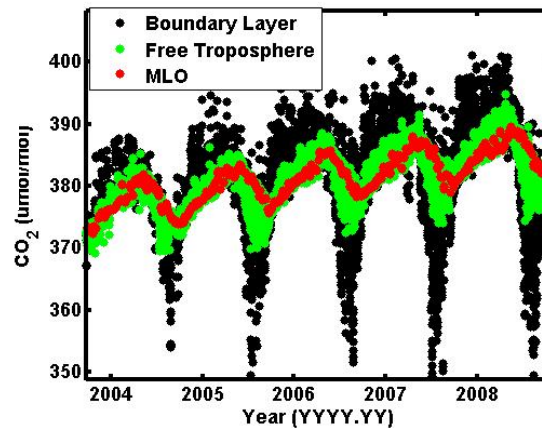
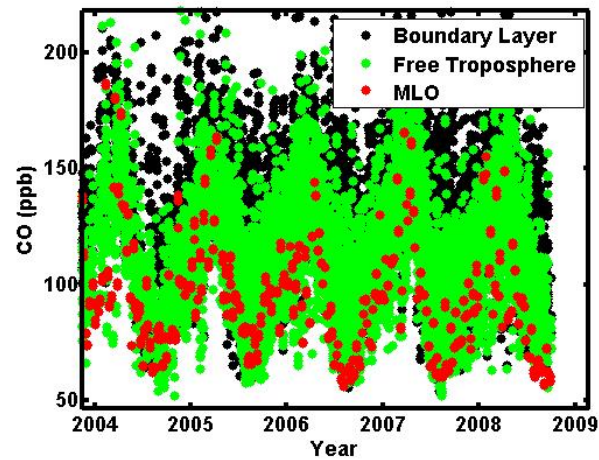


2010 C130 Aircraft Research Plans

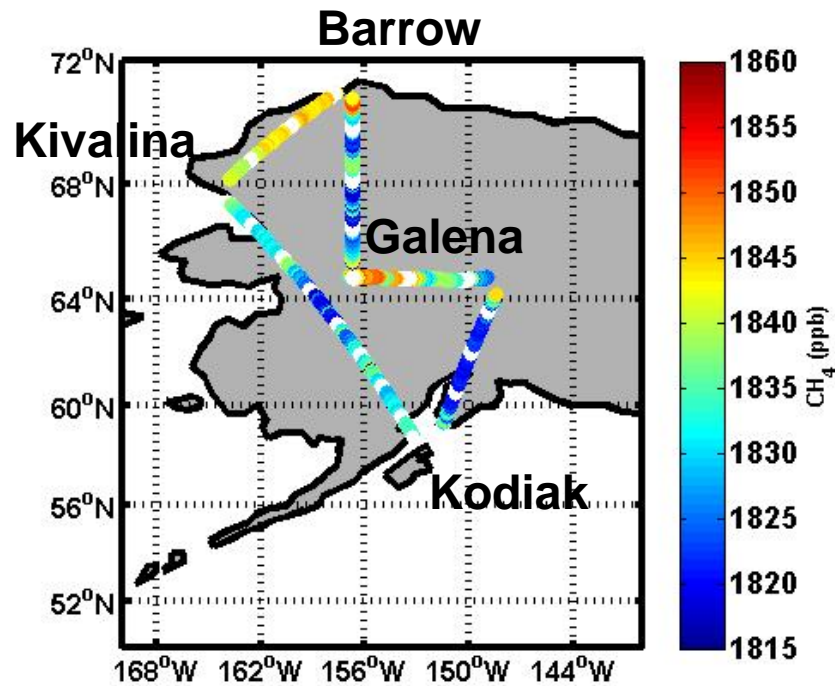
Continue C.Sweeney (NOAA, Boulder) CO₂, methane and other gas measurements bi-weekly (CO, SF₆, N₂O, etc.). CO₂ flight data below right.



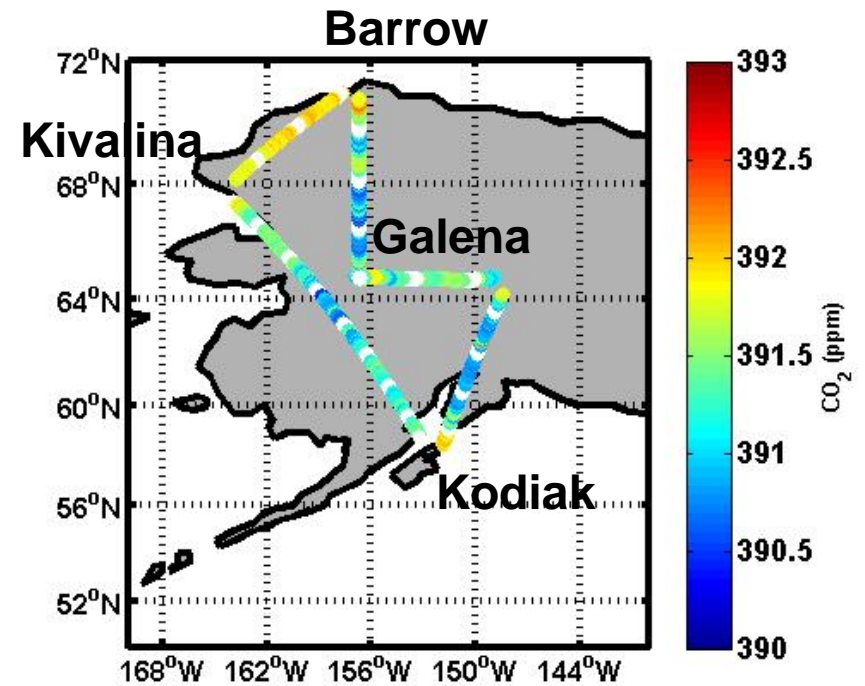
Aircraft CO, CO₂ (center), SF₆, CH₄, N₂O



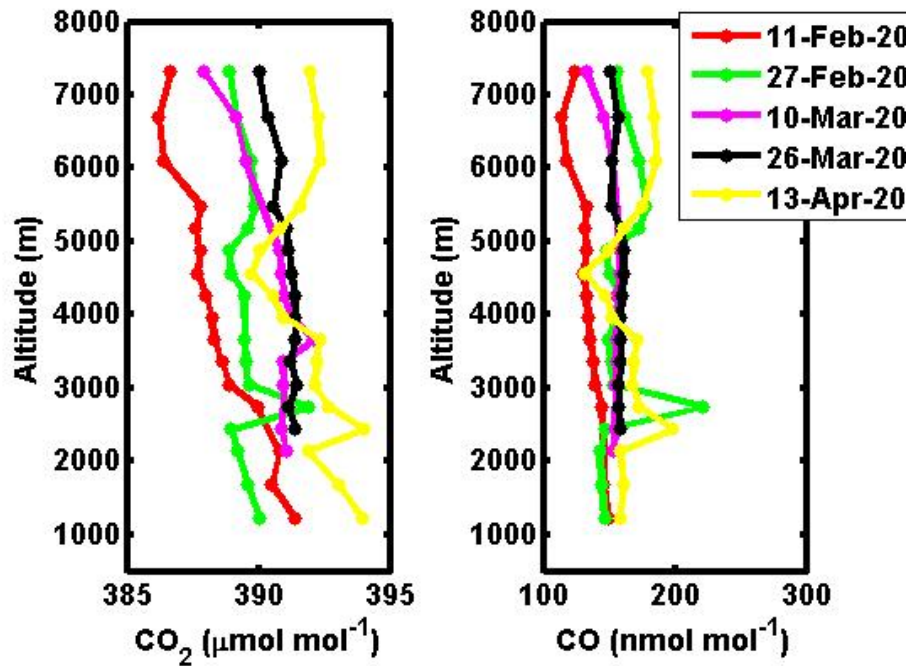
Kodiak to Fairbanks to Galena to Kivalina to Kodiak



CH₄

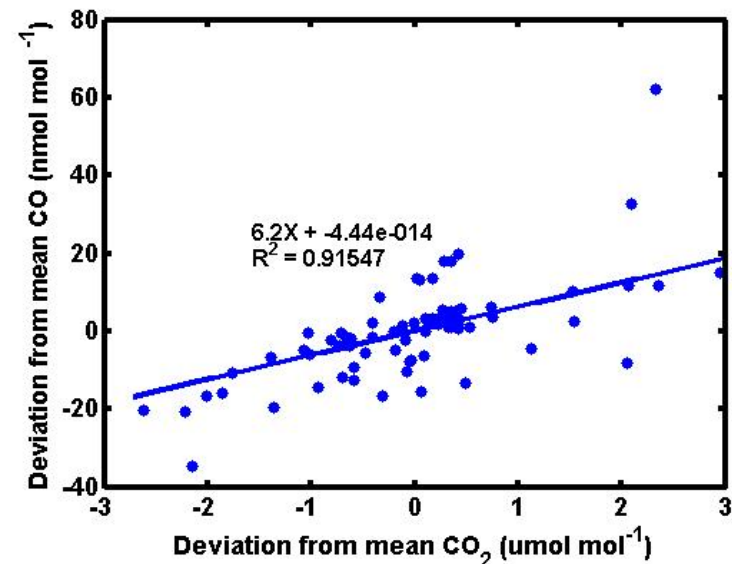


CO₂

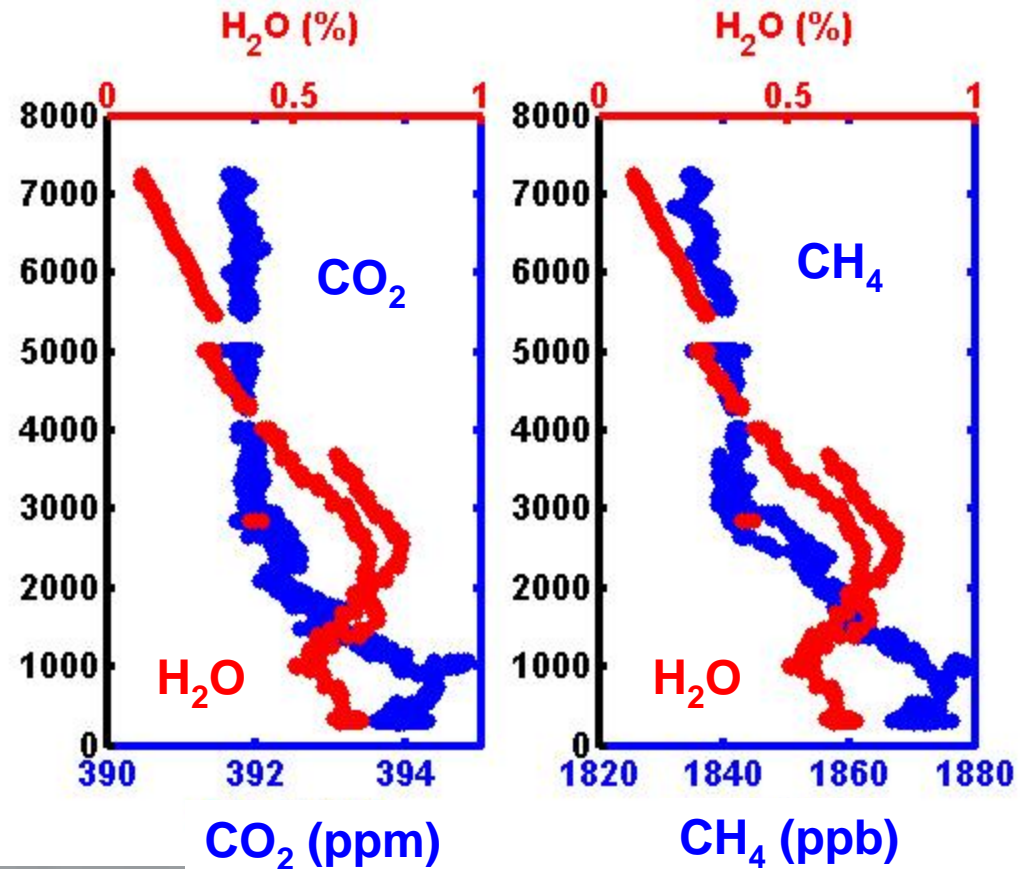


Residuals of profile means for CO_2 and CO correlates well suggesting that large scale transport is driving winter time high.

Arctic CO_2/CO Correlation

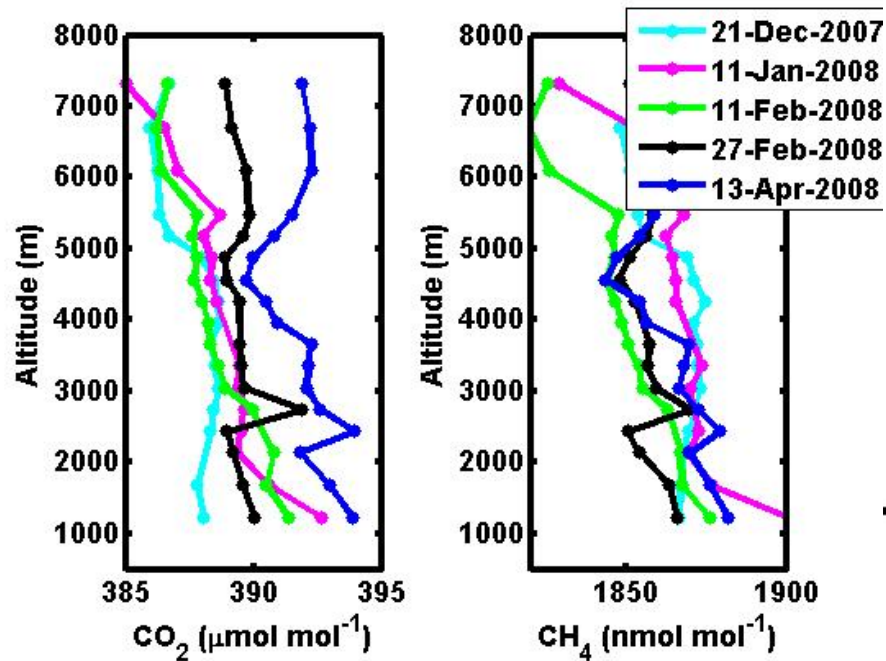


Kivalina, AK
The town falling
into the sea



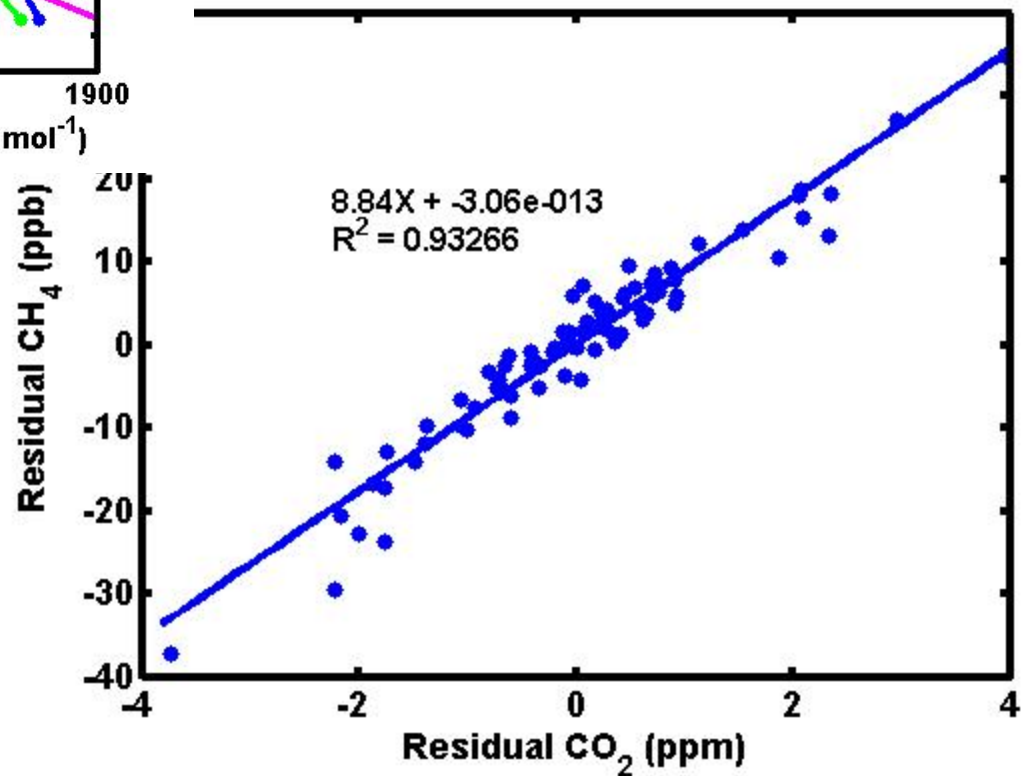
**CO_2 and CH_4 show
very close
correlation**

Arctic CO₂/CH₄ Correlation



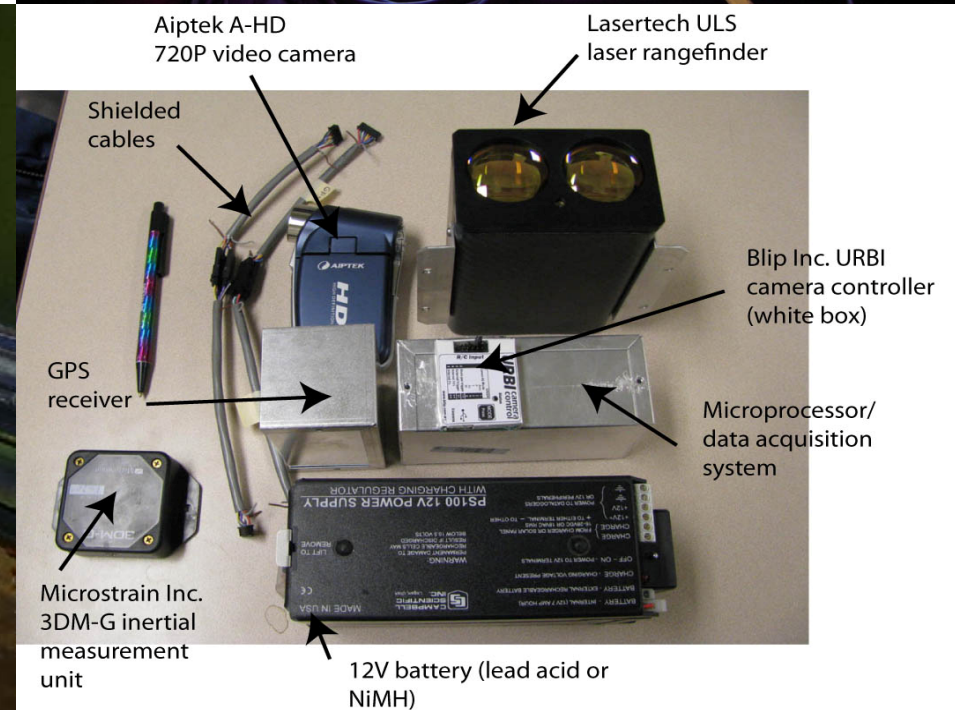
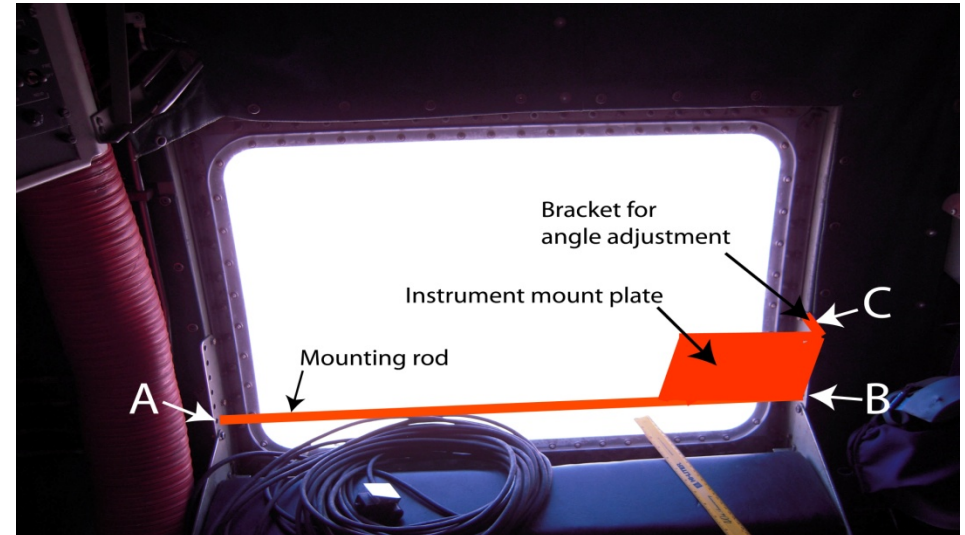
Residual of profile means show extremely good correlations in Arctic.

- Suggests large scale mixing (not local sources) are driving Arctic variability



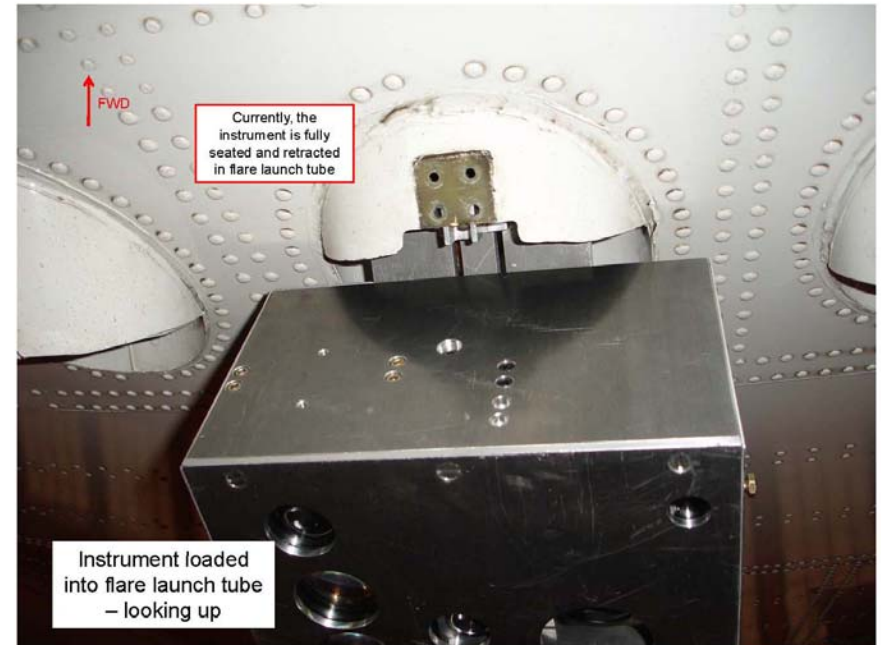
2010 C130 Aircraft Research Plans

- Approval J. Maslanik
U.Colo. ice laser altimeter
- Includes hi-res still & videocamera out window
- Conduct biweekly flights, beginning May 2010



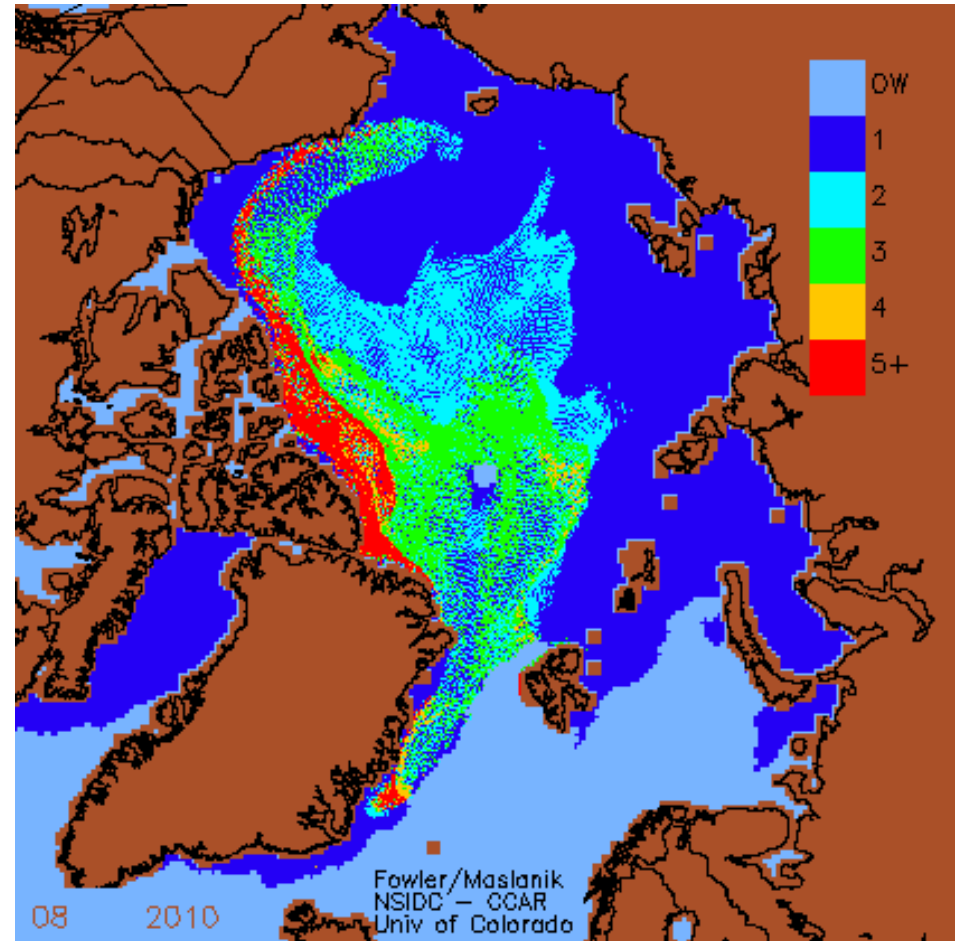
2010 C130 Aircraft Research Plans

Maslanik Lidar inside C130 FLIR tube; view from outside C130 tail of receiver



2010 C130 Aircraft Research Plans

- Maslanik graphic of 2009 multiyear ice
- Goal: use C130 lidar to study multiyear ice tongue
- On May 7, CG will host NPRB of Directors on C130 flite to explore other C130 science options



Canadian Helo Ice Thickness EM, laser & video altimeter

- EM mounted at front of helo; laser altimeter, video in pod on strut
- Two helo studies in Beaufort Sea to look at:
- multiyear ice thickness, ice drift using position beacons at edges of triangle, and ice thickness as a result of pack ice compression, and,
- Ice ridging at river mouths in April, effects FW under ice

