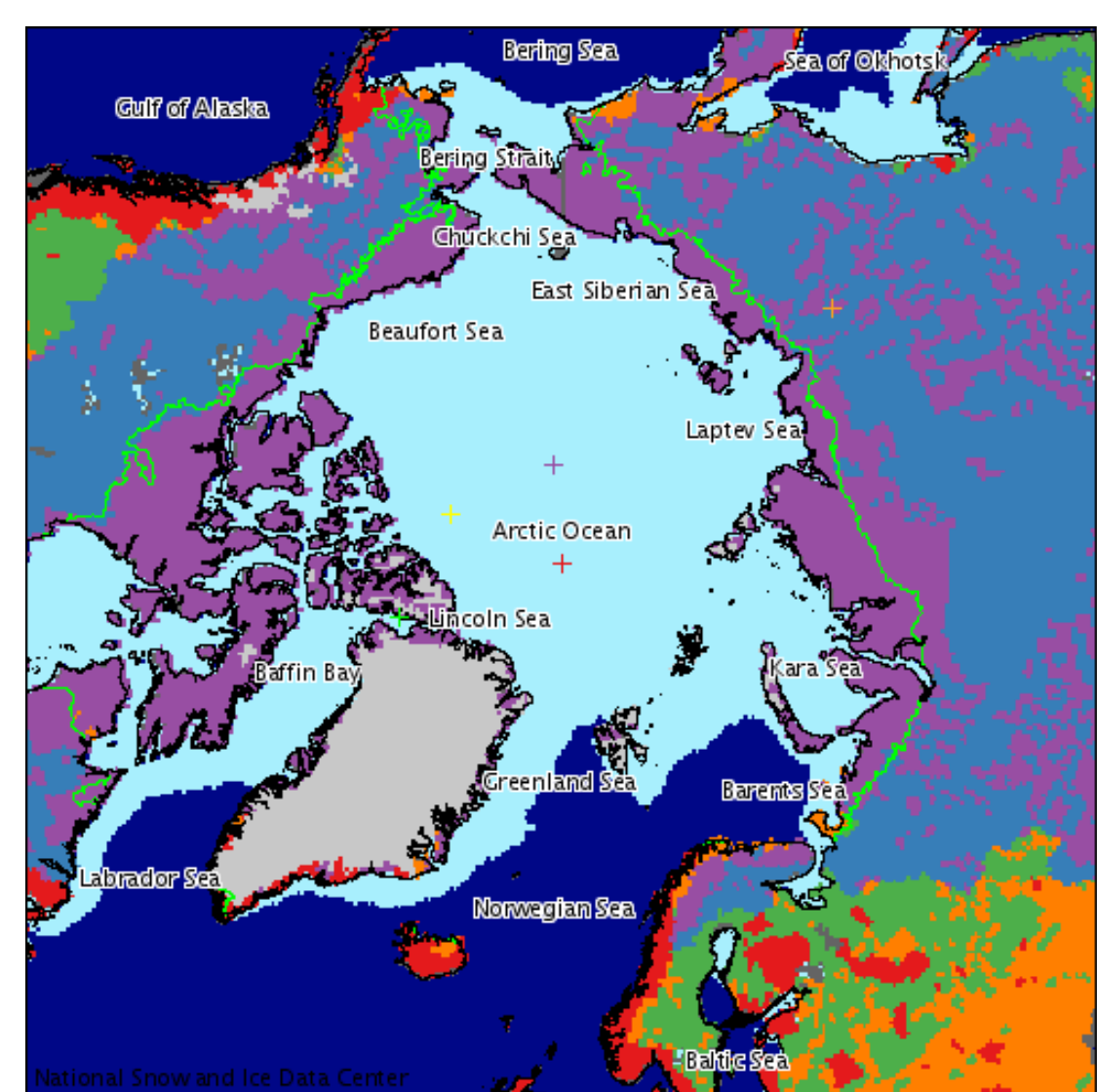
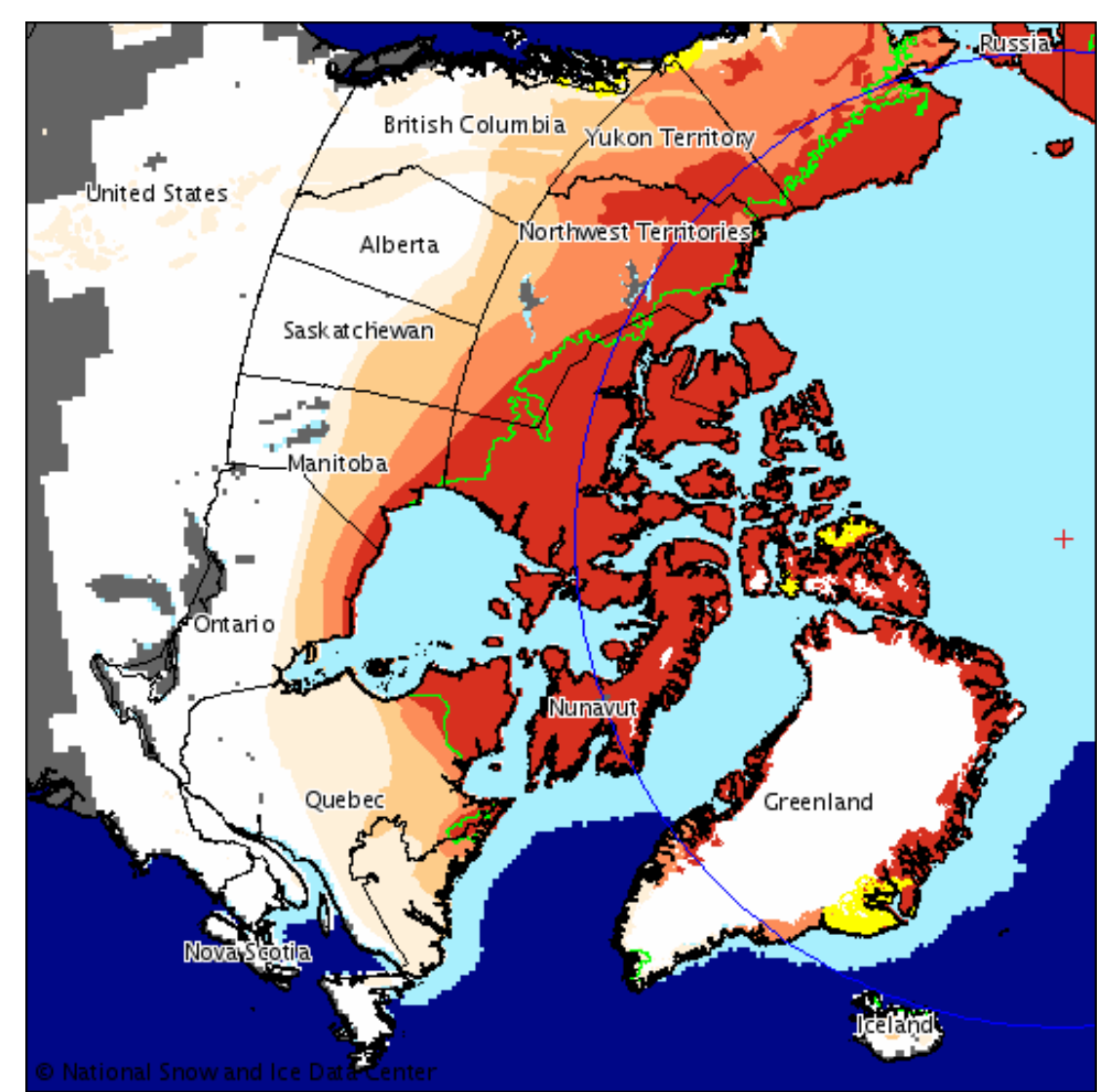


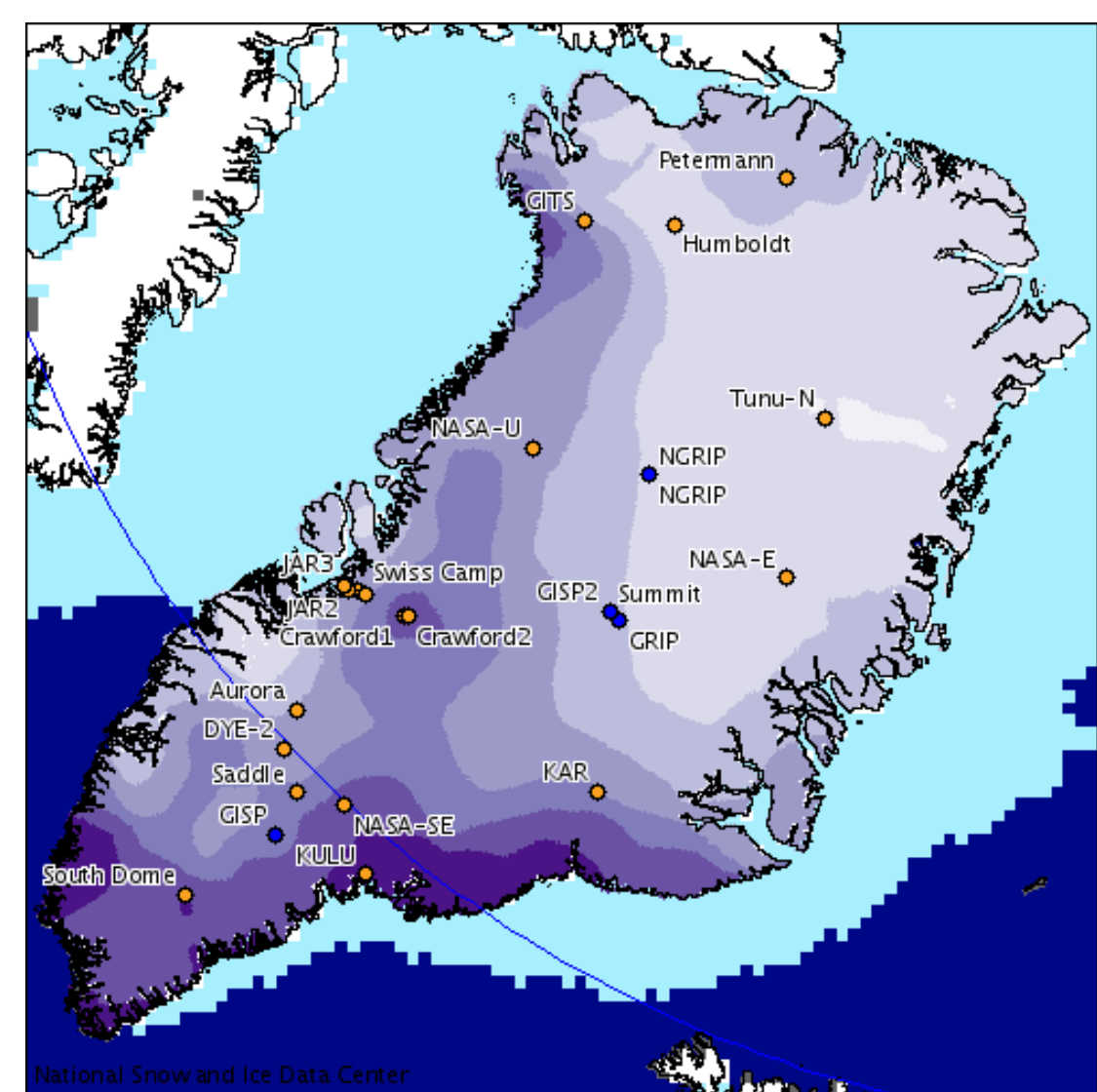
January climatology of Northern Hemisphere sea ice (1979-2005) and snow extent (1967-2005) with North Pole referenced (cross).



Arctic view of January sea ice climatology (1979-2005); seasonal snow classification on land; northern limit of forests (green line); and various types of North Poles referenced (crosses); geographic (red), geomagnetic (green), magnetic (yellow), cold pole (orange), and pole of inaccessibility (purple).



Northern Hemisphere view of permafrost extent, northern limit of forests (green line); glacier outlines (yellow); January climatology of sea ice (1979-2005) and snow extent (1967-2005); and Arctic Circle (blue line).



Greenland view of average annual snow accumulation (purples); January sea ice extent climatology (1979-2005); deep ice core locations (blue dots); Greenland Climate Network (GC-Net) Automatic Weather Station (AWS) locations (orange dots); and Arctic Circle (blue line).

Introduction

The National Snow and Ice Data Center (NSIDC) Atlas of the Cryosphere is a dynamic web mapping site, designed to be user-friendly, that allows the visitor to explore and interact with the frozen regions of Earth. Viewed from a polar perspective, information that can be displayed includes snow cover, sea ice extent and concentration, glaciers, permafrost, and other critical components of the Earth's cryosphere. The user can zoom in to a specific region on the Earth as well as overlay country borders, major cities, and other geographic information.

In addition to providing an interactive web interface, maps and data sources contained in the Atlas of the Cryosphere are also accessible via the Open Geospatial Consortium (OGC) Web Map Service (WMS), Web Feature Service (WFS), or Web Coverage Service (WCS). These international specifications provide a framework for sharing maps and geospatial data over the internet.

To visit the Atlas, go to: <http://nsidc.org/data/atlas>

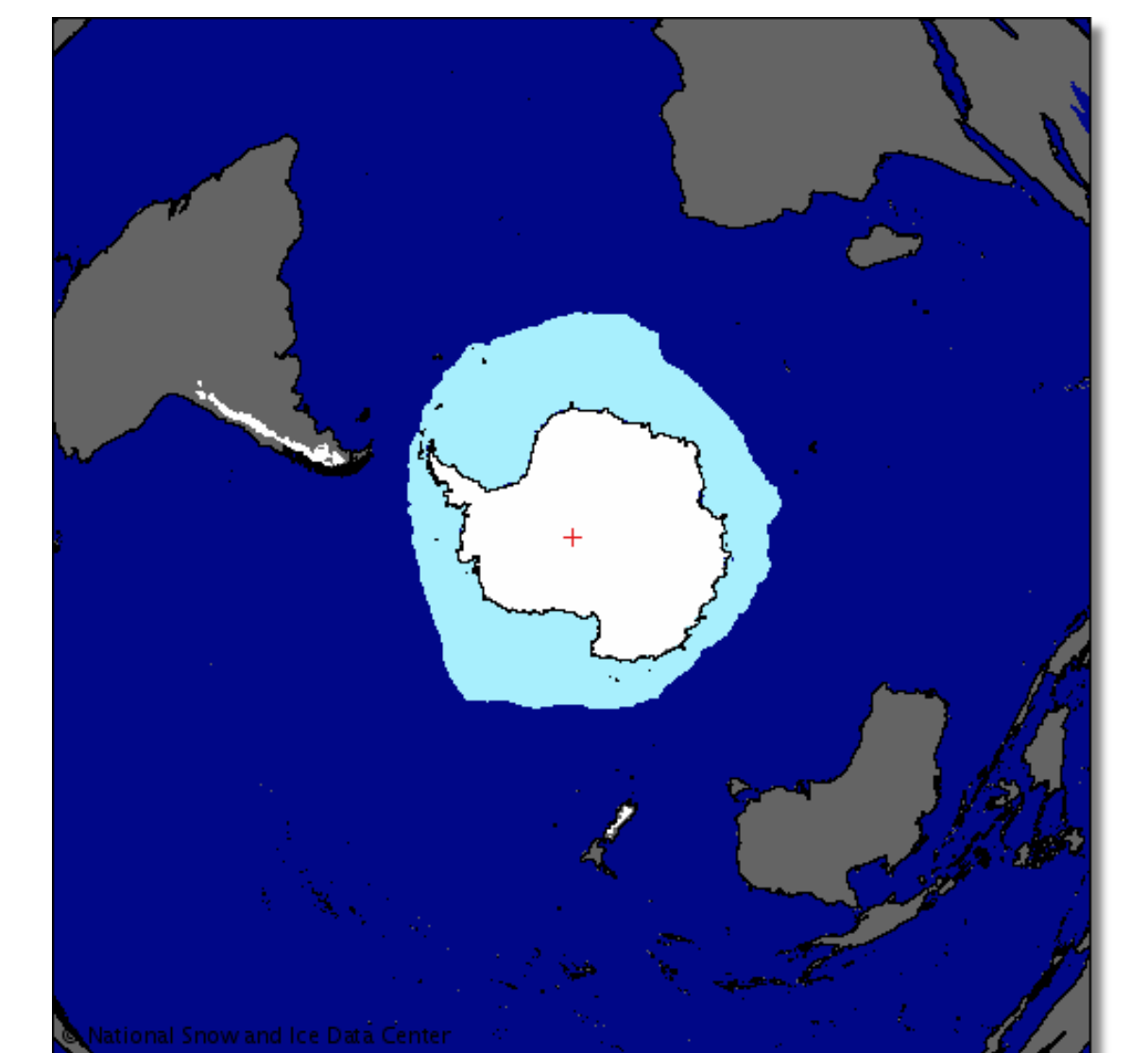
Selectable Parameters

Cryosphere:

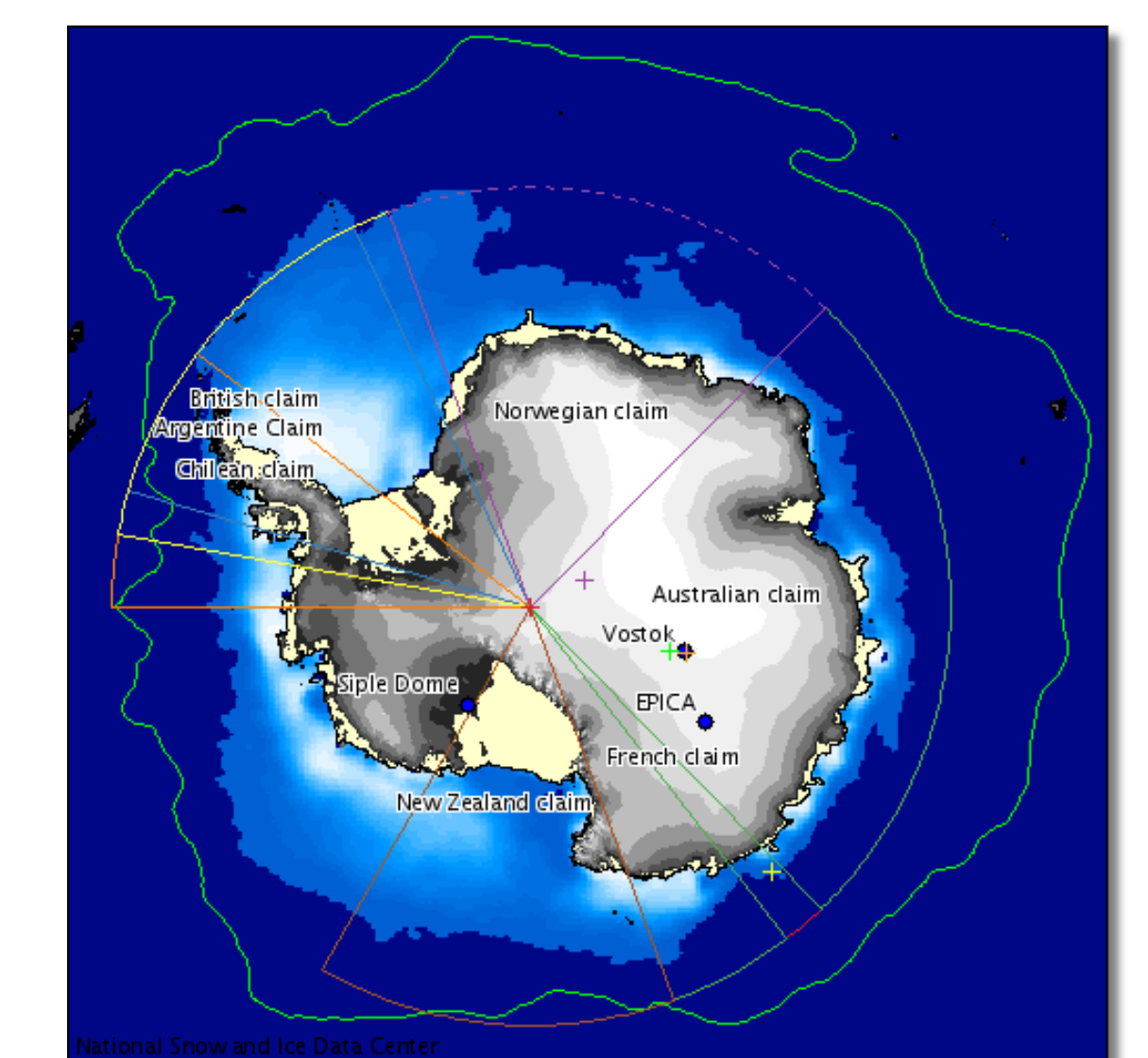
- glacier locations
- glacier outlines
- ice core locations
- ice sheet accumulation
- ice sheet elevation
- permafrost extent
- permafrost ice content
- sea ice concentration
- sea ice extent
- seasonal snow classification
- snow extent
- snow water equivalent
- treeline (northern limit of forests)
- and more...

Other:

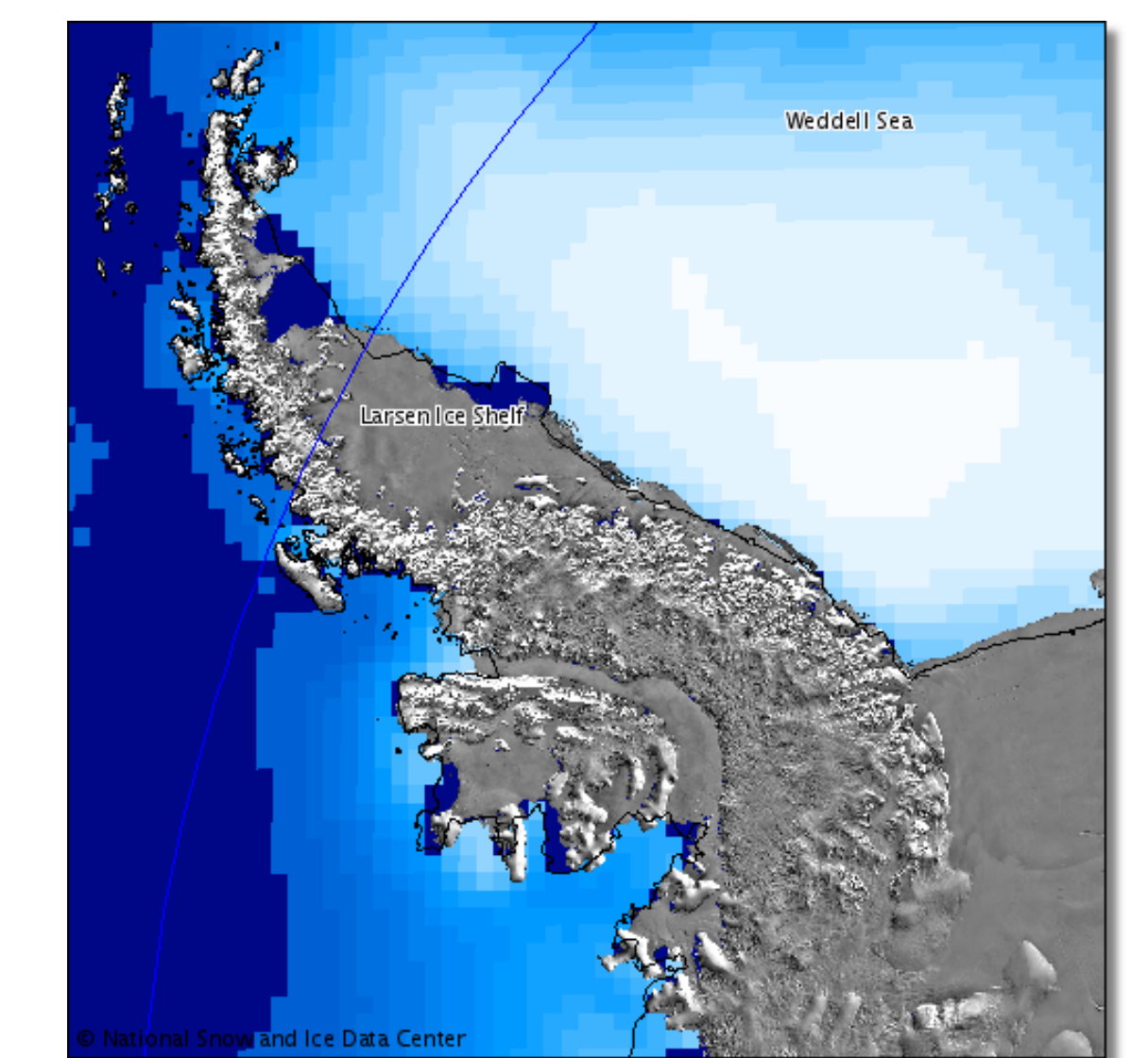
- Antarctic Circle
- Arctic Circle
- cities
- countries
- Equator
- geographic features (land, sea, and ice)
- International Date Line
- latitude and longitude
- North Pole
- South Pole
- Tropic of Cancer
- Tropic of Capricorn
- U.S. states
- and more...



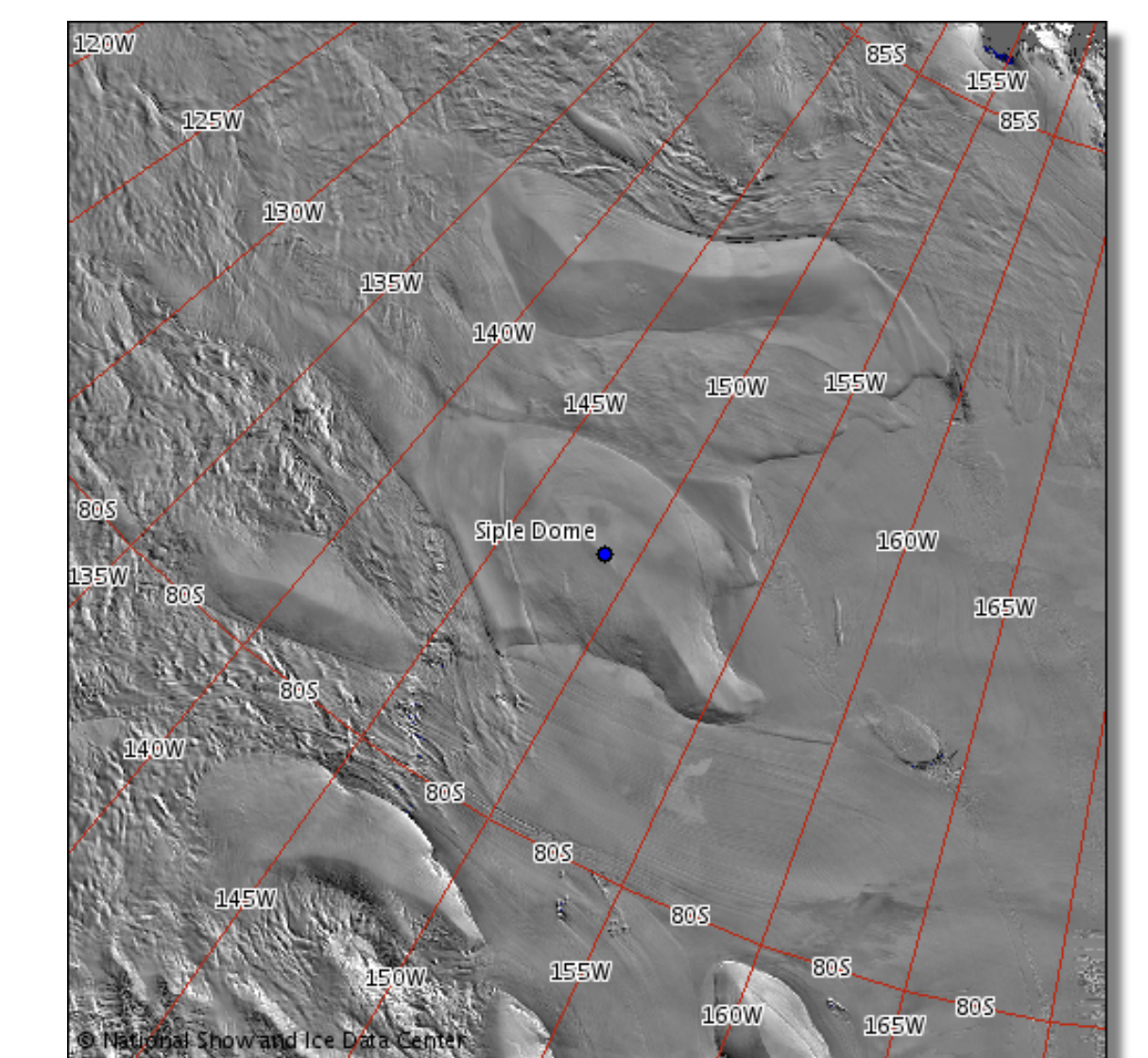
September climatology of Southern Hemisphere sea ice (1979-2003) and snow extent (1967-2002) with South Pole referenced (cross).



Antarctic view of January sea ice concentration climatology (1979-2003); Polar Front (green line); ice sheet surface elevation (greys); ice shelves (light yellow); Antarctic territorial claims; deep ice core locations (blue dots); and various types of South Poles referenced (crosses); geographic (red), geomagnetic (green), magnetic (yellow), cold pole (orange), and pole of inaccessibility (purple).



Antarctic Peninsula view of MODIS satellite image of surface features; March climatology of sea ice concentration (1979-2003); and Antarctic Circle (blue line).

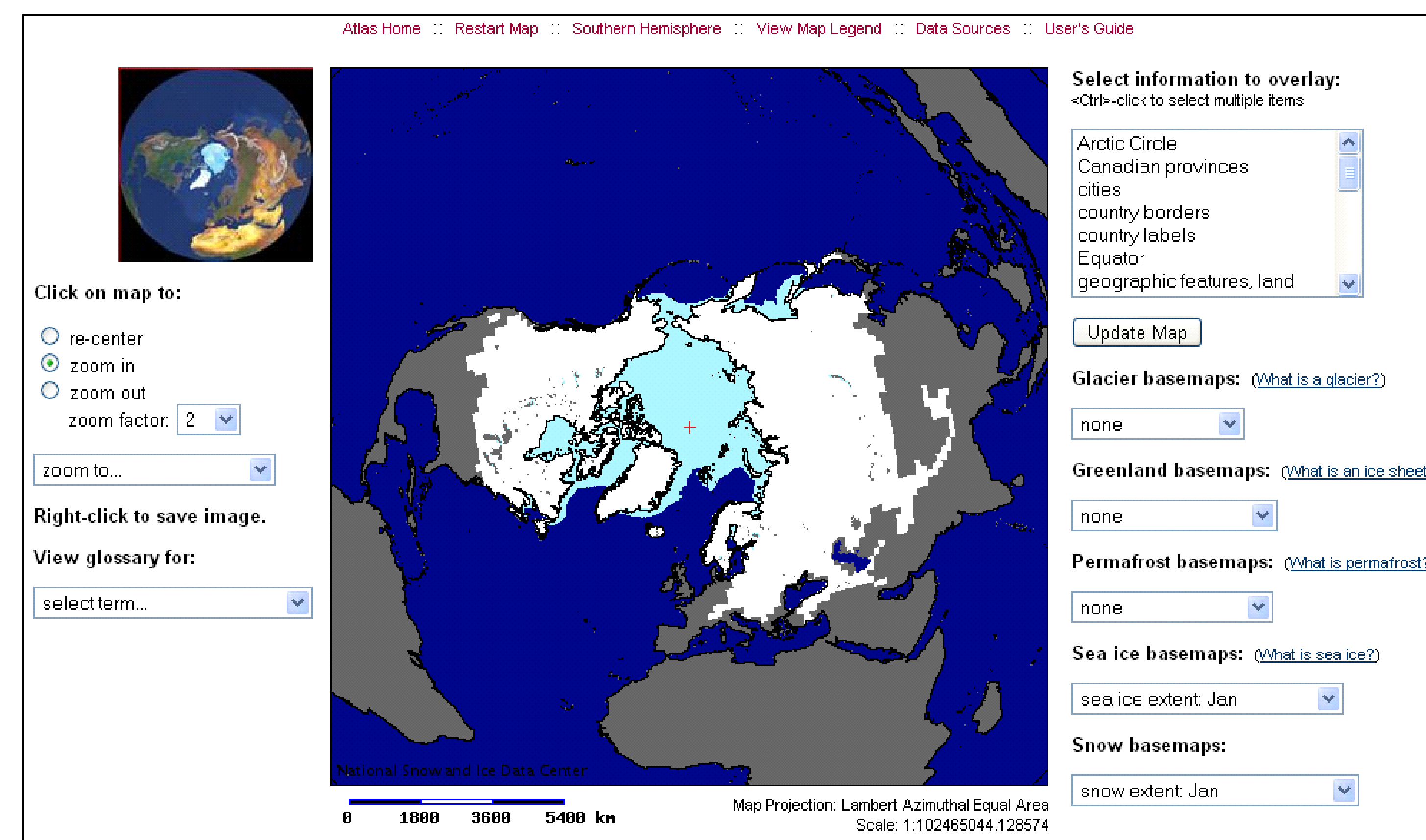


Antarctic close-up on MODIS satellite image of surface features on the ice sheet and the Ross ice shelf near the Siple Dome ice core (blue dot) with latitude and longitude referenced.

Open Source GIS

NSIDC has leveraged use of the following Open Source software packages for the development of the Atlas and for manipulation of its diverse data sources (e.g. reformatting, reprojecting, etc.):

- **MapServer**
a development environment for building spatially-enabled internet applications
- **Geospatial Data Abstraction Library (GDAL)**
a data translation and processing library for raster geospatial data formats
- **OGR Simple Features Library**
a data translation and processing library for vector geospatial data formats
- **PROJ.4**
a cartographic projections library for enabling reprojections
- **libgeotiff**
a GeoTIFF library for reading and writing GeoTIFF information tags



Screenshot of the Atlas of the Cryosphere web interface for the Northern Hemisphere. Zoom options, a reference map, and glossary definitions on the left; selectable data layers and basemaps on the right.

Open Geospatial Consortium (OGC)

Interoperable and customizable data access to Atlas maps and source data are enabled via the following OGC specifications:

- **Web Map Service (WMS)**
provides map and legend images of selected data layers and basemaps
- **Web Feature Service (WFS)**
provides vector source data in Geographic Markup Language (GML) format
- **Web Coverage Service (WCS)**
provides raster source data in GeoTIFF format

Using these services, maps and data can be accessed for your spatial region of interest. For more information, visit <http://opengeospatial.org>.

Remote Access

Maps can be generated through the provided Atlas of the Cryosphere web interface. Alternatively, maps and source data can be accessed remotely using Open Geospatial Consortium (OGC) web services and other OGC-compatible clients (e.g. uDig, GRASS, ArcGIS 9 Service Pack 2, Geospatial One Stop Map Viewer, Intergraph OGC Viewer, etc.). Remote access is normally obtained via an OGC "GetCapabilities" URL, as in the following examples for the Northern and Southern Hemispheres of the Atlas, where the "service" parameter can be either WMS, WFS, or WCS:

- http://nsidc.org/cgi-bin/atlas_north?service=WMS&request=GetCapabilities
- http://nsidc.org/cgi-bin/atlas_south?service=WMS&request=GetCapabilities

Other possible OGC requests include:

- **GetMap** – get an image of selected data layers
- **GetLegendGraphic** – get a map legend for selected data layers
- **GetFeature** – get vector source data
- **GetCoverage** – get raster source data

These requests can include various standardized options for customizing output, including the ability to limit results to a particular spatial region.

Atlas Features

- Dynamically visualize snow and ice on the planet
- Explore the planet from a polar perspective for both the Northern and Southern Hemispheres
- Customize your own maps: zoom in and out, select from a variety of different basemaps and overlays
- Save custom maps as image files for inclusion in reports and other publications
- View monthly climatologies of snow and sea ice to see how and where the cryosphere shrinks and grows over the course of a year
- Look up glossary definitions for unfamiliar cryospheric terms
- Access maps and source data via WMS, WFS, and WCS
- Learn more about the Atlas and its available data sources in the provided User's Guide