

# Scientific Committee for Oceanographic Aircraft Research

*Report to the UNOLS Council and Annual Meeting: Oct. 2010*



# SCOAR Membership 2010 / 2011

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

**Daniel Schwartz**

**James Hain**

**Steven Ramp**

**Phil McGuillivary**

**Bob Bluth**

**Hafliði Jonsson**

**Le Roy Woods**

**Steven Hartz**

**Chair**

**Associated Scientists at Woods Hole**

**Monterey Bay Aquarium Research Instit.**

**United States Coast Guard**

**CIRPAS (ex officio)**

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**University of Alaska (RVTEC represent.)**

# FACILITIES:

- **Thank You CIRPAS for hosting our meeting!**
- **Marina Facility**
  - 3500 ft runway - manned operations only
  - 30,000 sq ft maintenance hangar
  - Instrumentation and Calibration Laboratory
  - Maintenance and Payload integration shops
  - Offices

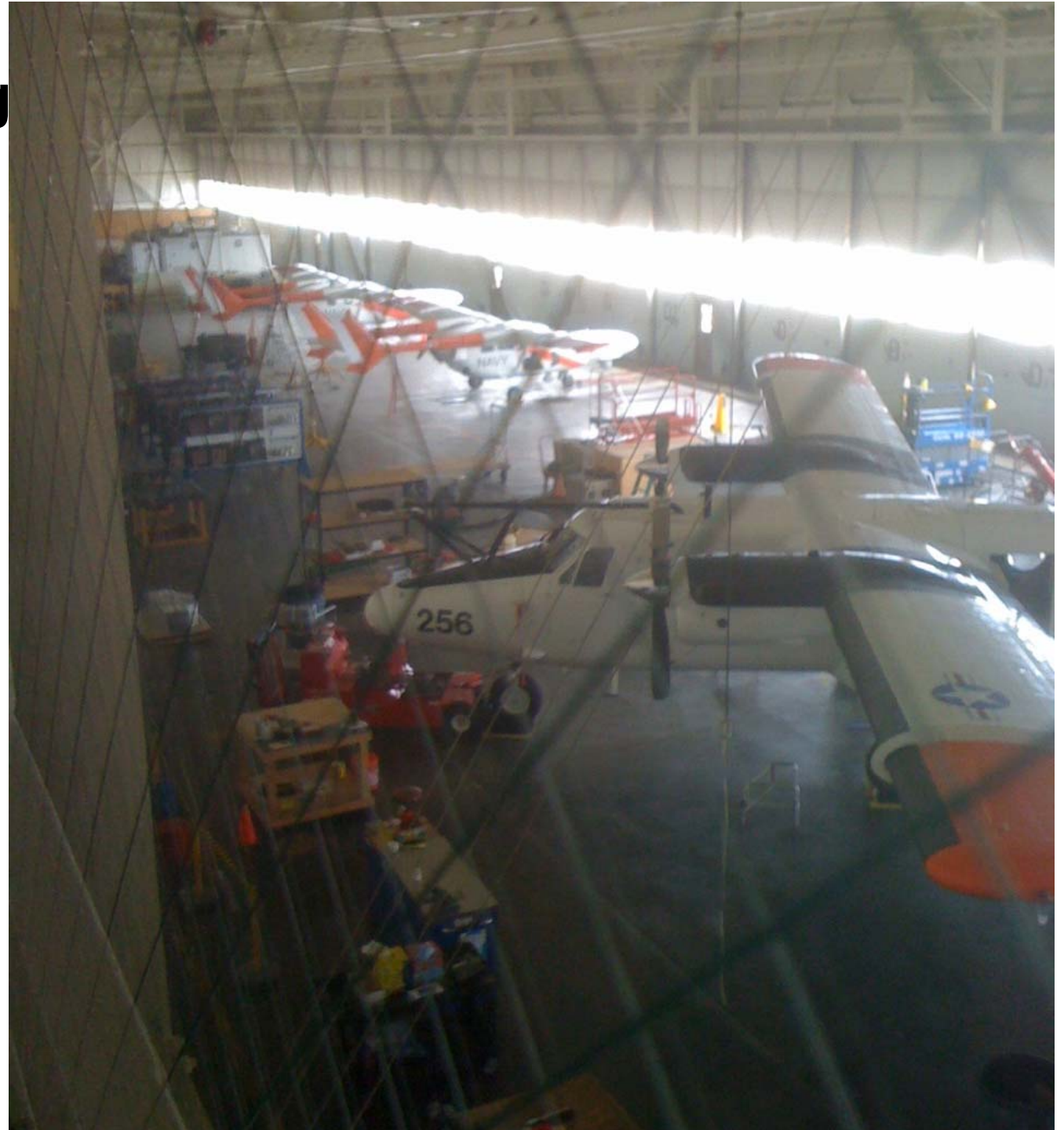


**SCOAR Meeting**

**Held at the  
CIRPAS facility**

**Marina, Calif.**

**June 22 & 23  
2010**



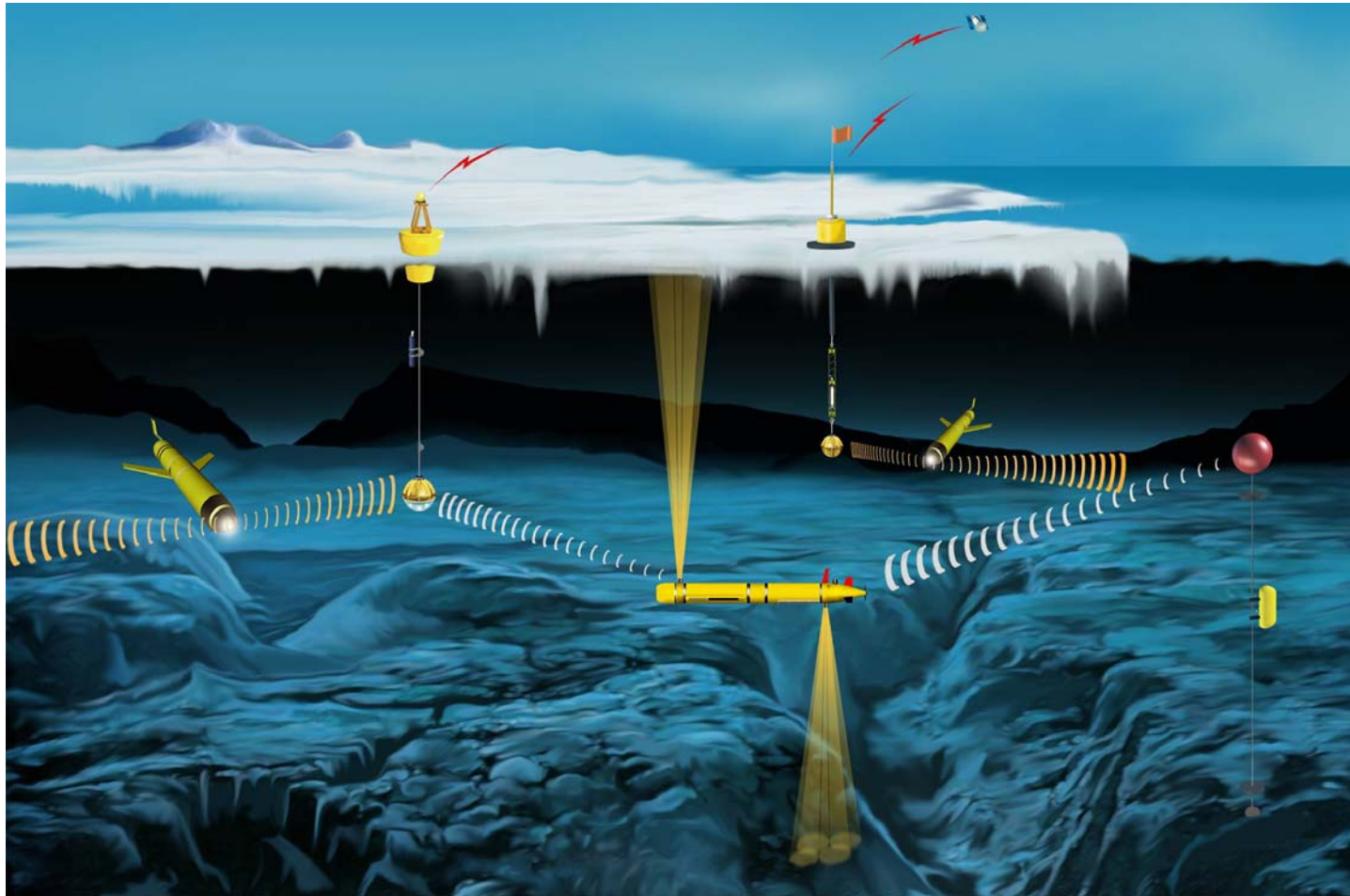
# **INCORPORATING AIRCRAFT INTO OCEAN OBSERVING SYSTEMS**

Dr. Phil McGillivray

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



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



*What's missing from this picture?*

# The prototype Ocean Observing System: SCCOOS



**Conceptual spatial coverage arcs by shore-based light aircraft systems.  
Rapid event response, spatial coverage, resolution: Advantage Aircraft**

# Flux Platforms for Fair to Moderate Weather

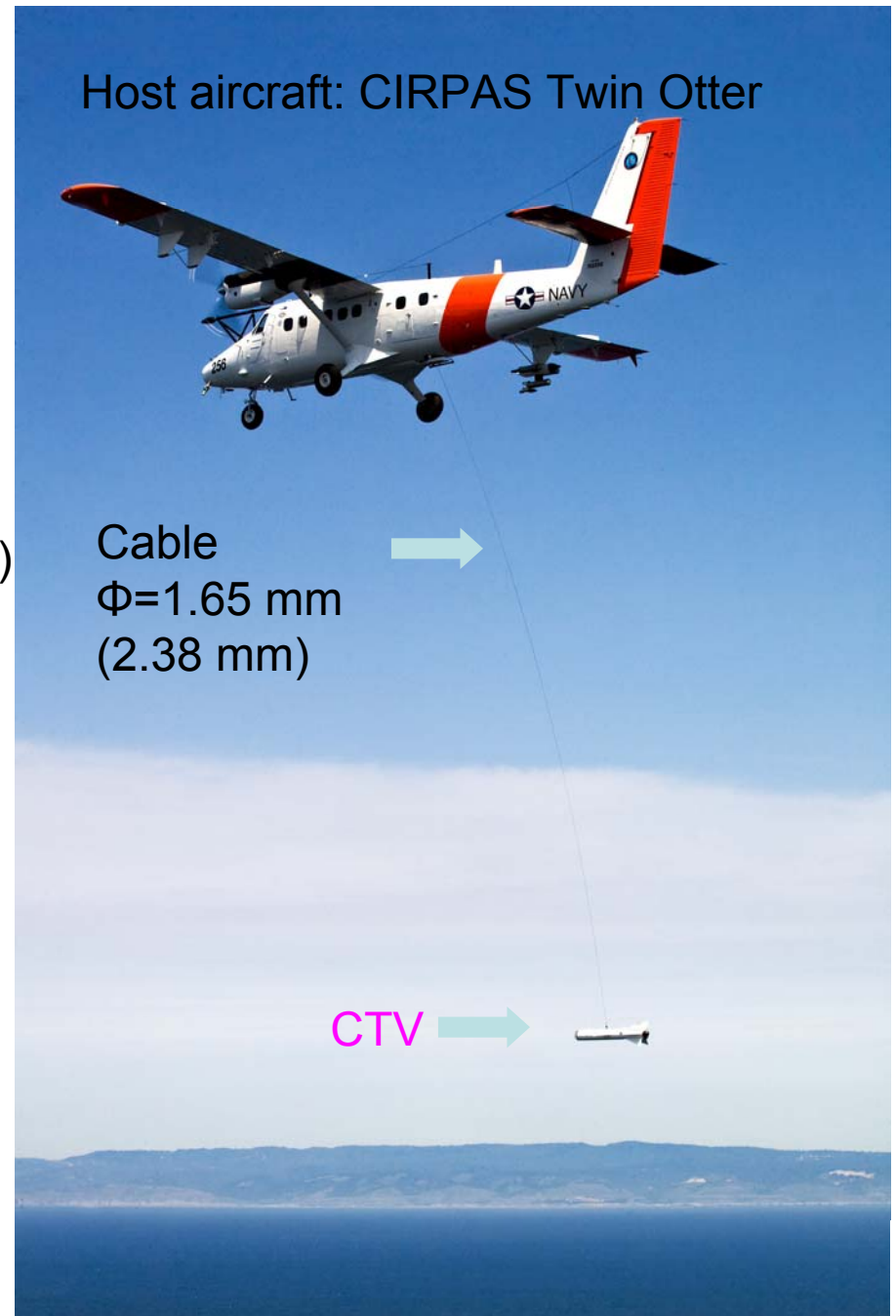
Buoy: 10m  
Ship: 14m  
Aircraft: >33m





# Choice of platform in Inhospitable Ocean Environment

1. Buoy – few, fixed-point, motion
2. Ship – slow, motion, flow distortions
3. Aircraft – mobile, low altitude limit
4. Unmanned Aerial Systems (UASs, ex-UAVs) – small payload, underpowered)
5. **Modify existing towed target drone technology for controlled height over the sea while tow aircraft is safely above.**



*What about a hybrid?  
UAS and Manned Aircraft...*



**More Imaginative Concepts are in the works!**

# CIRPAS “Pilot-Optional” Aircraft Platforms



# 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.

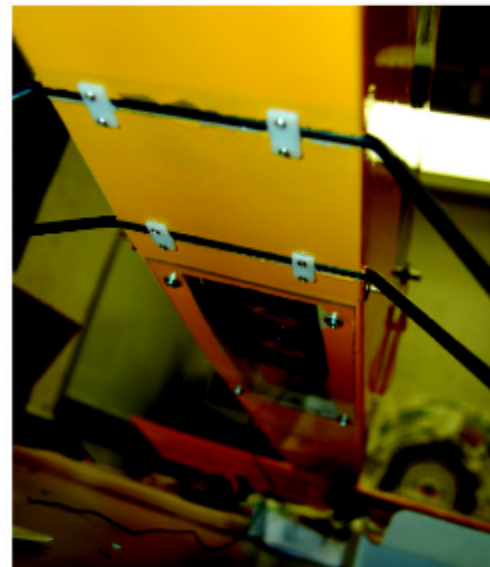




U. of Colorado UAV Laser Profing System installed in a UAS-capable Telemaster aircraft at C.U.



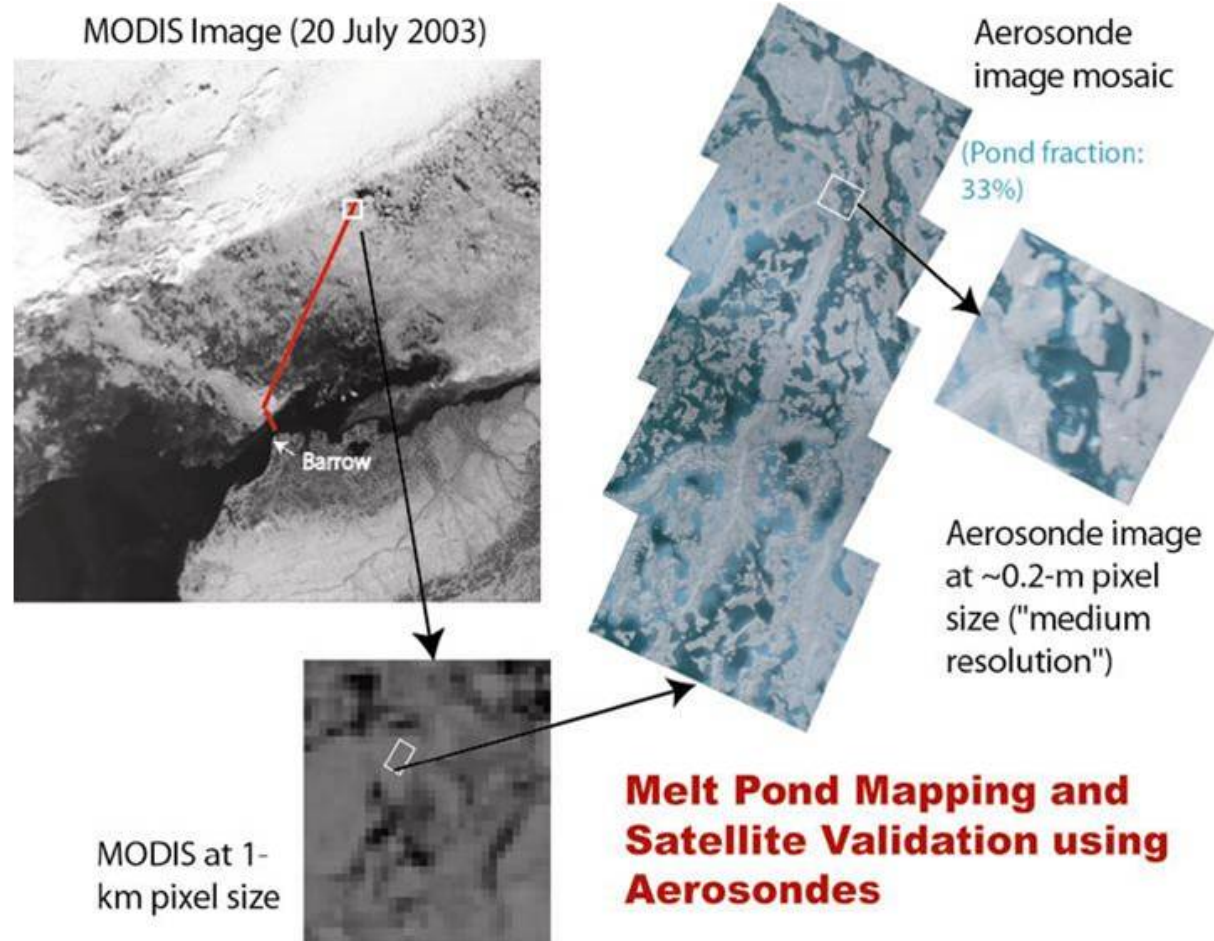
- IMU
- laser altimeter
- electronics (payload computer, GPS, flash memory data storage)



# Aerosonde launch system



# Aerosonde melt pond mapping



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.



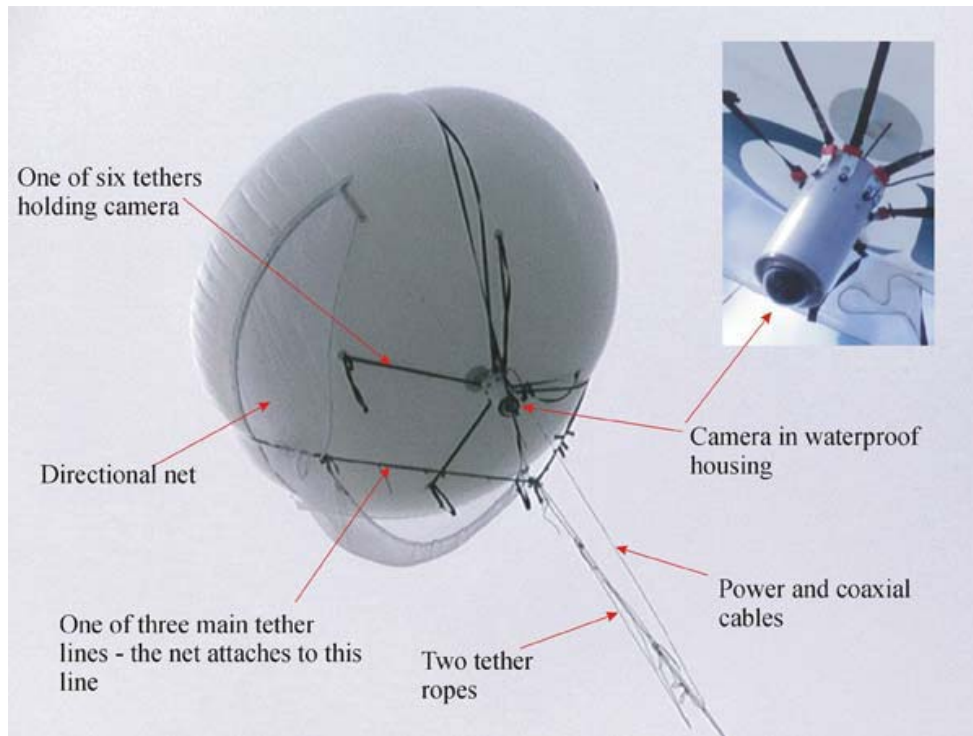
Ion Tiger, Navy funded UAS w  
fuel cell battery = quiet, good  
endurance



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



# U. Queensland BlimpCam for Dugongs



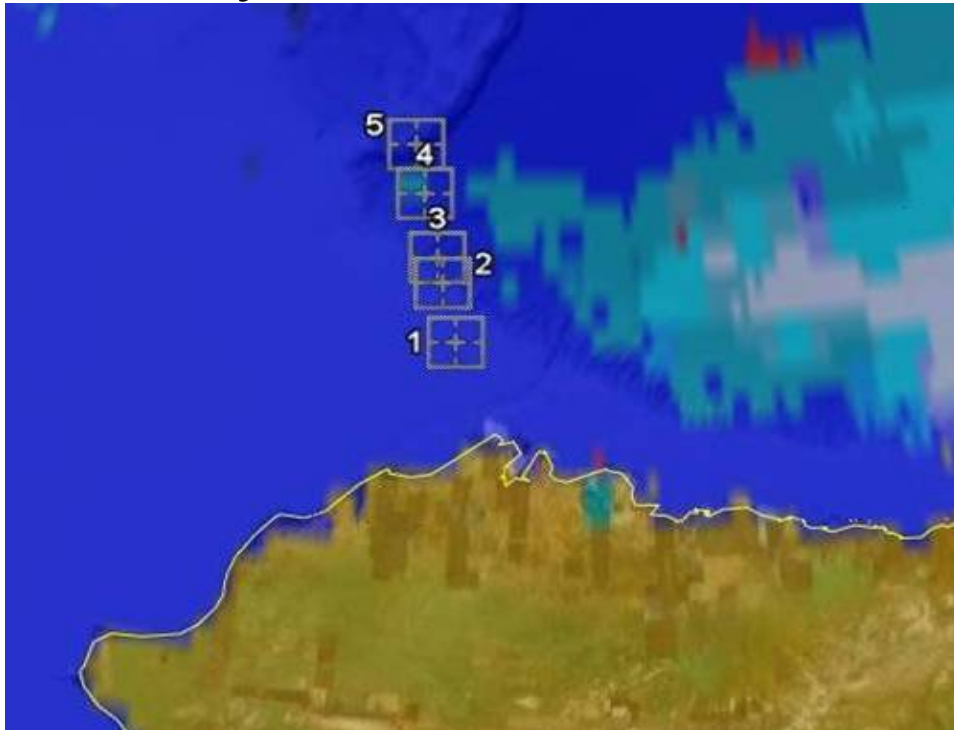
# Univ. Michigan relocatable buoy





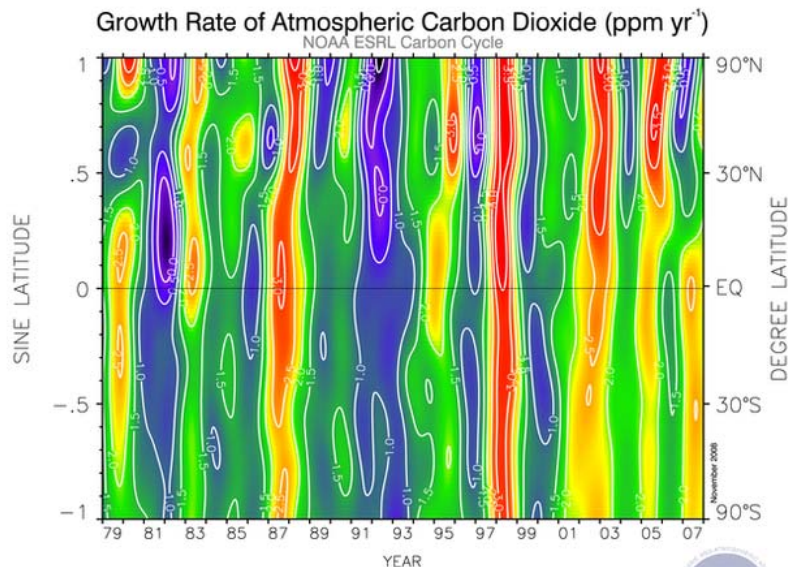
# 2010 C130 Aircraft Research Plans

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



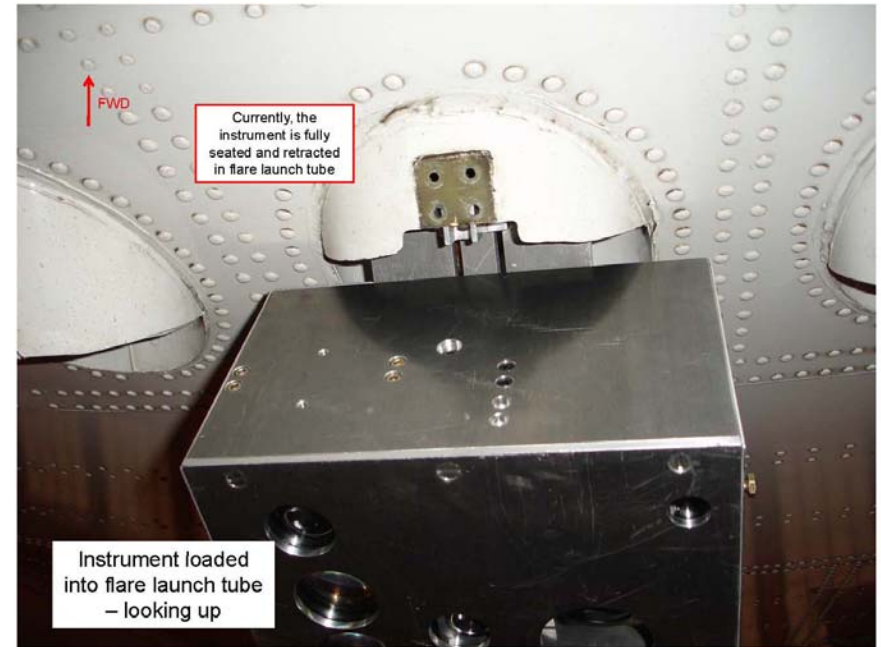
# 2010 C130 Aircraft Research Plans

Continue C.Sweeney (NOAA, Boulder) CO<sub>2</sub>, methane and other gas measurements bi-weekly (CO, SF<sub>6</sub>, N<sub>2</sub>O, etc.). CO<sub>2</sub> flight data below right.



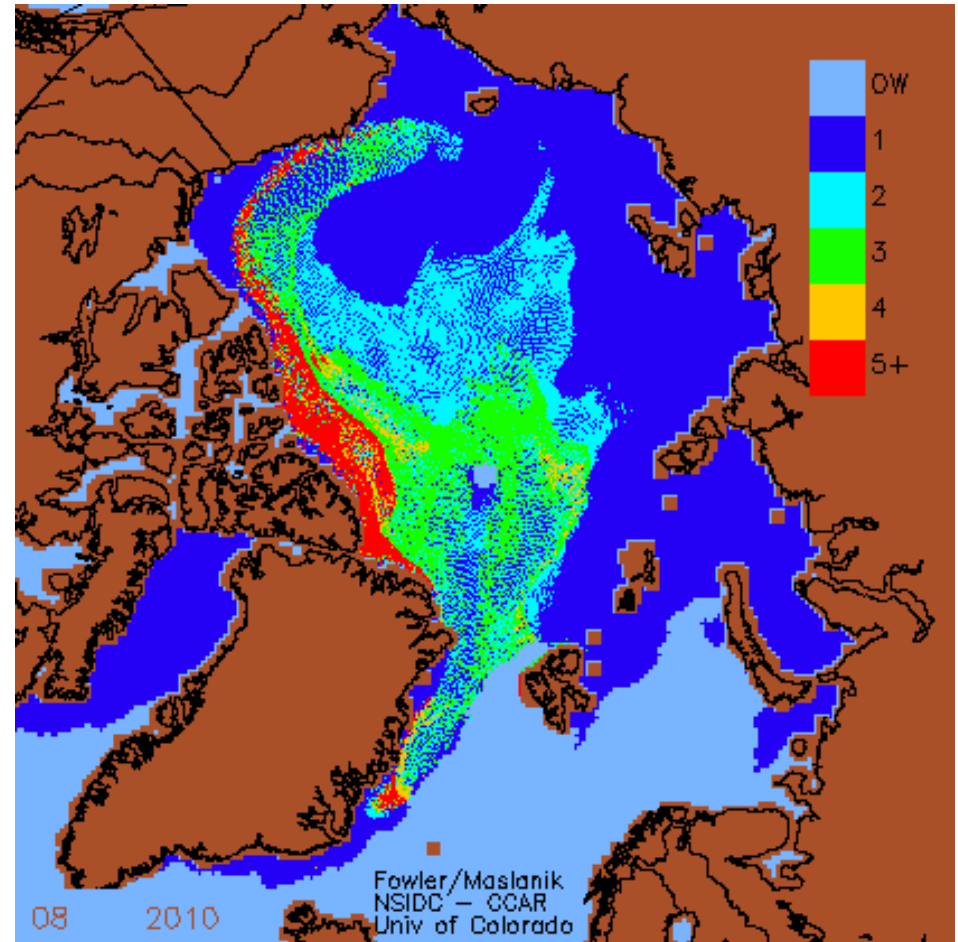
# 2010 C130 Aircraft Research Plans

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



***What has changed since SCOAR  
Was Established?:....***

***UAS are proving to be capable tools in  
multiple military and civil applications***

***Sensors are smaller, more capable.  
Regulatory issues are supplanting  
platform limitations as the primary  
operational challenge.***

***Funding Agencies are likely to face  
Budgetary pressure as deficits explode  
(Which may make these platforms more attractive)***

# Action Items

- **Sensors and Tools: (Cirpas/SCOAR)**
  - Determine the inventory of available sensors and tools.
  - Review and update the list of capabilities (sensors and tools) that should be available to oceanographers
  - Prioritize
- **Meet with agency reps at ONR and NSF. Inquire into the status of NSF's MOU – Oct 12<sup>th</sup> – Dan and Annette**
- **Check SCOAR broken links – UNOLS Office**
- **Draft a SCOAR/CIRPAS brochure – Dan, Laura, and Annette**
- **Submit a proposal for a proof-of concept experiment for a launch/recovery UAV demo on a Navy owned UNOLS Vessel – Ken Melville, Bob Bluth, Steve Hartz, Dan Schwartz, Phil M**
- **Update SCOAR website**
- **Propose an NSF workshop in relation to ocean observing systems – follow up at agency meetings, etc. – Phil and Dan**
- **Call for SCOAR Nominations - collect names.**
- **Circulate revised ToR to SCOAR**
- **Update SCOAR\_Plus email lists – check for ~airborn email list~**



# Opportunities for Air Platforms?

**Sun Tzu: “Timing is Everything!”**



...and perhaps the most unique UAS application this year:

<http://www.bbc.co.uk/news/science-environment-11447095>



*Thank You!*

**UNOLS SCOAR  
Committee**

**Daniel Schwartz  
Chair**

