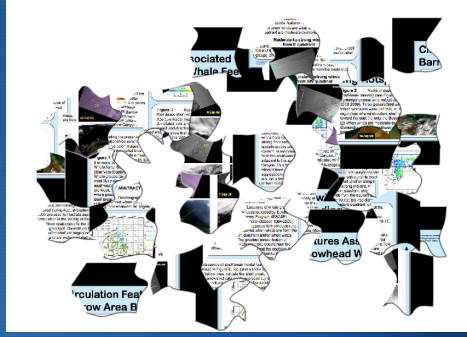


Scientific Poster "puzzle" Dissection

Bowhead Whale- Arctic

E. Eubanks- Capstone Project Fall 2013
Integrated Life and Earth Sciences in the Polar Regions

Objectives

To familiarize students with:

- The Scientific Method
- Real Polar Scientific Posters
- Real Polar Scientific Research
- Real Polar Scientific Terminology
- Real Polar Scientific Technology
- Real Polar Scientific Data
- Real Polar (Arctic) Scientists
- ***REAL SCIENCE***

- 1. Print the following pieces of the "puzzle" Poster (slides 3-9 ..pages 1-7)
- 2. Put Students into teams of at least two.
- 3. Give each team two pieces of the puzzle.
- 4. Utilizing internet resources & have students research 5 facts about their each piece (anything will do ☺)
- 5. Display this presentation - and have students present what they learned for each slide.
- 6. On the third to last slide – click the link to the "Poster Puzzle" and have students put it together.

Circulation Features Associated with the Barrow Area Bowhead Whale Feeding Hotspot

S.R. Okkonen, University of Alaska Fairbanks, okkonen@alaska.net
C.J. Ashjian, Woods Hole Oceanographic Institution, cashjian@whoi.edu
R.G. Campbell, University of Rhode Island, campbell@gso.uri.edu

ABSTRACT

Oceanographic, meteorological, and satellite data acquired during August-September 2008-2009 are used to illustrate aspects of ocean circulation in the vicinity of Barrow, Alaska and their relationship to the Bowhead whale feeding hotspot. Currents on the western Beaufort shelf are largely oriented along-shore and are well-correlated with winds from east and west quadrants. A strong front nominally aligned with the 20-m isobath occurs when the Alaska Coastal Current, in response to weak winds or winds from the southwestern quadrant, flows adjacent to the southern flank of Barrow Canyon. This front is of particular local interest because it contributes to the aggregation of zooplankton and, as a result, is a locus for Bowhead whale groups pausing to feed during their westward fall migration.

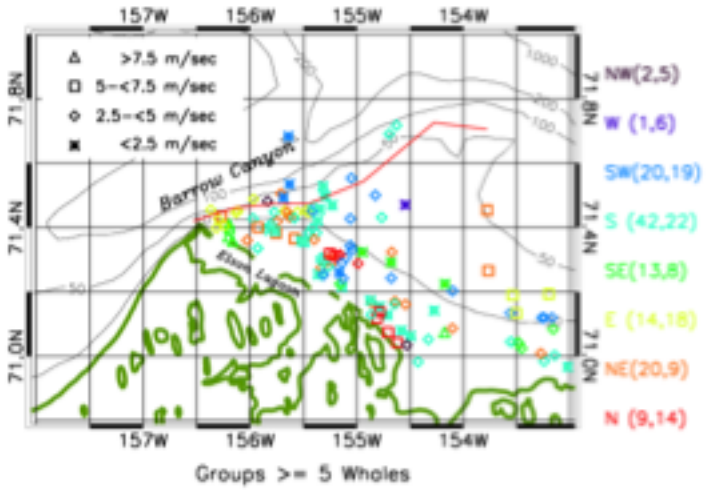


Figure 1 Locations of whale groups of 5 or more bowheads recorded by Bowhead Whale Aerial Survey Program (BWASP) observers (September-October 1984-2009). Whale groups (as opposed to individuals) are most likely observed when winds are from the southwestern quadrant and/or when winds are weak. The greatest concentration of whale group observations occurs near the shelf break (red line) along the southern flank of Barrow Canyon. Annotation to the right of the plot indicates wind direction, number of groups, and average group size, respectively.

ACKNOWLEDGMENTS Support was provided by Minerals Management Service, Cooperative Institute for Arctic Research, and National Oceanic Partnership Program. SAR imagery provided by Alaska Satellite Facility. MODIS imagery provided by MODIS Rapid Response System. Thanks to Janet Clarke, SAIC, for providing the Bowhead Whale Aerial Survey Program data.

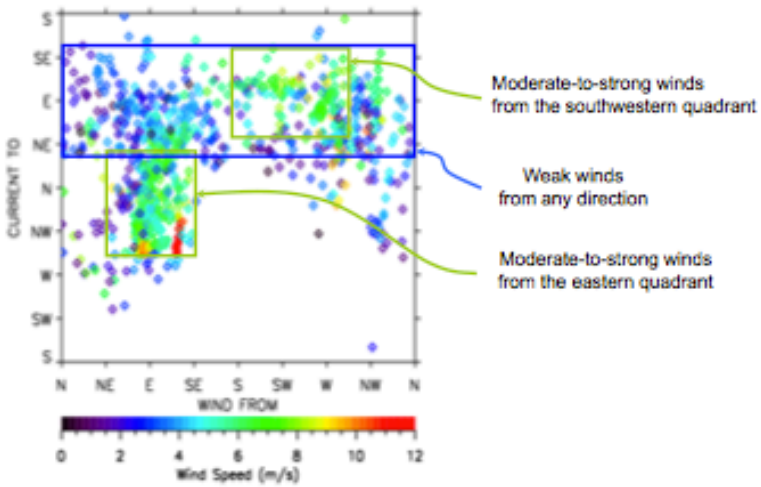
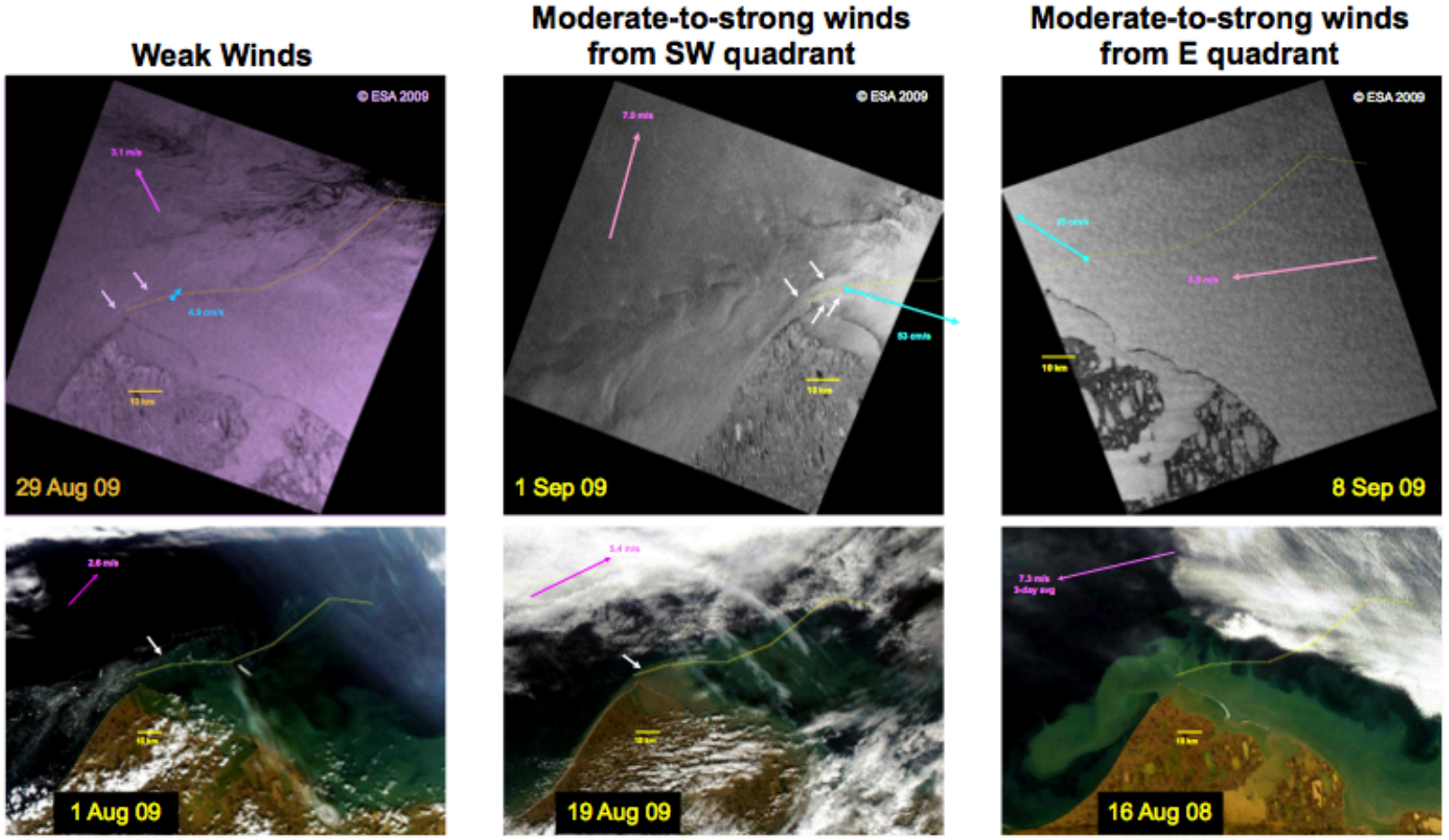


Figure 2 Matrix of depth-averaged current directions at the shelf-break mooring (see Figure 3 for mooring location) and contemporaneous wind velocities (mid-August to mid-September 2008-2009). Three ***generalized*** wind-current regimes are evident: (1) When winds are weak (<5 m/s, <~10 kts; purple-teal diamonds), regardless of wind direction, shelf-break currents most often flow toward the east (i.e onto the Beaufort shelf or along the shelf break), (2) When winds are moderate-to-strong (>5 m/s, >~10 kts; teal-red diamonds) and from southwestern quadrant, shelf-break currents flow toward the east, (3) When winds from the eastern quadrant are moderate-to-strong (>5 m/s, >~10 kts; teal-red diamonds), shelf break currents flow toward the northwestern quadrant, off the Beaufort shelf into Barrow Canyon.

Figure 3 Representative satellite images illustrating the presence/absence of shelf break frontal features and their association with the generalized wind-current relationships summarized in Figure 2. Top panels show Synthetic Aperture Radar images. Bottom panels show MODIS true color images. Yellow lines indicate the shelf break. Annotated pink arrows indicate wind speed and direction. Annotated blue arrows indicate depth-averaged current speed and direction at the shelf break mooring site (blue dot). White arrows indicate frontal features. The satellite images show that a shelf break front extends northeastward from near Pt. Barrow when winds are weak and/or winds are from the SW quadrant. This front is absent when winds from the eastern quadrant are moderate-to-strong.



Lets Put the Pieces Together

http://four.flash-gear.com/npuz/puz.php?c=v&id=3811551&k=88550453

Follow the Link- Scroll down on the page until you see the puzzle

Circulation Features Associated with the Barrow Area Bowhead Whale Feeding Hotspot

S.R. Okkonen, University of Alaska Fairbanks, okkonen@alaska.net
C.J. Ashjian, Woods Hole Oceanographic Institution, cashjian@whoi.edu
R.G. Campbell, University of Rhode Island, campbell@gso.uri.edu

ABSTRACT

Oceanographic, meteorological, and satellite data acquired during August-September 2008-2009 are used to illustrate aspects of ocean circulation in the vicinity of Barrow, Alaska and their relationship to the Bowhead whale feeding hotspot. Currents on the western Beaufort shelf are largely oriented along-shore and are well-correlated with winds from east and west quadrants. A strong front nominally aligned with the 20-m isobath occurs when the Alaska Coastal Current, in response to weak winds or winds from the southwestern quadrant, flows adjacent to the southern flank of Barrow Canyon. This front is of particular local interest because it contributes to the aggregation of zooplankton and, as a result, is a locus for Bowhead whale groups pausing to feed during their westward fall migration.

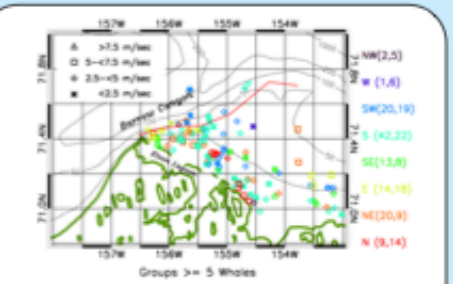


Figure 1 Locations of whale groups of 5 or more bowheads recorded by Bowhead Whale Aerial Survey Program (BWASP) observers (September-October 1984-2009). Whale groups (as opposed to individuals) are most likely observed when winds are from the southwestern quadrant and/or when winds are weak. The greatest concentration of whale group observations occurs near the shelf break (red line) along the southern flank of Barrow Canyon. Annotation to the right of the plot indicates wind direction, number of groups, and average group size, respectively.

ACKNOWLEDGMENTS: Support was provided by Minerals Management Service, Cooperative Institute for Arctic Research, and National Oceanic Partnership Program. SAR imagery provided by Alaska Satellite Facility. MODIS imagery provided by MODIS Rapid Response System. Thanks to Janet Clarke, BAC, for providing the Bowhead Whale Aerial Survey Program data.

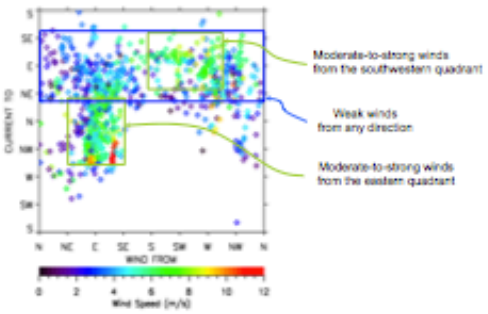
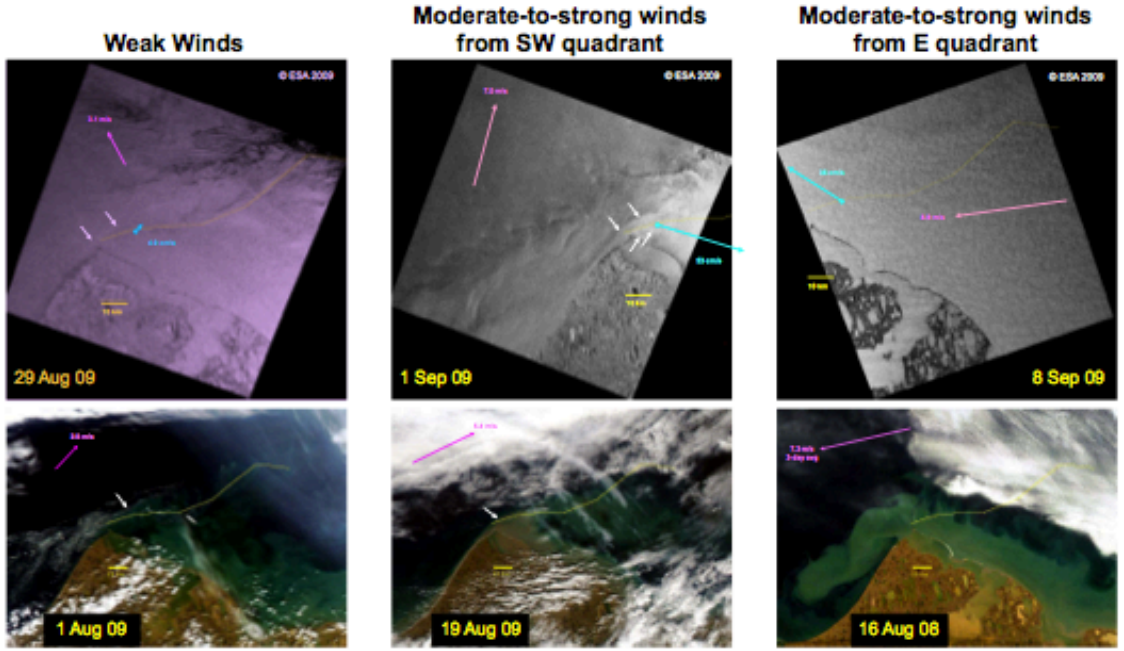


Figure 2 Matrix of depth-averaged current directions at the shelf-break mooring (see Figure 3 for mooring location) and contemporaneous wind velocities (mid-August to mid-September 2008-2009). Three ***generalized*** wind-current regimes are evident: (1) When winds are weak (<5 m/s, <~10 kts; purple-teal diamonds), regardless of wind direction, shelf-break currents most often flow toward the east (i.e onto the Beaufort shelf or along the shelf break), (2) When winds are moderate-to-strong (>5 m/s, >~10 kts; teal-red diamonds) and from southwestern quadrant, shelf-break currents flow toward the east, (3) When winds from the eastern quadrant are moderate-to-strong (>5 m/s, >~10 kts; teal-red diamonds), shelf break currents flow toward the northwestern quadrant, off the Beaufort shelf into Barrow Canyon.

Figure 3 Representative satellite images illustrating the presence/absence of shelf break frontal features and their association with the generalized wind-current relationships summarized in Figure 2. Top panels show Synthetic Aperture Radar images. Bottom panels show MODIS true color images. Yellow lines indicate the shelf break. Annotated pink arrows indicate wind speed and direction. Annotated blue arrows indicate depth-averaged current speed and direction at the shelf break mooring site (blue dot). White arrows indicate frontal features. The satellite images show that a shelf break front extends northeastward from near Pt. Barrow when winds are weak and/or winds are from the SW quadrant. This front is absent when winds from the eastern quadrant are moderate-to-strong.



Special Thanks
to
Dr. Steve Okkonen
for sharing
the poster and time

ARCUS

POLAR TREC

UAF