Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Chukchi and Beaufort Seas, Coastal Marine Institute Project (NOFA MMS09HQPA0004T)

Monthly progress report, May 2011

1) Summary of work performed and progress made during preceding month

A. Analysis of ice distribution and lead patterns

Work is continuing towards a detailed summary of repeatable lead patterns in the Chukchi Sea. This month, most of the time was spent working on defining the sequences of events involved in creating some specific deformation patterns of the pack ice in the Chukchi Sea. As part of this, some work was done to develop estimates of the extent of cloud cover over the Chukchi Sea, and the timing of events such as the opening of Bering Strait, and the first appearance of grounded ice on Herald Shoal.

B. Analysis of landfast ice extent

SAR data mining and processing

No new data were acquired during May, but we have now completed delineations for the partial 2007-08 season in the Chukchi Sea with the available data up until April. Due to the decommissioning of Radarsat, we will not be able to acquire imagery for the last 3 months of this final season. Tables 1-4 below show the current status of SAR data mining and processing. Updates since the last report are highlighted in red.

Table 1: Data acquisition and processing status for the Chukchi study region. Lower case y's indicate issues that will require further work / reprocessing

Chukchi	Order Placed	Order Retrieved	Geocoded	Mosaicked	Uploaded to web site	Notes
1996-1997	Y	Y	Y	Y	N	20 km geocoding error on R97_186_189mos, R97_162_189gdif; leap year issue with fall frames dates
1997-1998	Y	Y	Y	Y	N	Mosaics are good
1998-1999	Y	Y	Y	Y	N	Mosaics are good
1999-2000	Y	Y	Y	Y	N	Mosaics are good
2000-2001	Y	Y	Y	Y	N	Mosaics are good. Rename r00_365_366mos to r00_363_366mos
2001-2002	Y	Y	Y	Y	N	Mosaics are good. Rename r02_208_210mos to r02_208_211mos
2002-2003	Y	Y	Y	Y	N	Mosaics are good.
2003-2004	Y	?	N	N	N	Mosaics pending
2004-2005	Y	Y	Y	Y	N	Mosaics are good.
2005-2006	Y	Y	y	Y	N	Need to re-run mosaics giving preference to Chukchi swath; 8 mosaics with >1km geocoding errors
2006-2007	Y	Y	Y	Y	N	Mosaics are good.
2007-2008	Y	Y	N	N	N	Mosaics are good. (data only through April)

Table 2: Data acquisition and processing status for the Chukchi study region Lower case y's indicate issues that will require further work / reprocessing

Beaufort	Order Placed	Order Retrieved	Geocoded	Mosaicked	Uploaded to web site	Notes
1996-1997	Y	Y	Y	Y	Y	Complete (Previous study)
1997-1998	Y	Y	Y	Y	Y	Complete (Previous study)
1998-1999	Y	Y	Y	Y	Y	Complete (Previous study)
1999-2000	Y	Y	Y	Y	Y	Complete (Previous study)
2000-2001	Y	Y	Y	Y	Y	Complete (Previous study)
2001-2002	Y	Y	Y	Y	Y	Complete (Previous study)
2002-2003	Y	Y	Y	Y	Y	Complete (Previous study)
2003-2004	Y	Y	Y	Y	Y	Complete (Previous study)
2004-2005	Y	Y	Y	Y	N	Complete, but not on web
2005-2006	Y	Y	y	y	N	Geocoding errors on 7 mosaics; mosaics need to be reprocessed
2006-2007	Y	Y	Y	Y	N	Complete, but not on web
2007-2008	Y	Y	Y	Y	N	Complete, but not on web

Table 3: SLIE processing and database status for the Chukchi study region

Chukchi	SLIE Delineations	Shapefiles	Grids	GeoDB	Uploaded to web site	Notes
1996-1997	Y	Y	Y	Y	Y	Complete
1997-1998						
1998-1999	Y	Y	Y	Y	Y	Complete
1999-2000						
2000-2001						
2001-2002						
2002-2003						
2003-2004						
2004-2005	Y	Y	Y	Y	N	Delineations complete
2005-2006						Need updated mosaics (unresolved geocoding errors, etc.)
2006-2007	Y	Y	Y	Y	Y	Complete
2007-2008	Y					Complete up to April (Radarsat decommissioned)

Table 4: SLIE processing and database status for the Chukchi study region

Beaufort	SLIE Delineations	Shapefiles	Grids	GeoDB	Uploaded to web site	Notes
1996-1997	Y	Y	Y	Y	Y	Complete (Previous study)
1997-1998	Y	Y	Y	Y	Y	Complete (Previous study)
1998-1999	Y	Y	Y	Y	Y	Complete (Previous study)
1999-2000	Y	Y	Y	Y	Y	Complete (Previous study)
2000-2001	Y	Y	Y	Y	Y	Complete (Previous study)
2001-2002	Y	Y	Y	Y	Y	Complete (Previous study)
2002-2003	Y	Y	Y	Y	Y	Complete (Previous study)
2003-2004	Y	Y	Y	Y	Y	Complete (Previous study)
2004-2005	Y	Y	Y	Y	Y	Complete
2005-2006						In progress; need mosaics (unresolved geocoding errors)
2006-2007	Y	Y	Y	Y	Y	Complete
2007-2008	Y	Y	Y	Y	Y	Complete up to April (Radarsat decommissioned)

Chukchi bathymetry data

We have acquired and are in the process of comparing two bathymetry datasets for the Chukchi Sea region. The two datasets are:

i) US Geological Survey Chukchi Sea Bathymetry
http://alaska.usgs.gov/science/biology/walrus/bering/bathy/chukbath.html

ii) Alaska Region Bathymetric Digital Elevation Model (ARB DEM)
(http://mather.sfos.uaf.edu/~seth/bathy/)

The USGS bathymetry data were produced from digitized contours taken from 1:1,000,000 scale charts. The contour interval (and hence the bathymetric resolution of the data) is 10m. The second dataset was compiled as a research took by Seth Danielson and others at the Institute of Marine Science (IMS) at UAF. The ARB DEM is distributed as floating point data on a geographic grid with spacings of 30´´ and 60´´ in latitude and longitude, respectively. We have re-gridded both these datasets to 100m grids on an Alaska Albers projection and cropped them to our Chukchi study region.

Figures 1 and 2 show the two bathymetry datasets as gridded DEMs with the coastline and isobaths overlain. The coarser bathymetric resolution of the USGS data is evident in the lack of texture between isobaths. The locations of the 10 m and 20 m isobaths in both datasets are in generally good agreement, but the USGS data places deeper isobaths closer to the coast than the ARB DEM. For the purposes of analyzing the relationship between landfast sea ice extent and water depth, we are most concerned with the accuracy and resolution of the data close to shore. In this regard, the ARB DEM data look better and will therefore likely be the dataset we choose. However, close inspection of the data indicates the presence of interpolation artifacts in the form chains of shoals or depressions in straight lines aligned with survey grids. We will therefore need to exercise care when interpreting these data in conjunction with the SLIE results.

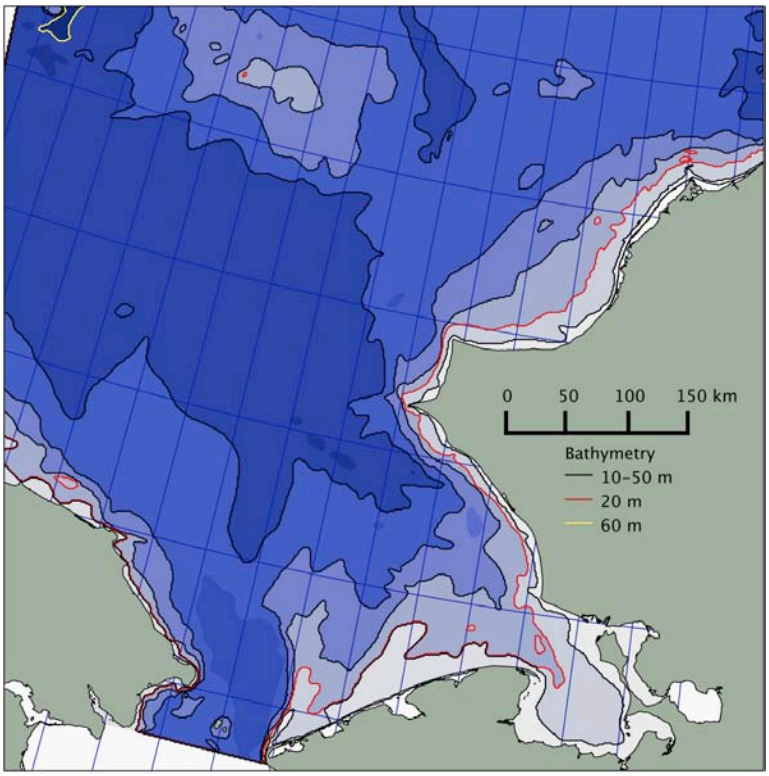

Figure 1: Regridded USGS Chukchi Sea bathymetry. Isobaths are at 10m intervals. The 20m and 60m isobaths are shown in red and yellow, respectively.

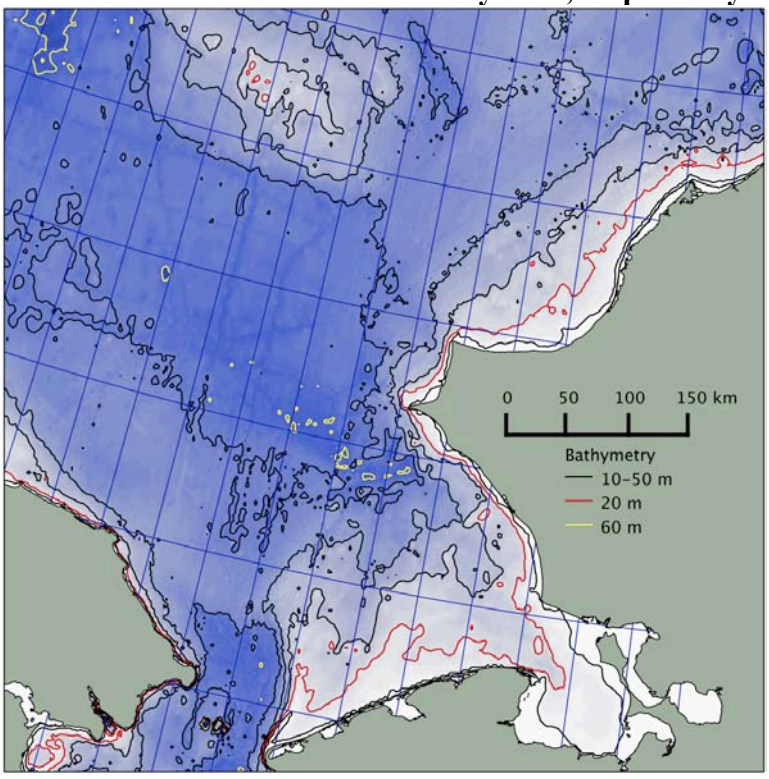

Figure 2: Regridded Alaska Region Bathymetric DEM. Isobaths are at 10m intervals. The 20m and 60m isobaths are shown in red and yellow, respectively.

C. *Assessing potential alternative approaches at deriving landfast ice edge locations and landfast ice stability*

We are now in the final stages of making revisions before resubmitting our manuscript on landfast ice detection with InSAR to the journal *Remote Sensing of the Environment*.

D. *Miscellaneous activities*

n/a

2) *Summary of significant technical, schedule or cost problems encountered during preceding month*

n/a

3) *Summary of resolutions agreed to between Contractor and MMS re item (2)*

n/a

4) *Significant meetings held or other contacts made in connection with project during preceding month*

n/a

5) *Action items, open questions etc.*

n/a