GIS Mapping Software Project Training

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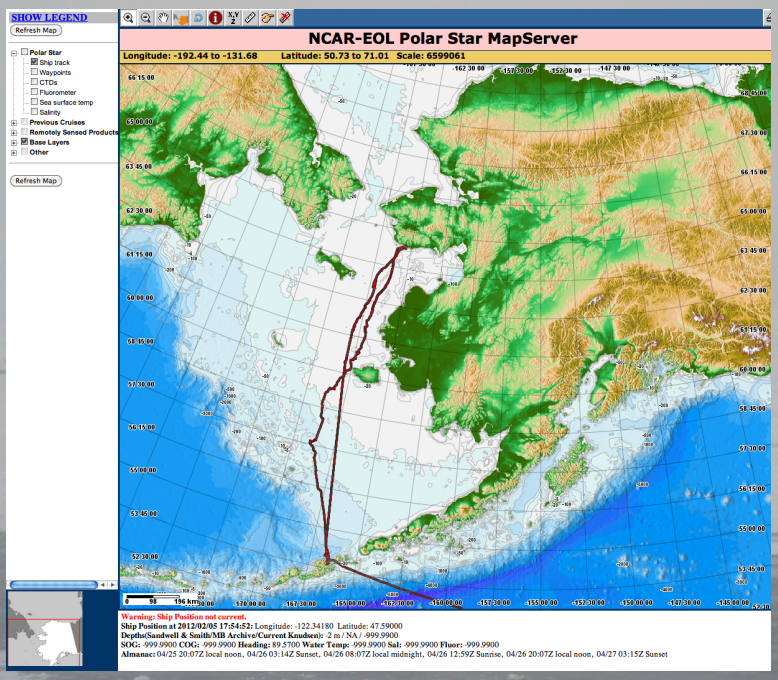
Table of Contents (con't.)

Objectives

- Learn how Mapserver works
- Add layers and data to Mapserver
- Ice observations form use
- Process TeraScan satellite imagery for Mapserver
- Typical tasks in Mapserver

Mapserver



Objectives

- Mapserver setup
- Mapserver use
- Changing Mapserver layers
- Adding data to Mapserver
- Creating ship tracks

Mapserver Setup

- html directory

  /mnt/mapserver/html/polarstar
- data directory

  /mnt/mapserver/data/polarstar
- cgi-bin directory

  /mnt/mapserver/cgi-bin/polarstar

Html Directory

- index.html – main web page
- mapper.html – displays map
- layers.html – displays layers
- refmap.html – displays reference map
- layers.inc.js – definition of layers
- javascript directory – measure tool, zoom functions, other javascript programs

Data Directory

- polarstar.map – main map file that describes how to display the data.

  Included map files from other directories
- All data files
- All template html files used with “Info” button

Cgi-bin Directory

- Mapserver executable: mapserv
- getshipinfo.pl
- Other scripts for displaying information in Mapserver

Mapserver Use

To navigate around the map, use the buttons at the top of the map window. The buttons and functions are as follows:

 Zoom in button: This is the selected button by default. Left click once on this button, then left click once on the map to zoom in to an area around where the mouse was clicked on the map. If you want to select an area on the map to zoom in to, hold down the left mouse button while moving the mouse. A box outlined in red will show on the map. Release the left mouse button when you have selected the area you are interested in. This area will be displayed zoomed in on the map.

 Zoom out button: Left click once on this button, then left click once on the map to zoom out to an area around where the mouse was clicked on the map.

 Pan button: Left click once on this button, then hold down the left mouse button while on the map and move the mouse in the direction you want the map to move. Release the left mouse button after the map has moved to display the new area of the map.

 Default display button: Left click once on this button to return to the default display area of the map.

 Refresh button: Left click once on this button to redraw the map.

 Query button: Left click once on this button, then left click once on a site on the map. More information about this site will be displayed at the bottom of the browser window below the map. You can also select an area as described in the Zoom in button section. All the sites that are in the box outlined in red will have more information displayed in the area below the map.

Mapserver Use

Lat-Long button: Left click once on this button, then left click once on a site on the map. The latitude and longitude for this location will be displayed at the bottom of the browser window below the map.


Start measure button: Left click once on this button, then left click once on the map to start the measure on a spot that you want to measure distances from. Left click once on the map for each additional distance that you want to measure. A small red number will show on the map for each left click on the map. All the lengths will be displayed at the bottom of the browser window below the map. Distances are shown in nautical miles and kilometers. To edit or move the small red numbers to measure different distances, see Edit measure button below. To end the measuring function, see Stop measure button below.


Edit measure button: To change the locations of any of the small red numbers from using the measuring tool, left click once on this button. Then hold down the left mouse button while over one of the small red numbers and either move it to the desired location on the map or move it to the trash can located at the bottom right of the map. The small red number will be moved to the new location where the mouse button is released.


Stop measure button: Left click once on this button to stop the measuring function and clear all the values at the bottom of the window. A new measure can now be started if so desired.

Help button: Left click once on this button to display this help page.


Print button: Left click once on this button to display a printable map in a new browser window. The new browser window will display a map that can be printed. (This button is located to the right of the browser window.)

Mapserver Use

- Select layers on left side
- Click “Refresh Map” button
- “Show Legend” button displays legend for selected layers
- Current ship information displayed at the bottom
- Reference map in lower left corner shows area of map being displayed

Mapserver Exercise

1) Browse different layers in Mapserver.
2) Display a ship track, select the “Info” button and click somewhere on the ship track. Look through the information displayed in the new window.
3) Try the zoom in/out functions on the main mapserver web page and also pan around the map. Click on the “Default Display” button to return to the original map view.
4) Use the measure tool to measure some distances on the map.

Mapserver Data Files

- Shapefiles – ship tracks, stations, waypoints
- gif, png, jpg image files – geo-located
- MrSid ice imagery files
- geotiff geo-referenced files
- Tile index of geotiff files – useful for large data sets such as multibeam data.

Map File

Defines the Mapserver setup, including map projection, reference map, legend, and scalebar.

Defines layers and how the layers are displayed in Mapserver.

Use INCLUDE command to add map files from other directories.

Defines template html files used for the layers. The template html files describe the information displayed when using the “Info” button.

Debugging Mapserver

Files with possible error messages:

/tmp/mapserver.log

/var/log/apache2/error.log

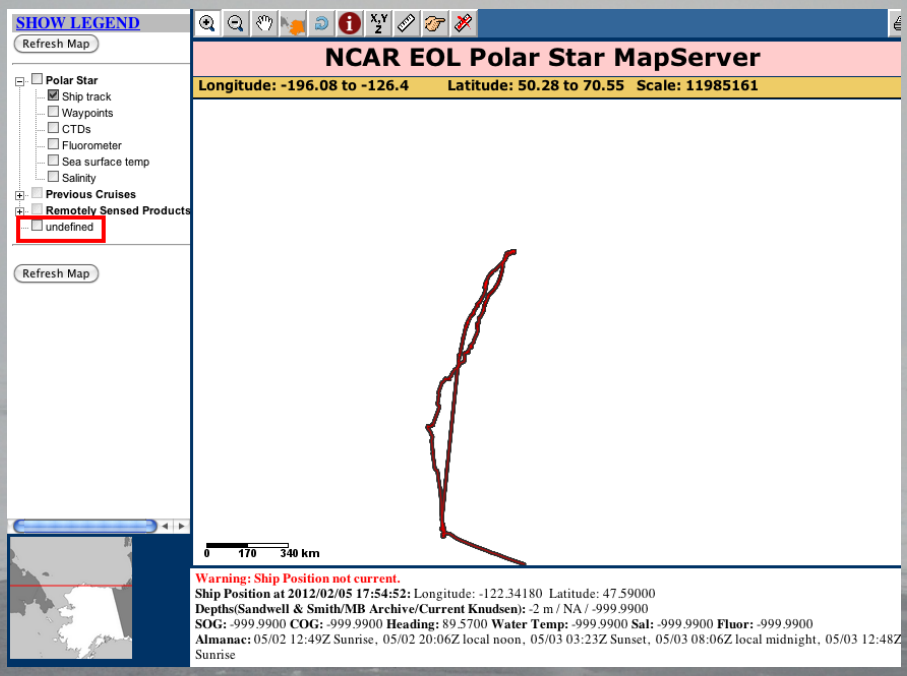
/var/log/apache2/access.log

/mnt/mapserver/html/tmp/polarstar.log

Hints:

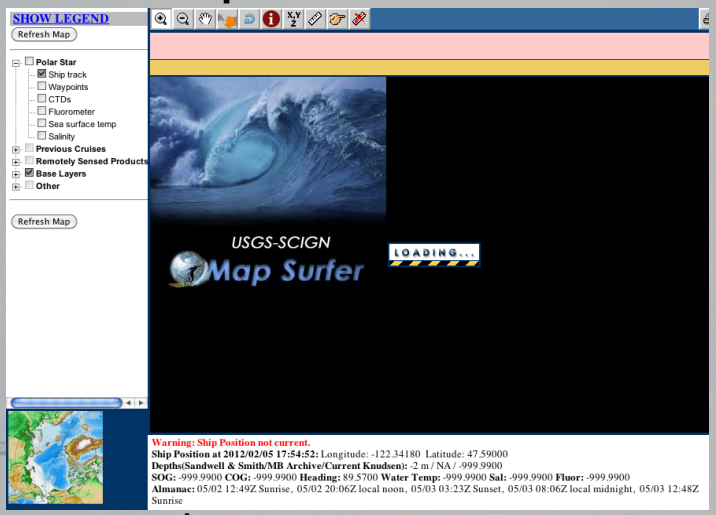
- Comment out last entries and test again.
- Check syntax in javascript files and map files.

Mapserver Error



Error in layers.inc.js file

Mapserver Error



/tmp/mapserver.log:

[Wed May 2 14:41:32 2012].168764 msLoadMap(): Unknown identifier. Parsing error near (YMBOLSET):(line 14)

Error in polarstar.map file

Adding Layers

1) Edit layers.inc.js file – Add code to set up layer
2) Add information about layer to polarstar.map file
3) Test layer in mapserver
4) Add template html files for the layer

Hint: Don't make too many changes at the same time.

Layer Example

layers.inc.js

```
var j = -1;
a[++i] = new Array;
a[i]['caption']          = "<b>Polar Star</b>";
a[i]['checkboxName']     = "a"+i;
a[i]['isOpen']           = true;
a[i]['isChecked']        = 0;
a[i]['children']         = new Array;
a[i]['onChangeCheckbox'] = "loadLayers()";

a[i]['children'][++j] = new Array;
a[i]['children'][j]['caption'] = 'Ship track'
a[i]['children'][j]['checkboxName'] = 'polarstar track';
a[i]['children'][j]['isChecked']    = 1;
```

polarstar.map

```
LAYER
  NAME polarstar_track
  GROUP polarstar_track
  TYPE LINE
  STATUS OFF
  DATA ship/track_stere.shp
  CLASS
    NAME "Polar Star Track"
    STYLE
        COLOR 50 50 50
        WIDTH 3.5
     END
    OVERLAYSIZE 1
    OVERLAYCOLOR 255 0 0
  END
  TEMPLATE "data/ship/trackinfo.html"
  HEADER "data/ship/track_header.html"
  FOOTER "legend_table_footer.html"
  TOLERANCE 3
END
```

Template Html Files

Found in Mapserver data directory

track_header.html

html to describe headings for the table

track_footer.html

html to finish the table

track.html

contains data field names from the shape file

NOTE: Must have <!– Mapserver Template --> at beginning of all template html files.

Sample Template Files

track_header.html

```
<!--Mapserver Template-->
<h3>Polar Star Ship Track</h3>
<table cellpadding=5 cellspacing=2 border=0>
<tr bgcolor=#CCCCCC>
<th>Date</th>
<th>Time (UTC)</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Speed over ground</th>
<th>Course over ground</th>
<th>Heading</th>
<th>Depth</th>
<th>Air Temp (C)</th>
<th>Sea Surface Temperature</th>
<th>Salinity</th>
<th>Fluorometer (volts)</th>
</tr>
```

track_footer.html

```
<!--MapServer Template-->
</table><p>
<IMG SRC="[legend]">
<br><br>
```

track.html

```
<!-- Mapserver Template -->
<tr>
<td>[Date]</td>
<td>[Time_GMT]</td>
<td nowrap>[Latitude]</td>
<td nowrap>[Longitude]</td>
<td>[SOG]</td>
<td>[COG]</td>
<td>[Heading]</td>
<td nowrap>[Depth]</td>
<td>[AirTemp]</td>
<td>[SST]</td>
<td nowrap>[Salinity]</td>
<td>[Fluor-Volt]</td>
</tr>
```

Sample Template

Polar Star Ship Track

Date	Time (UTC)	Latitude	Longitude	Speed over ground	Course over ground	Heading	Depth	Air Temp (C)	Sea Surface Temperature	Salinity	Fluorometer (volts)
2012/01/13	02:37:00	64.1269	-166.0123	-999.990	-999.990	321.0600	-999.990	-23.3400	-999.990	-999.990	-999.990
2012/01/13	02:38:00	64.1287	-166.0151	-999.990	-999.990	325.3200	-999.990	-23.4000	-999.990	-999.990	-999.990
2012/01/13	02:39:00	64.1308	-166.0172	-999.990	-999.990	342.3600	-999.990	-23.4000	-999.990	-999.990	-999.990
2012/01/13	02:40:00	64.1333	-166.0184	-999.990	-999.990	350.0400	-999.990	-23.2700	-999.990	-999.990	-999.990
2012/01/13	02:41:00	64.1359	-166.0177	-999.990	-999.990	11.1200	-999.990	-23.4900	-999.990	-999.990	-999.990
2012/01/13	02:42:00	64.1383	-166.0166	-999.990	-999.990	8.9400	-999.990	-23.7400	-999.990	-999.990	-999.990
2012/01/13	02:43:00	64.1406	-166.0158	-999.990	-999.990	10.3300	-999.990	-23.4900	-999.990	-999.990	-999.990

Layer Exercise

1) Edit layers.inc.js file to include code for displaying HLY0902 cruise track under the Previous Cruises section after the Polar Star layer. Data file is data/hly0902/ HLY0902_track_stere.shp
2) Edit polarstar.map file to add the information for displaying the data in Mapserver.

   Hint: Look at data/ship/shiptrack.map for an example

Layer Exercise

3) Reload Mapserver webpage.
   a) Does the layer appear in the list?
   b) Does the track display in the map?
4) View the shape file using the ogrinfo command.
5) Create template html files for the layer (header and footer also). Display Datetime, lat, lon, cog, sog, and SST.

Layer Exercise

6) Edit the polarstar.map file to include the template files just created.
7) Click the “Info” button and click on the map on the Healy track. Does the info web page have the correct information and are the correct values displayed?

Shapefiles

- ESRI format
- Points, lines, polygons
- Binary files
- .shp, .shx, .dbf, .prj files
- ogrinfo command to view content

Note: Use ogrinfo –help for more information on the ogrinfo command.

Creating Shapefiles

- shp files define the points or segments
- dbf files include supporting data such as winds, temperatures, etc.

Points:

```
shpcreate track_current.shp point
shpadd track_current.shp -122.34 47.59
```

Lines:

```
shpcreate track.shp arc
shpadd track.shp -166.45 53.92 -166.53 53.9
```

Creating Shapefiles

Points and Lines:

dbfcreate track.dbf -s Date 10, -s Time_GMT 10,
-n Longitude 10 4, -n Latitude 10 4,
-n WindDir 8 4, -n WindSpd 8 4,
-n AirTemp 8 4

dbfadd track.dbf 2011/12/17 04:26:00 -166.46 53.93 12.23 9.36 1.83

Note: Use man dbfadd for more information on the dbfadd command.

Point Shapefiles

Alternate Method:

ogr2ogr track.shp track.csv -- creates dbf file

ogr2ogr track.shp track.vrt -- creates shp file

Sample CSV File

```
ID,Stn-num,Stn-name,Cast,Datetime,Lat,Long,Latitude,Longitude
1,001,VNG1,1,2010/03/13 14:54,62 01.09 N,175 02.99 W,62.0181666666667,-175.049833333333
2,002,NWC5,2,2010/03/13 20:36,62 03.08 N,175 11.98 W,62.0513333333333,-175.199666666667
3,002,NWC5,3,2010/03/13 21:20,62 02.82 N,175 11.78 W,62.047,-175.196333333333
4,003,NWC4,4,2010/03/14 22:33,62 24.05 N,174 31.64 W,62.4008333333333,-174.527333333333
5,004,NWC4A,5,2010/03/15 10:52,62 33.69 N,174 12.58 W,62.5615,-174.209666666667
6,005,VNG3,6,2010/03/15 17:54,62 33.29 N,173 50.45 W,62.5548333333333,-173.840833333333
7,006,VNG3.5,7,2010/03/16 02:18,62 34.62 N,173 37.42 W,62.577,-173.623666666667
8,007,CD1,8,2010/03/16 14:47,62 40.58 N,173 22.00 W,62.6763333333333,-173.366666666667
```

Point Shapefiles

Sample VRT File

```
<OGRVRTDataSource>
    <OGRVRTLayer name="PSEA1001-CTDEvents">
        <SrcDataSource>PSEA1001-CTDEvents.csv</SrcDataSource>
        <GeometryType>wkbPoint</GeometryType>
        <LayerSRS>WGS84</LayerSRS>
        <GeometryField encoding="PointFromColumns" x="Longitude" y="Latitude"/>
    </OGRVRTLayer>
</OGRVRTDataSource>
```


Shapefile Example

ogrinfo -al track.shp

```
INFO: Open of `track.shp'
      using driver `ESRI Shapefile' successful.

Layer name: track
Geometry: Line String
Feature Count: 72767
Extent: (-168.993200, 47.590000) - (-122.341800, 64.489400)
Layer SRS WKT:
(unknown)
Date: String (10.0)
Time_GMT: String (10.0)
Longitude: Real (10.4)
Latitude: Real (10.4)
AirTemp: Real (8.4)
JS-WndDirR: Real (8.4)
JS-WndSpdR: Real (8.4)
OGRFeature(track):0
  Date (String) = 2011/12/17
  Time_GMT (String) = 04:26:00
  Longitude (Real) =  -166.4589
  Latitude (Real) =    53.9253
  AirTemp (Real) =   1.9100
  JS-WndDirR (Real) =  18.1400
  JS-WndSpdR (Real) =   8.5400
  LINESTRING (-166.4589 53.9253,-166.4589 53.9253)

OGRFeature(track):1
  Date (String) = 2011/12/17
  Time_GMT (String) = 04:27:00
  Longitude (Real) =  -166.4589
  Latitude (Real) =    53.9253
  AirTemp (Real) =   1.8300
  RelHumid (Real) =  93.4300
  Pressure (Real) = 980.9900
  JS-WndDirR (Real) =  12.2300
  JS-WndSpdR (Real) =   9.3600
  LINESTRING (-166.4589 53.9253,-166.4589 53.9253)
```

VRT File Definition

- Control File written in XML

```
<OGRVRTDataSource>
    <OGRVRTLayer name="PSEA1001-CTDEvents">
        <SrcDataSource>PSEA1001-CTDEvents.csv</SrcDataSource>
        <GeometryType>wkbPoint</GeometryType>
        <LayerSRS>WGS84</LayerSRS>
        <GeometryField encoding="PointFromColumns" x="Longitude" y="Latitude"/>
    </OGRVRTLayer>
</OGRVRTDataSource>
```

- OGRVRTDataSource – Root element contains OGRVRTLayer for each layer in the virtual data source.
- SrcDataSource – name of data source this layer is derived from.
- GeometryType – wkbNone, wkbPoint, wkbLineString, wkbPolygon

VRT File Definition


```
<OGRVRTDataSource>
    <OGRVRTLayer name="PSEA1001-CTDEvents">
        <SrcDataSource>PSEA1001-CTDEvents.csv</SrcDataSource>
        <GeometryType>wkbPoint</GeometryType>
        <LayerSRS>WGS84</LayerSRS>
        <GeometryField encoding="PointFromColumns" x="Longitude" y="Latitude"/>
    </OGRVRTLayer>
</OGRVRTDataSource>
```


- LayerSRS – Spatial reference for the layer (WGS84, NAD27, NAD83, WGS72)
- GeometryField – How geometry for features should be derived. Point from columns means the x and y values come from data in the file. Specify the names of the columns.

Creating Ship Tracks

- perl programs run from cron jobs
- completetrack.pl, partialtrack.pl, createtrack.pl
- Create shapefiles for displaying ship track in mapserver
- Create shapefiles for marking current position of ship
- Use real-time ship data
- Create one-minute data

Converting Ship Tracks

- Convert shapefiles from lat, lon projection to Polar Stereographic projection
- ogr2ogr –t_srs stere.prj track_stere.shp track.shp

Note: Destination file is before source file on command line

stere.prj file:

```
PROJCS["unnamed",GEOGCS["WGS 84",DATUM["WGS_1984",SPHEROID["WGS
84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],TOWGS84[0,0,0,0,0,0,0],AUTHORITY["EP
SG","6326"]],PRIMEM["Greenwich",0,AUTHORITY["EPSG","8901"]],UNIT["degree",0.017453292519
9433,AUTHORITY["EPSG","9108"]],AXIS["Lat",NORTH],AXIS["Long",EAST],AUTHORITY["EPSG","432
6"]],PROJECTION["Polar_Stereographic"],PARAMETER["latitude_of_origin",67.5],PARAMETER["c
entral_meridian",-
155],PARAMETER["scale_factor",1],PARAMETER["false_easting",0],PARAMETER["false_northing"
,0],UNIT["Meter",1]]
```

Creating Ship Tracks

completetrack.pl

- Runs once per day
- If no date is specified on the command line, the entire previous day is run.
- Specify completetrack.pl 04/30/12 to run for that specific date.
- Allows a track to be recreated if necessary.

Creating Ship Tracks

partialtrack.pl

- Runs every 10 minutes
- Adds data for the current day to previously created shape files.

Both completetrack.pl and partialtrack.pl run the createtrack.pl program, which creates the track shape files and track_current shape files in polar stereographic projection.

Creating Ship Tracks

track – The entire track for the current cruise.

track_current – The last position of the ship.

Both shape files include one-minute data for selected variables.

Shapefile Exercise

Points

1) Create a directory under the home directory using your last name as the directory name. cd to the directory just created.
2) Create a point shape file and a dbf file from the command line using the shpcreate and dbfcreate commands.
3) Use the csv file ~ucar/class/track.csv to create the data points for the shape file using the shpadd and dbfadd commands.
4) View the shapefile using the ogrinfo command. Does everything look correct in the shape file?

Shapefile Exercise

Alternate method for Points

1) Create a point shape file in the same directory as above using the ogr2ogr commands for the same csv file. Name these files a different name from the first exercise.
2) View the shape file. Does everything look correct? Are there any differences from the first shape file?
3) How will this shape file look when displayed in Mapserver?

Shapefile Exercise

Lines

1) Use the same directory, as the points exercise, for the working directory.
2) Create a line shape file and a dbf file from the command line using the shpcreate and dbfcreate commands. Name your shapefile a different name from the points exercise.
3) Use the same csv file, as the points exercise, to add the data to the shape and dbf files.

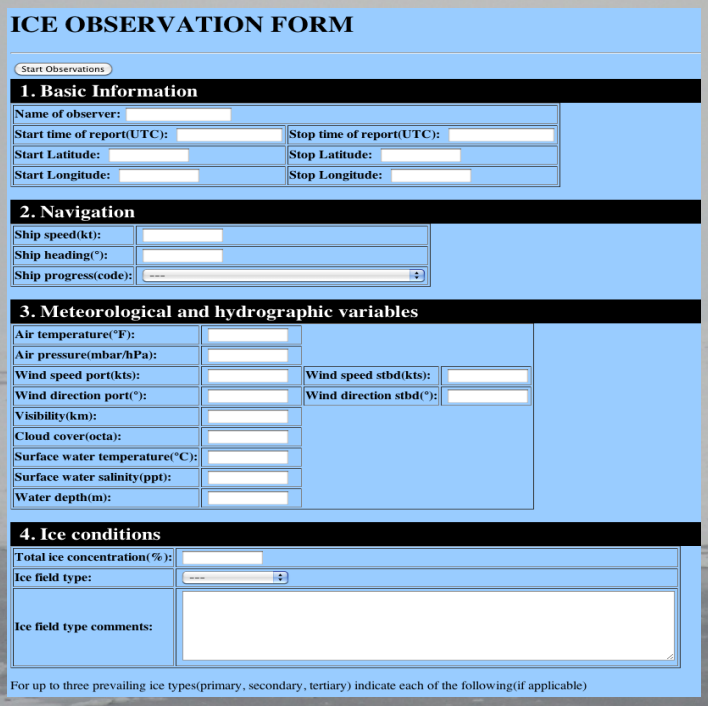
Shapefile Exercise

4) View the shapefile using the ogrinfo command
5) How does this shape file look different from the points shapefile?
6) How will this shapefile look when displayed in Mapserver?
7) Use one of your created shapefiles and convert from lat long projection to polar stereographic projection.

Mapserver Summary

- Directory setup of Mapserver.
- Mapserver interface use.
- Debugging Mapserver.
- Adding layers and data to Mapserver.
- Creating shape files, both points and lines.
- Process of creating ship tracks and converting to base map projection.

Ice Observations



ICE OBSERVATION FORM

Start Observations

1. Basic Information

Name of observer:			
Start time of report(UTC):		Stop time of report(UTC):	
Start Latitude:		Stop Latitude:	
Start Longitude:		Stop Longitude:	

2. Navigation

Ship speed(kt):	
Ship heading(°):	
Ship progress(code):	---

3. Meteorological and hydrographic variables

Air temperature(°F):			
Air pressure(mbar/hPa):			
Wind speed port(kts):		Wind speed stbd(kts):	
Wind direction port(°):		Wind direction stbd(°):	
Visibility(km):			
Cloud cover(octa):			
Surface water temperature(°C):			
Surface water salinity(ppt):			
Water depth(m):			

4. Ice conditions

Total ice concentration(%):	
Ice field type:	---
Ice field type comments:	

For up to three prevailing ice types(primary, secondary, tertiary) indicate each of the following(if applicable)

Objectives

- Create new ice observations
- Browse all ice observations
- Display summaries of ice observations
- Edit and delete ice observations

Create Ice Observations

- Clear and reset form button.
- Click start observation button. Fills in real-time data from ship.
- Name of observer is required field.
- Upload images of ice.
- Click stop observation button.
- Click Preview Report button.
- Once everything looks correct, click Save Report button

Browse Ice Observations

Latest – Shows last entered ice observation.

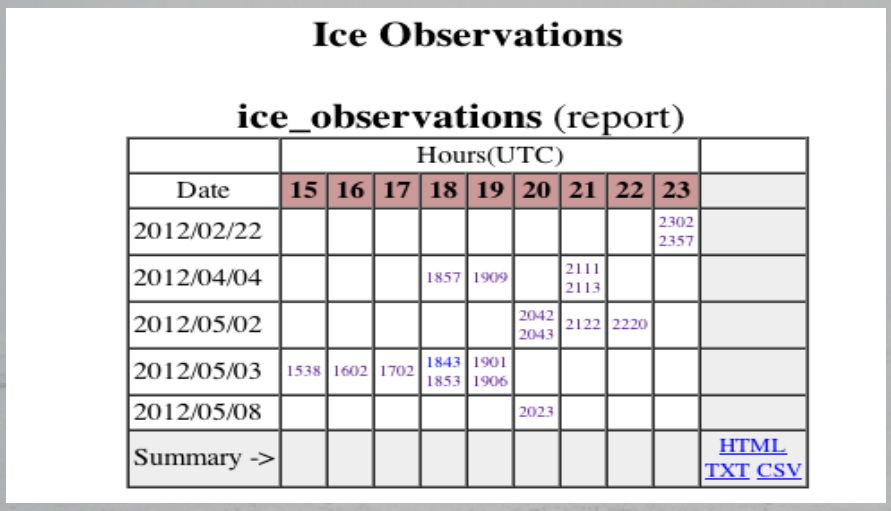
Last Day – Shows table of all ice observations from the most recent day.

Use Start/End Dates to choose the ice observations to display.

All – Shows all ice observations in a table

Click on Get Data.

Browse Ice Observations



Ice Observations

ice_observations (report)

	Hours(UTC)									
Date	15	16	17	18	19	20	21	22	23	
2012/02/22									2302 2357	
2012/04/04				1857	1909		2111 2113			
2012/05/02						2042 2043	2122	2220		
2012/05/03	1538	1602	1702	1843 1853	1901 1906					
2012/05/08						2023				
Summary ->										HTML TXT CSV

- Click on time of ice observation to display the report
- At the bottom of the report are links to edit or delete the reports.

Ice Observations Summary

- Click on HTML, CSV, or TXT to display different versions of the ice observation summary.

Ice Observations Summary Table

Description of Ice Observation Fields

For the period **2012/04/04 18:57** thru **2012/05/08 20:23 UTC**

Start Time	Start Lat	Start Lon	Air Temperature(F)	Wind Speed(knots) port	Wind Direction port	Wind Speed(knots) stbd	Wind Direction stbd	Total ice concentration (%)	Ice field type	Dominant ice type	Concentration of Primary Ice Type	Secondary ice type	Concent of Secor Ice Type
2012/04/04 18:57:57	47:35.40229	-122:20.55008	46.44	0.08	236.93	0.01	239.84		---	---		---	
2012/04/04 19:09:52	47:35.40229	-122:20.55008	46.44	0.08	236.93	0.01	239.84		---	---		---	
2012/04/04 21:11:22	47:35.40229	-122:20.55008	46.44	0.08	236.93	0.01	239.84		---	---		---	
2012/04/04 21:13:20	47:35.40229	-122:20.55008	46.44	0.08	236.93	0.01	239.84	100	1 - rounded pack	1 - shuga	100	6 - pancakes	45

Ice Observation Details

- Programs in /mnt/mapserver/cgi-bin/iceobsform
  - ice_obs.pl – Main ice observation program
  - ice_util.pl – Fills in values from real-time ship data
  - ice_sum*.pl – Display ice summaries

  /mnt/mapserver/html/iceobsform
  - ice_observations – Ice observation reports
  - deleted, state-cache, upload_files – Directories used in creating ice observations

Ice Observation Exercise

1) Create an ice observation.
2) Add the ice images in the class directory named port.jpg, forward.jpg, starboard.jpg to the ice observation.
3) Preview and save the report
4) Browse the ice observations. Is your ice observation displayed in the table?
5) Display your ice observation and click on the edit link.

Ice Observation Exercise

6) Change some of the data displayed in the ice observation and save the changes.
7) Browse your ice observation and verify that your changes are included.
8) Create another new ice observation.
9) Browse the ice observations table and look for the ice observation created in step 8.

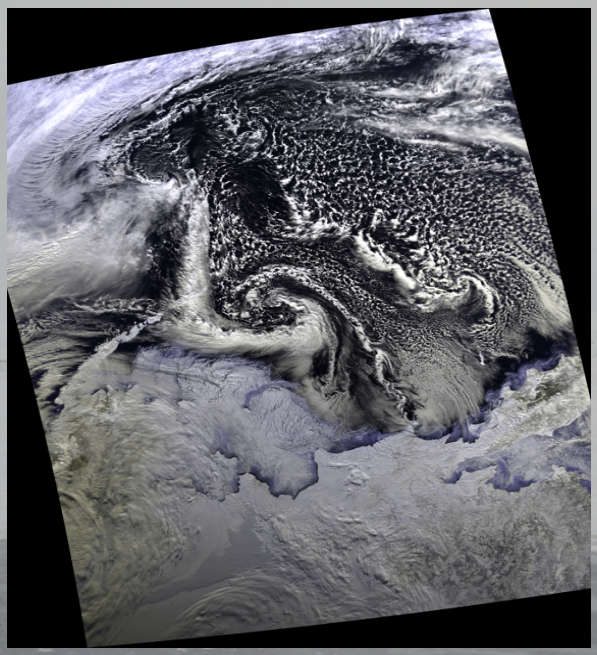
Ice Observation Exercise

10) Display your ice observation created in step 8. Click on the delete link and verify that you want to delete the ice observation.
11) Verify that the ice observation is no longer displayed in the table of ice observations.

Ice Observation Summary

- Created ice observations
- Learned to browse ice observations
- Displayed summaries of all ice observations
- Edited and deleted ice observations
- Learned where the programs and ice observations are stored on the file system.

TeraScan Processing



Objectives

- Locate recent satellite images.
- Visually correct navigation of satellite images.
- Process raw data files into geotiff images.
- Add geotiff images to Mapserver.

TeraScan Process

1) Locate a good, recent dmsp image.
2) Correct the navigation of the image.
3) Create a geotiff image from the raw data.
4) Add geotiff image to Mapserver.

Note: This process is done for both DMSP and AVHRR imagery. All processing is done on teramap computer.

TeraNav

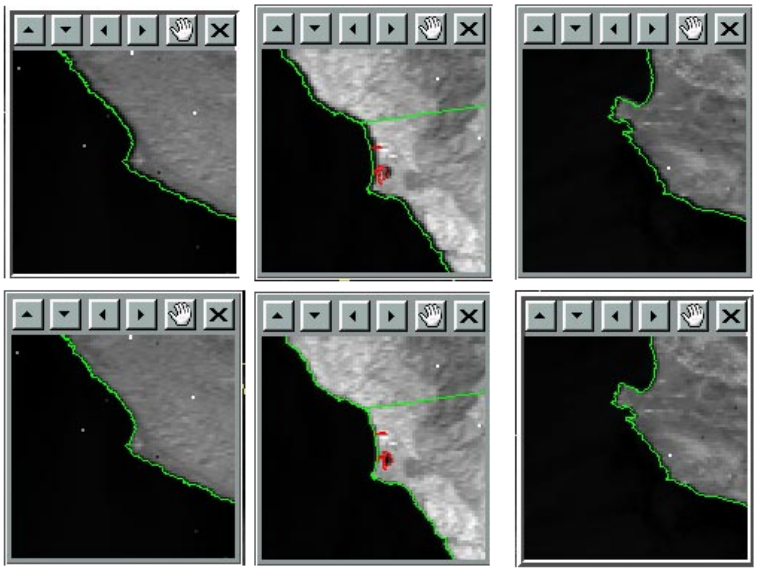
- Application for visually correcting the navigation of satellite images.
- Click on relevant areas that clearly display coastal areas.
- Small windows called NavLenses open.
- NavLenses show the region zoomed.
- Adjust the coastline overlay to match the actual coast.

Note: Do not confuse ice or snow with land boundaries. Error on the side of less adjustment.

TeraNav

Before

After



Examples of coastline correction

DMSP Processing

Step 1:

- cd ~/scripts/postprocs/output
- use gthumb command to view *.jpeg images
- Naming convention: fxx.yyjjj.hhmm.jpeg
  - xx – satellite number
  - yy – year
  - jjj – julian day of year
  - hh – hour of start of pass
  - mm – minute of start of pass

DMSP Processing

Step 1 con't:

- Look for a recent image that shows a good view of the land and ice.
- cd ~/scripts/geotiff_dmsp
- cp data/fxx.yyjjj.hhmm.ols .

Step 2:

- Navigate the satellite image.
- Source /opt/terascan/etc/tscan.login
  or
  /tscan.bash_profile

DMSP Processing

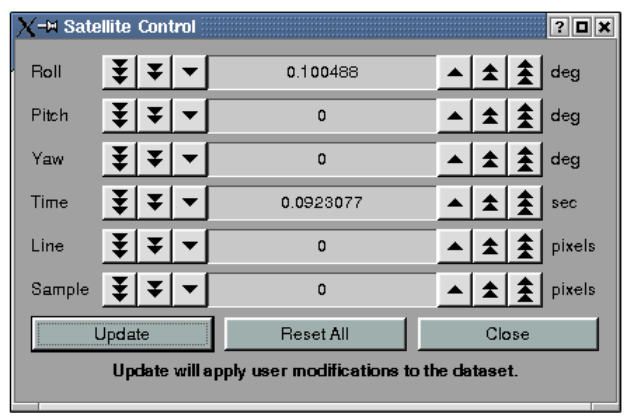
Step 2 con't:

- teranav fxx.yyjjj.hhmm.ols
- Either specify filename on the command line or use File→Open image once the teranav window is displayed.
- Scroll down until the satellite image is displayed in the teranav window.

DMSP Processing

Step 2 con't:

- Open Tasks→Satellite Control



DMSP Processing

Step 2 con't:

- Click on 2 or more points of clearly seen coastal areas.
- Adjust the coastline in the NavLens window.
- Switch between channels at the top of the TeraNav window.
- Adjust time and/or sample if needed.
- Click on Update button in Satellite Control window.

DMSP Processing

Step 2 con't:

- Check the resulting satellite image for accurate navigation.

Note: Use Reset All button to reset all values to initial values.

- Once the satellite image is correctly navigated, select Tasks→Apply Changes to Dataset

This modifies the original data files with the current navigation changes.

DMSP Processing

Step 2 con't:

Note: It is best to get a good spread of NavLens coverage. If your NavLenses are clustered in the center or on one side of the image, then only that area will be accurately navigated, and the coast overlay for the rest of the image may end up worse than it started.

DMSP Processing

Step 3:

- ./expim.pl fxx.yyjjj.hhmm.ols

This generates the geotiff file fxx.yyjjj.hhmm.tif

Step 4:

- Add the tiff image to Mapserver.

This process is similar to the process for adding ice imagery to Mapserver.

AVHRR Processing

Similar to DMSP Processing

Step 1:

- cd ~/scripts/postprocs/output
- Browse through the recent jpeg images to locate a good image.
- Naming convention: nxx.yyjjj.hhmm.jpeg
- cd ~/scripts/geotiff_hrpt
- cp data/nxx.yyjjj.hhmm.avhrr .

AVHRR Processing

Step 2:

- TeraNav nxx.yyjjj.hhmm.avhrr

This step can be skipped for avhrr images, unless navigation errors are noticeable.

Step 3:

- ./rgb.pl nxx.yyjjj.hhmm.avhrr

This generates the geotiff file nxx.yyjjj.hhmm.tif

Step 4:

- Add the tif image to Mapserver.

TeraScan Processing

- fastreg command is used in the programs that create the geotiff images.
- Registers 2-D data to a user-defined base map and projection.
- fastreg command uses a master file. Currently the master is set to the Bering Sea base map and projection.
- These are csh programs that create a new master file for the Seattle area or the Bering Sea area in ~/scripts/postprocs/*.csh
- There are also 1km and 4km master files, so use the appropriate master for the satellite imagery being processed.

TeraScan Exercise

1) Login to the teramap computer (using ssh –XY) and make a directory using your last name as the directory name.
2) cd /home/ucar/class
3) cd group? where ? is the number of your group (1-8).
4) gthumb *.jpeg and locate a good dmsp image that needs to be navigated and shows a good view of the land and ice. File name format is 2010mmddhhmm.f-1[3,5,6,7].1km_vis.jpeg. Make sure there is a corresponding .ols file for the jpeg file. ols file name format is f1[3,5,6,7].10jjj.hhmm.ols and note the ols name and directory.
5) cd ; then cd to the directory created in step 1.

TeraScan Exercise

6) cp directory/file-name .
7) source /opt/terascan/etc/tscan.bash_profile
8) teranav file-name (from step 6 without directory name).
9) Scroll down until the satellite image is displayed in the teranav window. Open Tasks -> Satellite Control
10) Look for areas in the image that show the coastlines clearly and correct the coastlines in the NavLens windows.
11) Click on Update in the Satellite Control window and check the resulting image. Is the navigation better or worse than before? You can start over by clicking the Reset All button.

TeraScan Exercise

12) Continue to fix the navigation until the image is navigated properly. Switch between channels at the top of the teranav window and change the values for time and sample in the Satellite Control window to help with the navigation. Once the navigation is complete, select Tasks -> Apply Changes to Dataset.
13) Exit out of teranav by selecting File -> Quit
14) Run ../expim.pl file-name. This will create the same name file with .tif extension instead of .ols.
15) View the resulting tif image with gthumb command.

TeraScan Summary

- Located satellite images to use.
- Visually navigated the satellite imagery.
- Processed raw data files and created geotiff images.
- Added geotiff images to Mapserver.

Mapserver Tasks

1) Change to a new cruise.
2) Change default extent of the map.
3) Add data from a csv or shapefile to Mapserver.
4) Order layers in Mapserver.
5) Add ice imagery to Mapserver.

New Cruise Setup

1) Edit layers.inc.js file -- Rename for new cruise
2) Edit previous.js file
   Add old cruise to Previous Cruises section
3) Create directory for new cruise
   ie. /mnt/mapserver/data/polarstar/data/cruise where cruise is the name of the cruise.
4) Add map files for new cruise.
5) Edit polarstar.map file
   Add included file for new cruise.
6) Set up process to create ship tracks for new cruise.
7) Update the perl programs that create the track data files. Change to the directory created in step 3.

layers.inc.js File

- Javascript code
- Point to another Javascript file

```
//--------------------------------------------------

j = -1;
a[++i] = new Array;
a[i]['caption']          = "<b>Previous Cruises</b>";
a[i]['checkboxName']     = "a"+i;
a[i]['isOpen']           = false;
a[i]['isChecked']        = 0;
a[i]['checkboxDisabled'] = true;
a[i]['children']         = previous;
```

- When adding another Javascript file, it must be added to layers.html file

```
<script type="text/javascript" src="previous.js"></script>
<script type="text/javascript" src="experimental.js"></script>
<script type="text/javascript" src="layers.inc.js"></script>
```

- If the .js file is not located in the same directory as the layers.html file, a symbolic link must be created.

  ln –s /mnt/mapserver/data/polarstar/ship/previous.js

previous.js File

```
previous = new Array;
var i = -1;
previous[++i] = new Array;
previous[i]['caption']  = "2010 Polar Sea";
previous[i]['checkboxName']   = "previous"+i;
previous[i]['checkboxDisabled']   = true;
previous[i]['isChecked']    = 0;
previous[i]['isOpen']    = false;
previous[i]['children']    = new Array;

var j = -1;
previous[i]['children'][++j] = new Array;
previous[i]['children'][j]['caption'] = 'Ship track'
previous[i]['children'][j]['checkboxName'] = 'psea1001_track';
previous[i]['children'][j]['isChecked']    = 0;

previous[i]['children'][++j] = new Array;
previous[i]['children'][j]['caption'] = 'CTDs';
previous[i]['children'][j]['checkboxName'] = 'psea1001_ctd';
previous[i]['children'][j]['isChecked']    = 0;
```


Current Cruise Files

/mnt/mapserver/data/polarstar/data/ship

current*.html – Template files for current ship position

track*.html – Template files for ship track

track_current_stere* - Data files for current ship position

track_stere* - Data files for ship track

fluorometer.map, salinity.map, sst.map, shiptrack,map –

Map files for displaying ship track data

Current Cruise Directories

complete – Contains track_stere* data files from the last completetrack.pl run. completetrack.pl adds an entire day to the data files. Usually, these files are not the same as the data/ship directory since partial days are run every 10 minutes.

temp – The new files are created in this directory and are moved to the data/ship directory once the program has finished running.

polarstar.map File

```
#--------------------------------------------------
## PolarStar data

INCLUDE "data/ship/shiptrack.map"
INCLUDE "data/ship/fluorometer.map"
INCLUDE "data/ship/salinity.map"
INCLUDE "data/ship/sst.map"
```

data/ship/shiptrack.map

```
LAYER
  NAME polarstar_track
  GROUP polarstar_track
  TYPE LINE
  STATUS OFF
  DATA ship/track_stere.shp
  CLASS
    NAME "Polar Star Track"
    STYLE
        COLOR 50 50 50
        WIDTH 3.5
     END
    OVERLAYSIZE 1
    OVERLAYCOLOR 255 0 0
  END
  TEMPLATE "data/ship/trackinfo.html"
  HEADER "data/ship/track_header.html"
  FOOTER "legend_table_footer.html"
  TOLERANCE 3
END
```

Track Programs

- Currently in /home/ucar/mapserver directory

completetrack.pl

```
my $rundate;
my $mapdir = "/mnt/mapserver/data/polarstar/data/ship";
my $bindir = "/home/ucar/mapserver";
my $completedir = "$mapdir/complete";
my $tempdir = "$mapdir/temp";
my $shapefile = "track.shp";
my $shapefile2 = "track.shx";
my $dbffile = "track.dbf";
my $curshape = "track_current.shp";
my $curdbf = "track_current.dbf";
my $curstere = "track_current_stere.shp";
my $sterefile = "track_stere.shp";
my $ogrcmd = "ogr2ogr -s_srs EPSG:4326 -t_srs $mapdir/stere.prj";
```

- Also need to update partialtrack.pl and createtrack.pl

Change Default Extent

1) Position map to area for new default extent
2) Look at last line in log file:
   /mnt/mapserver/html/tmp/polarstar.log

```
Wed May  9 18:48:43 2012,23276,128.117.85.163,POLARSTAR,0,-1531534.041916
-2650357.180639 931490.958084 -501970.104790,-300021.541916 -
1576163.642715,polarstar_track a3 GRID ibcao_geotiff ibcao2_line ,normal
execution
```

3) Edit mapper.html file
   /mnt/mapserver/html/polarstar/mapper.html

```
// Set MapServer cgi location and general map parameters
var mapserver = '/cgi-bin/polarstar/mapserv';
var mapfile = '/mnt/mapserver/data/polarstar/polarstar.map';

    // find these from the imgext= bit of the URI (/var/log/httpd/access_log)
   //    for the image loaded when you fiddle with zoom/pan in the web UI
//var extent = new Array(-2066407, -4101219,   87553, -2454767); // knorr summer09
//var extent = new Array(-1400000, -4280000, 1500000, -0800000); // bering sea, gulf of alaska, arctic
  var extent = new Array(-1575780, -4041730,  887245, -2109490); // psea1001 incl kodiak
```

Replace extent array with numbers from the polarstar.log file

Adding Data to Mapserver

1) Create shape file from data in the csv file as described in a previous section.
2) Add layer to map file describing the data to be displayed.
3) Add layer information to the layers.inc.js file.
4) Create template html files for data in layer.
5) Test everything in Mapserver, including the “Info” button.

Order of Layers in Mapserver

- Map file is read from top to bottom.
- Layers near the top of the map file will be drawn before those near the bottom.
- Generally, background layer types, multibeam, bathymetry at top of file. Layers with lines and points, ship tracks, ship current positions at bottom of file.
- An incorrect ordering of layers may cause one layer to draw over another, thereby making one layer invisible.

Ice Imagery in Mapserver

- National Ice Center imagery
- Polar View imagery
- AMSR-2 imagery (Expected mid-2012)
- SSMIS Experimental imagery
  Replaces AMSR-E imagery

Ice Imagery Process

1) Download ice imagery file.
   Usually .tif files which are geo-referenced.
2) Use gdalinfo command on sample imagery, locate the projection information for the imagery.
3) Create .js file similar to previous.js in New Cruise Setup section.
4) Edit layers.inc.js file to add layer name and information about the layer.

Ice Imagery Process

5) Edit layers.html file and add new .js file.
6) Create map file for imagery.
7) Edit polarstar.map file.
   Add include statement for new map file.
8) Test in Mapserver.

Ice Imagery Process

1) Files downloaded

```
asi-SSMIS-n6250-20120501-v5.tif
asi-SSMIS-n6250-20120502-v5.tif
asi-SSMIS-n6250-20120503-v5.tif
asi-SSMIS-n6250-20120504-v5.tif
asi-SSMIS-n6250-20120505-v5.tif
```

2) gdalinfo command

```
Driver: GTiff/GeoTIFF
Files: asi-SSMIS-n6250-20120501-v5.tif
Size is 1216, 1792
Coordinate System is:
PROJCS["IDL GeoTIFF Support
Projection = Polar Stereographic
True scale:         70.000000deg
Gunnar Spreen, Apr 2004",
    GEOGCS["WGS 84",
        DATUM["WGS_1984",
            SPHEROID["WGS 84",6378137,298.257223563,
                AUTHORITY["EPSG","7030"]],
            AUTHORITY["EPSG","6326"]],
        PRIMEM["Greenwich",0],
        UNIT["degree",0.0174532925199433],
        AUTHORITY["EPSG","4326"]],
    PROJECTION["Polar_Stereographic"],
    PARAMETER["latitude_of_origin",70],
    PARAMETER["central_meridian",-45],
    PARAMETER["scale_factor",1],
    PARAMETER["false_easting",0],
    PARAMETER["false_northing",0],
    UNIT["metre",1,
        AUTHORITY["EPSG","9001"]]]
Origin = (-3846875.000000000000000,5846875.000000000000000)
Pixel Size = (6250.000000000000000,-6250.000000000000000)
```

Ice Imagery Process

3) layers.inc.js

```
j = -1;
a[++i] = new Array;
a[i]['caption']     = "<b>Remotely Sensed Products</b>";
a[i]['isOpen']          = false;
a[i]['isChecked']       = 0;
a[i]['children']    = new Array;
a[i]['checkboxName']    = "a"+i;
a[i]['checkboxDisabled']    = true;

a[i]['children'][++j] = new Array;
a[i]['children'][j]['caption'] = 'SSMIS Sea Ice Maps';
a[i]['children'][j]['checkboxName'] = "a"+i+"x"+j;
a[i]['children'][j]['isChecked']    = 0;
a[i]['children'][j]['url']          = "ssmis.html";
a[i]['children'][j]['target']       = "bremen";
a[i]['children'][j]['onClickCaption']       =
"window.open('ssmis.html','bremen','width=850,height=650,status=no,resizable=yes,scrollbars=yes')";
a[i]['children'][j]['children']    = new Array;
a[i]['children'][j]['children']    = ssmis;
```

4) ssmis.js

```
ssmis = new Array;
var i = -1;
ssmis[++i] = new Array;
ssmis[i]['caption']  = "2012/05/01";
ssmis[i]['checkboxName']    = "ssmis_20120501";
ssmis[++i] = new Array;
ssmis[i]['caption']  = "2012/05/02";
ssmis[i]['checkboxName']    = "ssmis_20120502";
ssmis[++i] = new Array;
ssmis[i]['caption']  = "2012/05/03";
ssmis[i]['checkboxName']    = "ssmis_20120503";
ssmis[++i] = new Array;
ssmis[i]['caption']  = "2012/05/04";
ssmis[i]['checkboxName']    = "ssmis_20120504";
ssmis[++i] = new Array;
ssmis[i]['caption']  = "2012/05/05";
ssmis[i]['checkboxName']    = "ssmis_20120505";
```


Ice Imagery Process

5) layers.html

```
<script type="text/javascript" src="previous.js"></script>
<script type="text/javascript" src="ssmis.js"></script>
<script type="text/javascript" src="experimental.js"></script>
<script type="text/javascript" src="layers.inc.js"></script>
```

6) ssmis.map - image

```
LAYER
    NAME "ssmis-20120501_image"
    GROUP "ssmis_20120501"
    DATA "ssmis/asi-SSMIS-n6250-20120501-v5.tif"
    TYPE RASTER
    TRANSPARENCY 85
    OFFSITE 100 100 100
    PROJECTION
        "proj=stere"
        "ellps=WGS84"
        "datum=WGS84"
        "lat_0=90"
        "lat_ts=70.0"
        "lon_0=-45.0"
        "x_0=0.0"
        "y_0=0.0"
        "units=m"
    END
    STATUS ON
END
```

Ice Imagery Process

ssmis.map – label

```
LAYER
   NAME "ssmis-20120501_label"
   GROUP "ssmis_20120501"
   TRANSFORM FALSE
   TYPE ANNOTATION
   FEATURE
      POINTS
         4 34
      END
      TEXT 'SSMIS 2012/05/01'
   END
   CLASS
      LABEL
         TYPE truetype
         FONT arial-bold
         SIZE 11
         FORCE true
         POSITION LR
         WRAP ';'
         COLOR 255 255 135
         OUTLINECOLOR 0 0 0
         SHADOWCOLOR 0 0 0
         SHADOWSIZE 2 2
      END
   END
END
```

Note:

- Select a low transparency number to check that projection is correct.
- Offsite sets pixel value that is not displayed.
  - Grey land was removed.
- Click on layer link to see legend and information on imagery.

Summary

- Learned how Mapserver works.
- Added layers and data to Mapserver.
- Ice observation form use.
- Processed TeraScan satellite imagery for display in Mapserver.
- Typical tasks in Mapserver.

Web Sites

mapserver.org – Mapserver Website and Documentation

shapelib.maptools.org – Shapefile Tools

gdal.org – GDAL software

gdal.org/ogr/drv_csv.html – CSV to Shapefile Conversion

gdal.org/ogr/drv_vrt.html – Virtual Format Driver

trac.osgeo.org/proj – Cartographic Projections Library

remotesensing.org/geotiff/proj_list – Projections Transform List

eol.ucar.edu/cds/services/satellite/html/teranav/teranav.html – TeraNav program help

psbcw1.nesdis.noaa.gov/terascan/man1/fastreg.html – TeraScan fastreg command information

Acronyms

AMSR-2 – Advanced Microwave Scanning Radiometer 2
AVHRR – Advanced Very High Resolution Radiometer
DMSP – Defense Meteorological Satellite Program
ESRI – Environmental Systems Research Institute
Developers of ArcGIS Software
GDAL – Geospatial Data Abstraction Library
GIS – Geographical Information Systems
HPRT – High Resolution Picture Transmission
MrSid – Multi-resolution Seamless Image Database
NIC – National Ice Center
SSMIS – Special Sensor Microwave Imager/ Sounder
VRT – Virtual GDAL Data Set

Mapserver Directories and Files

/mnt/mapserver/html/polarstar

index.html – main web page
mapper.html – displays map
layers.html – displays layers
refmap.html – displays reference map
layers.inc.js – layer definitions
measure.html – measure tool display
previous.js – previous cruises layers
ssmis.js – layers for SSMIS products
ssmis.html – information on SSMIS products
javascript/mapserver.js – main mapserver javascript
javascript/measure.js – measure tool program
javascript/zoombox.js – zooming program

Mapserver Directories and Files

/mnt/mapserver/cgi-bin/polarstar

mapserv – binary executable program
getshipinfo.pl – program to add ship information at the bottom of the main mapserver page
getdepth_ll.pl - program to compute depths for the x,y,z button
segments_gc.pl – program used by the measure tool for measuring distances

/mnt/mapserver/data/polarstar

*.html files – template files for layers in mapserver
polarstar.map – main map file defining layers displayed
fonts directory – fonts available in mapserver
data directory – all mapserver data separated by type
data/ship – directory for displaying current ship track
data/psea1001 – files for the Polar Sea layers
data/ssmis – files for the SSMIS layer