

Climate Data Guide for climate analyses and model evaluation

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- Identify the observational data set that you need for your purpose
- Learn about data set nuances, strengths and weaknesses
- Share your expertise on the data that you use or developed

ICOADS Surface Marine Weather Observations



ICOADS (International Comprehensive Ocean–Atmosphere Data Set) is the most comprehensive archive of global marine surface climate observations available. Variables include SST, SLP, air temperature, wind speed, cloud amount, and others. There is no processing beyond initial quality control. ICOADS data are packaged in several different formats with different time periods, timesteps, and grid resolutions. Scattered observations extend back to 1662, but climate scientists will probably be most interested in the monthly summary statistics that span 1800–2007 on a 2°x2° grid, or 1960–2007 on a 1°x1° grid. Preliminary data since 2007 are also provided until

the next major release (This summary is based on Release 2.5).

Key Strengths

- Very long timeseries of several climate variables available in many locations
- Provides "ground truth" of the original measurements from which other, interpolated products are derived (e.g. NOAA ERSST; HadSLP2)
- Statistics such as standard deviations, percentiles, and number of observations are published along with the monthly means

Key Weaknesses

- No corrections (e.g., to account for changes in observing practices or instrumentation) are applied beyond basic quality control
- Data coverage is sparse, and creating comprehensible maps of a given climate variable can take some processing and patience
- As of January, 2012, budget cuts at NOAA have left the further development of ICOADS uncertain (see Technical Notes for more information)

Basic Information

Categories & Variables

[Sea surface temperature](#) | [Ocean](#) | [Wind](#) | [Specific Humidity](#) | [Sea Level Pressure](#) | [Cloud Properties](#) | [Air Temperature](#) | [Atmosphere](#)

Years

1650
9999

Institution / PIs

[NOAA](#) | [NCAR](#) |

Input / Data Assimilated

in situ ship and buoy measurements.

Spatial Resolution

2x2 (1800–2007); 1x1 (1960–2007)

Domain

[Global](#) |

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– [Basic Information](#)

Expert Contributors (linked to their Climate Data Guide contributions)

[Deser, Clara](#)

Expert User Guidance

#General Description

The International Comprehensive Atmosphere–Ocean Data Set (ICOADS) is the most extensive and widely used digital collection of quality–controlled surface weather observations available for the world oceans for studies of marine climate and its variability. The data set begins in 1800, and currently extends through 2007 with updates every several years. The ICOADS includes monthly values each year of sea surface temperature (SST), air temperature, wind, cloudiness, barometric pressure, and humidity, as well as derived variables such as turbulent heat and momentum pseudo–fluxes ("pseudo" because they neglect transfer coefficients). The number of observations and the standard deviation of the individual observations that make up each monthly value are also archived for each variable. This important data set forms the basis for our empirical knowledge of surface marine climate and its variability during the

Typical questions addressed by expert guidance:

- Applications of the data set to climate research
- The characterization of uncertainty in the data measurements or methodology
- The nature of spurious trends or jumps in data set timeseries
- Strategies for comparing the data with models
- Key strengths and limitations of the data set and comparison with similar data sets

Why participate?

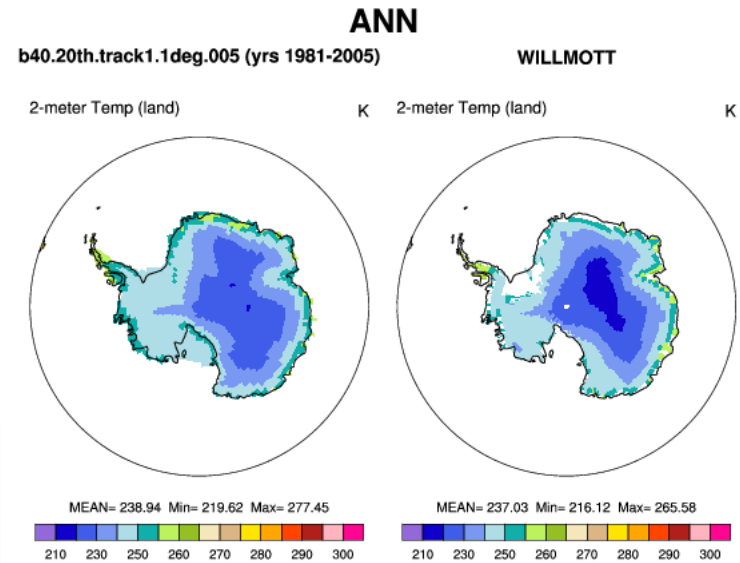
- Reach ~1500 unique visitors per month
- More visibility for your data set or science using someone else's data set
- Make your name known to a broad, international audience
 - Countries from Algeria to Zanzibar in the audience
 - Students and Professionals from academia, industry, government and NGOs are represented
- Recognition for outreach/broader impacts
- Become aware of a wide range of data sets and avoid common pitfalls in data analyses

Collaboration with CESM working groups:

- Document the data sets used in the Diagnostics Packages
- Find these data sets easily via Climate Data Guide
- Example: Atmospheric Model Working Group (AMWG)

AMWG Diagnostics Package

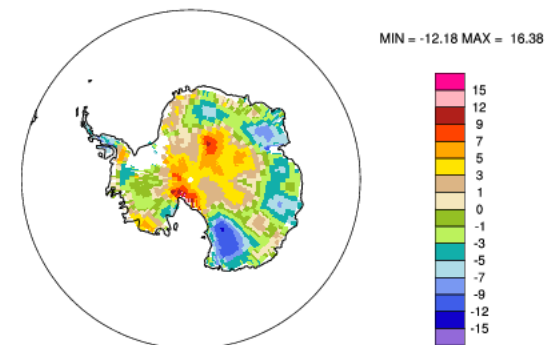
- 600+ plots generated comparing model output with almost 30 observational data sets
- Little documentation



b40.20th.track1.1deg.005 - WILLMOTT

2-meter Temp (land)

K



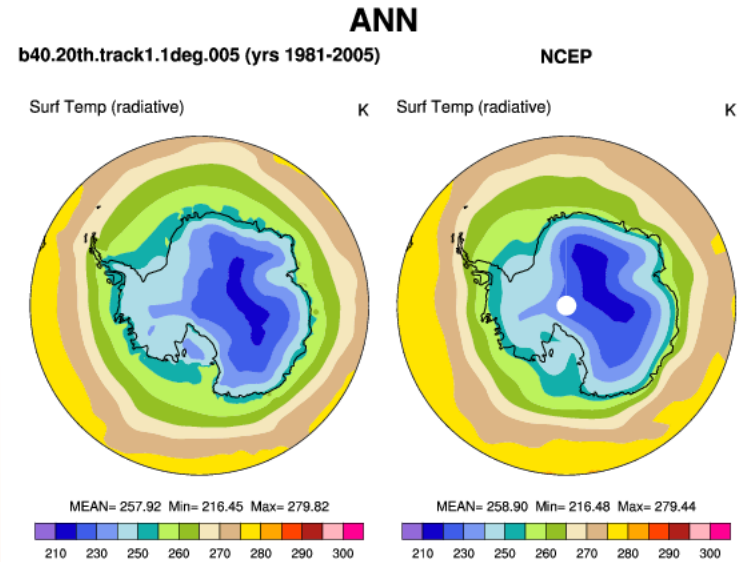
<http://www.cgd.ucar.edu/amp/amwg/diagnostics/>

<http://www.cgd.ucar.edu/amp/amwg/diagnostics/plotType.html>

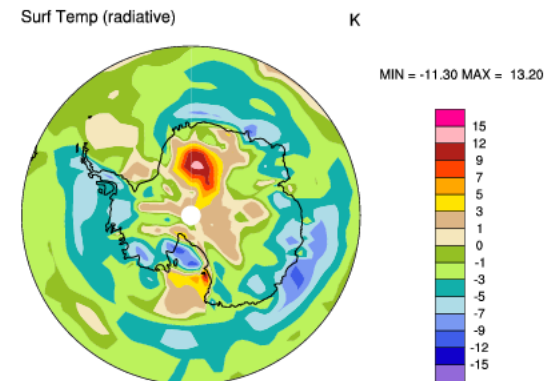
<http://www.cesm.ucar.edu/experiments/cesm1.0/>

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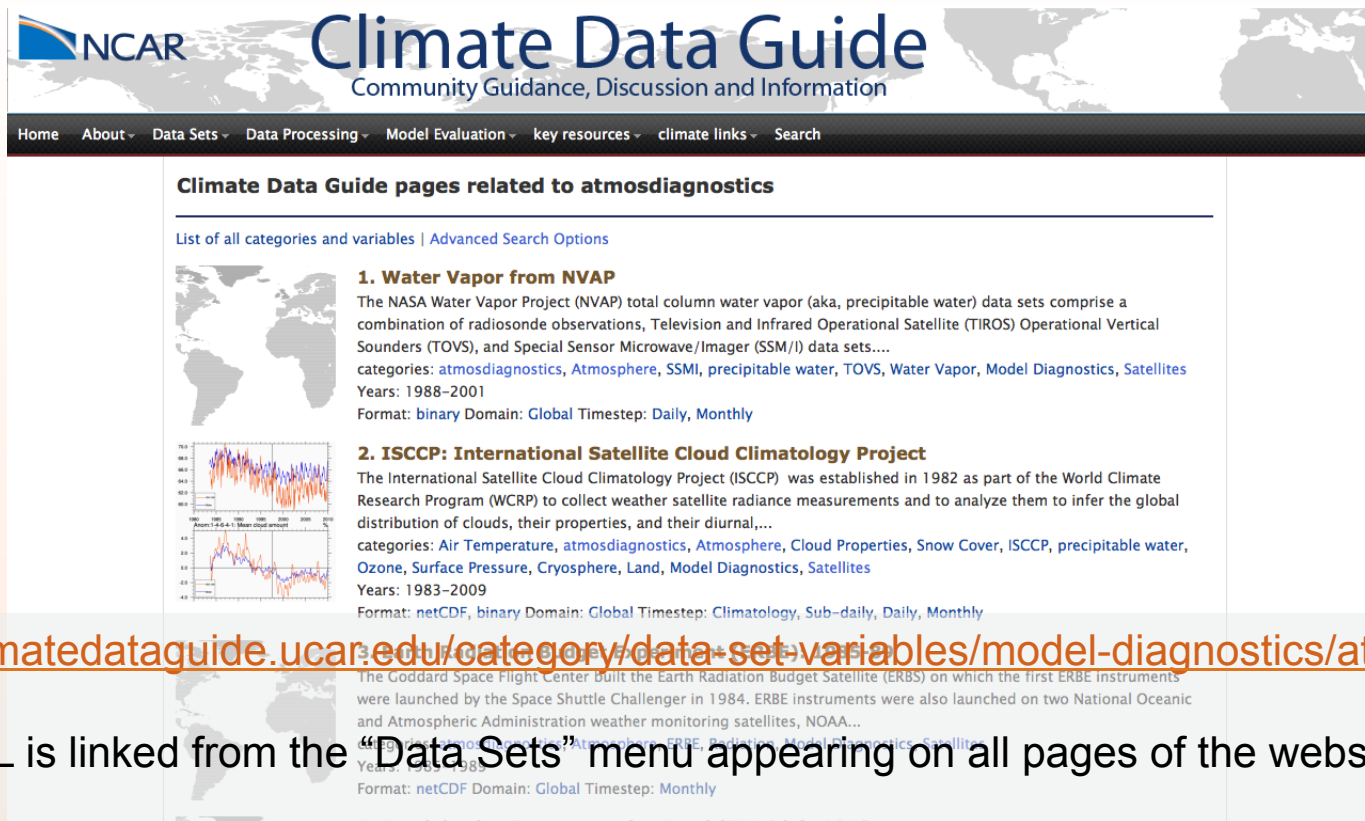
b40.20th.track1.1deg.005 - NCEP



<http://www.cgd.ucar.edu/amp/amwg/diagnostics/>
<http://www.cgd.ucar.edu/amp/amwg/diagnostics/plotType.html>
<http://www.cesm.ucar.edu/experiments/cesm1.0/>

Diagnostics data sets via Climate Data Guide

- We are collecting information and expert guidance on numerous diagnostic data sets
- When a data set is added, it is tagged and the list of diagnostics data is automatically updated



The screenshot shows the Climate Data Guide website interface. At the top, there is a navigation bar with links for Home, About, Data Sets, Data Processing, Model Evaluation, key resources, climate links, and Search. Below the navigation bar, the main content area is titled "Climate Data Guide pages related to atmsdiagnostics". Under this title, there is a link for "List of all categories and variables | Advanced Search Options". The main content area lists two data sets:

- 1. Water Vapor from NVAP**
The NASA Water Vapor Project (NVAP) total column water vapor (aka, precipitable water) data sets comprise a combination of radiosonde observations, Television and Infrared Operational Satellite (TIROS) Operational Vertical Sounders (TOVS), and Special Sensor Microwave/Imager (SSM/I) data sets....
categories: [atmsdiagnostics](#), [Atmosphere](#), [SSM/I](#), [precipitable water](#), [TOVS](#), [Water Vapor](#), [Model Diagnostics](#), [Satellites](#)
Years: 1988–2001
Format: [binary](#) Domain: [Global](#) Timestep: [Daily](#), [Monthly](#)
- 2. ISCCP: International Satellite Cloud Climatology Project**
The International Satellite Cloud Climatology Project (ISCCP) was established in 1982 as part of the World Climate Research Program (WCRP) to collect weather satellite radiance measurements and to analyze them to infer the global distribution of clouds, their properties, and their diurnal,...
categories: [Air Temperature](#), [atmsdiagnostics](#), [Atmosphere](#), [Cloud Properties](#), [Snow Cover](#), [ISCCP](#), [precipitable water](#), [Ozone](#), [Surface Pressure](#), [Cryosphere](#), [Land](#), [Model Diagnostics](#), [Satellites](#)
Years: 1983–2009
Format: [netCDF](#), [binary](#) Domain: [Global](#) Timestep: [Climatology](#), [Sub-daily](#), [Daily](#), [Monthly](#)

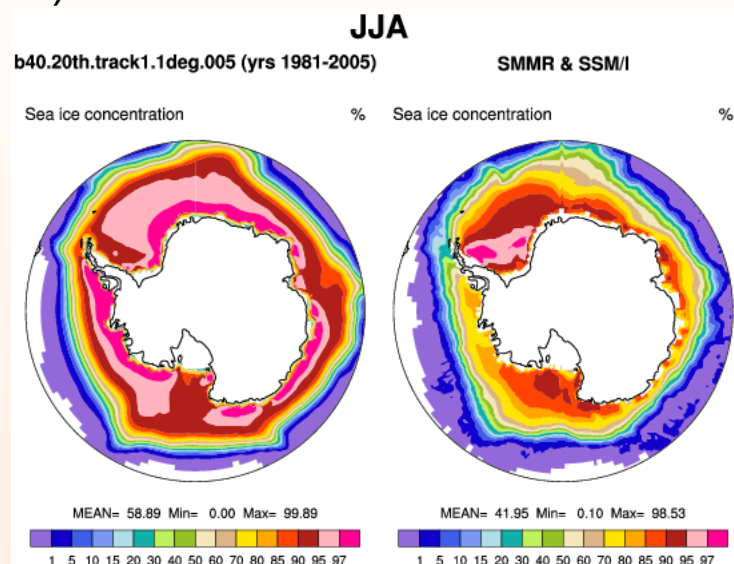
Below the ISCCP entry, there is a partial view of a third entry for the Earth Radiation Budget Satellite (ERBS) data sets.

<http://climatedataguide.ucar.edu/category/data-set-variables/model-diagnostics/atmosdiagnostics>

(this URL is linked from the “Data Sets” menu appearing on all pages of the website)

Quick evaluation of ocean around Antarctica using diagnostics (b40.20th.track1.1deg.005)

- Too much sea ice (vs. SSM/I & HadISST)
 - Too cold (vs. Wilmott & NCEP)
 - **Not cloudy enough (vs. ISCCP, Cloudsat, Cloudsat-COSP*, Calipso*)**
 - **Too dry (vs. GPCP, NVAP)**
 - Downward LW Flux too low (vs. ISCCP)
 - Upper Ocean too cold (vs Levitus)
-
- **Too cloudy (vs. Warren)**
 - **Too wet (vs Modis)**

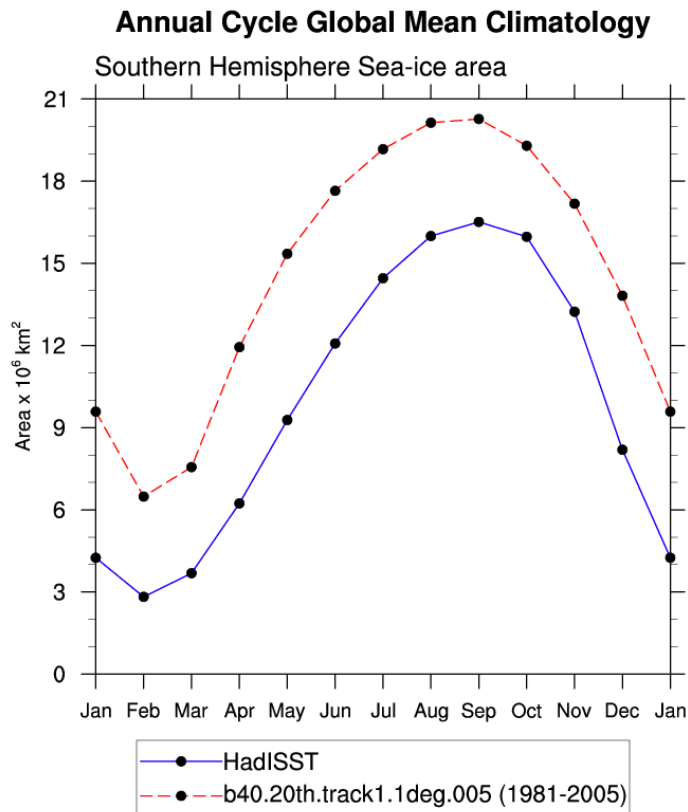


*based on AMIP simulation – Jen Kay

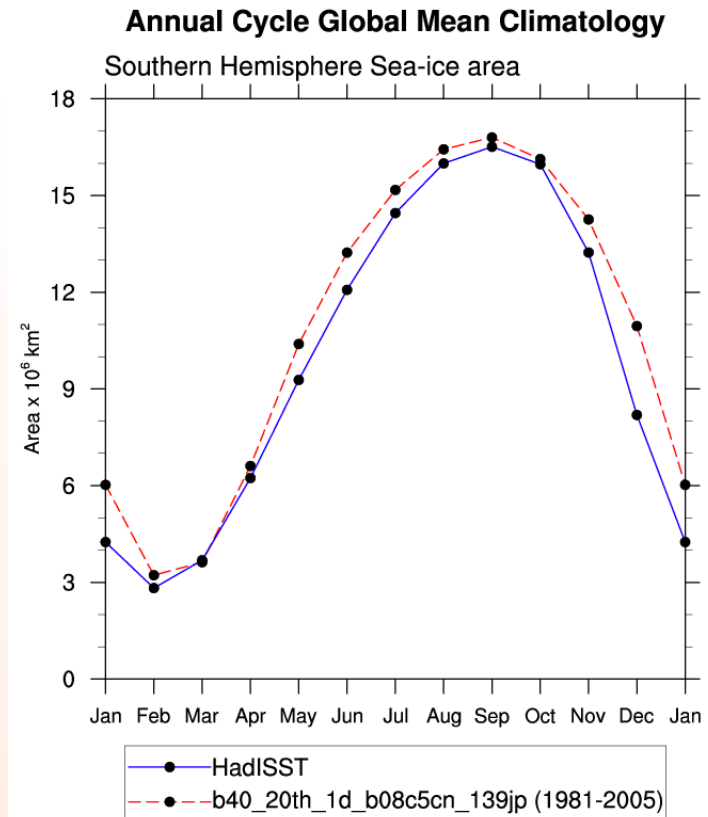
see Landrum, L., M. Holland, D. Schneider, and E. Hunke, 2012: Antarctic sea ice Climatology, variability and late 20-th Century change in CCSM4, J. Climate, accepted.

- Sea ice biases are reduced in CAM5
- Is the model within the observational uncertainty?

CAM4



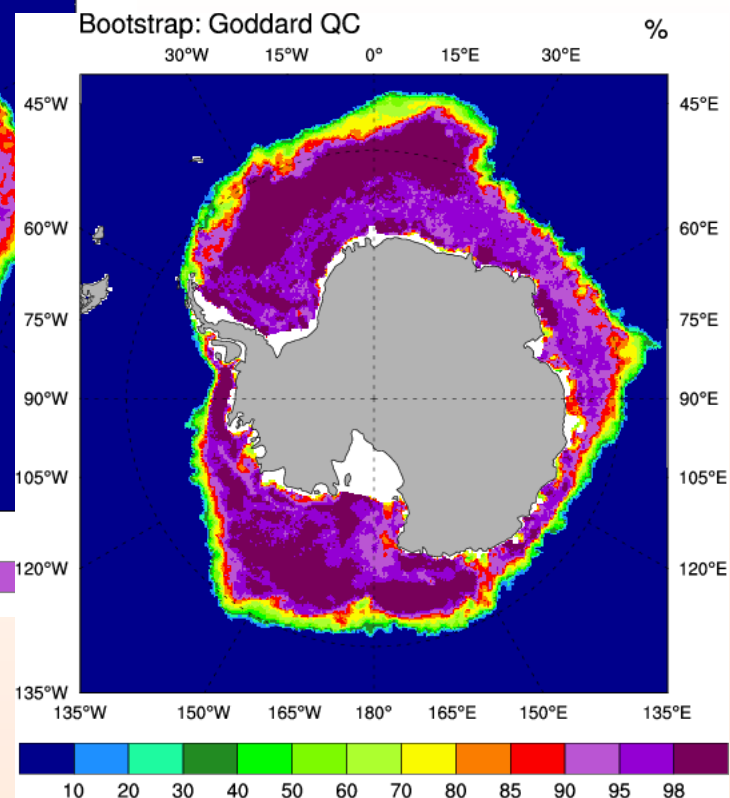
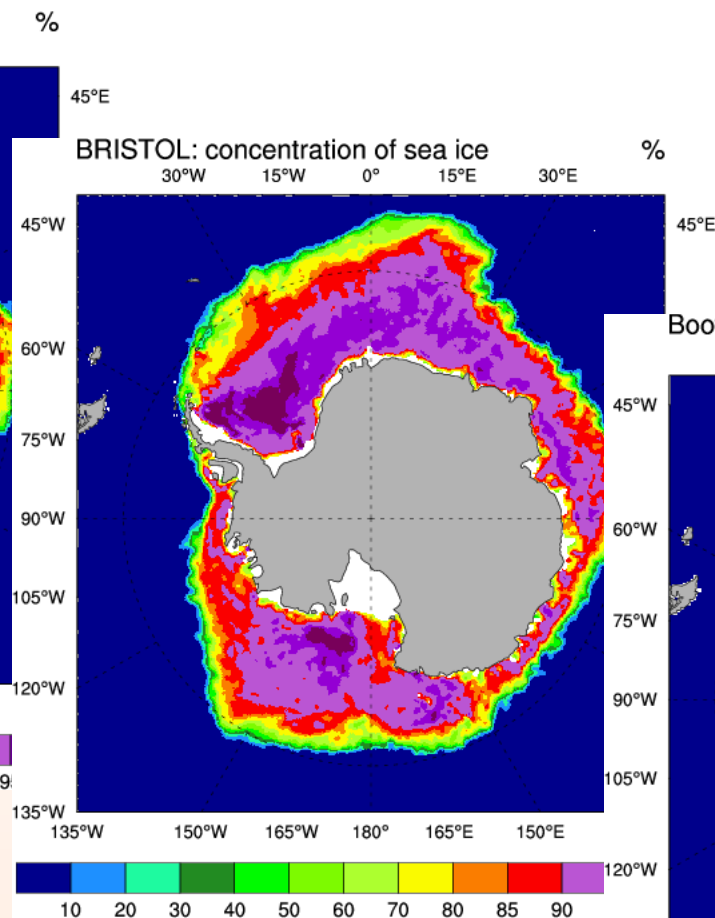
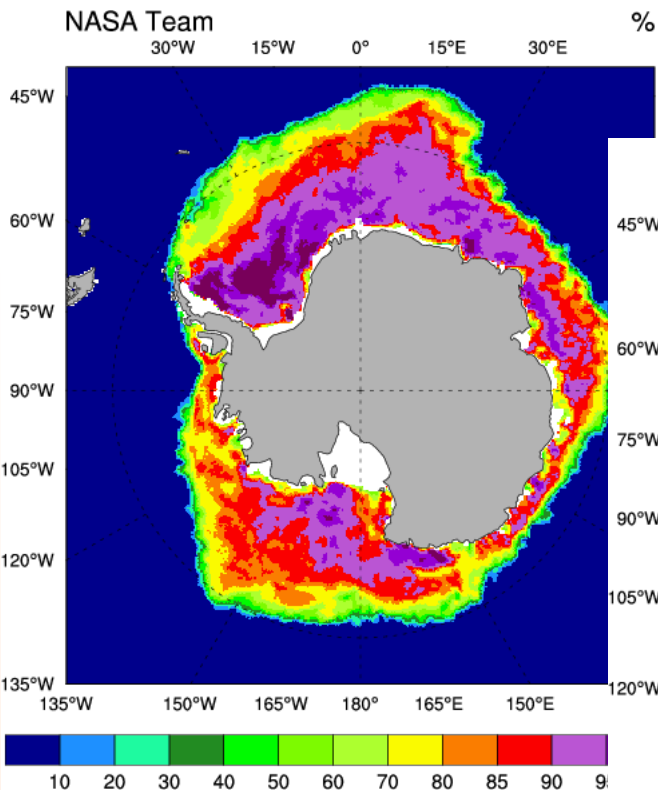
CAM5



Sea ice climatology -

- Many data sets to choose from; some combine different satellite sensors and use different algorithms over time

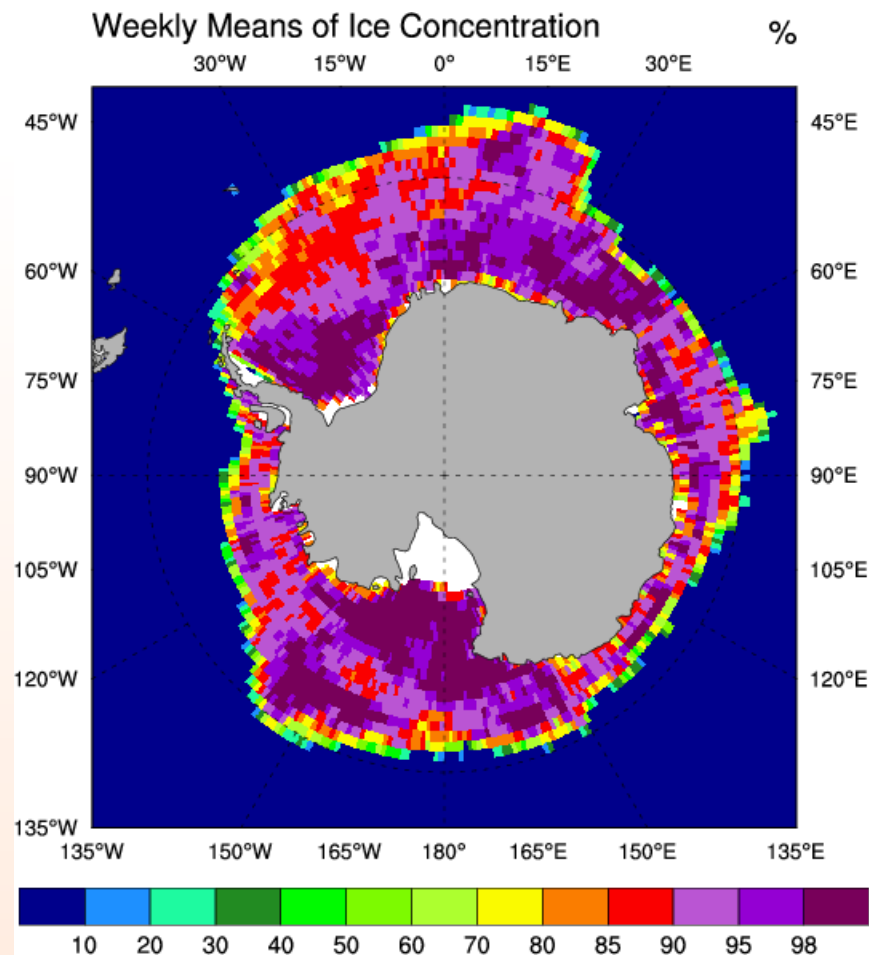
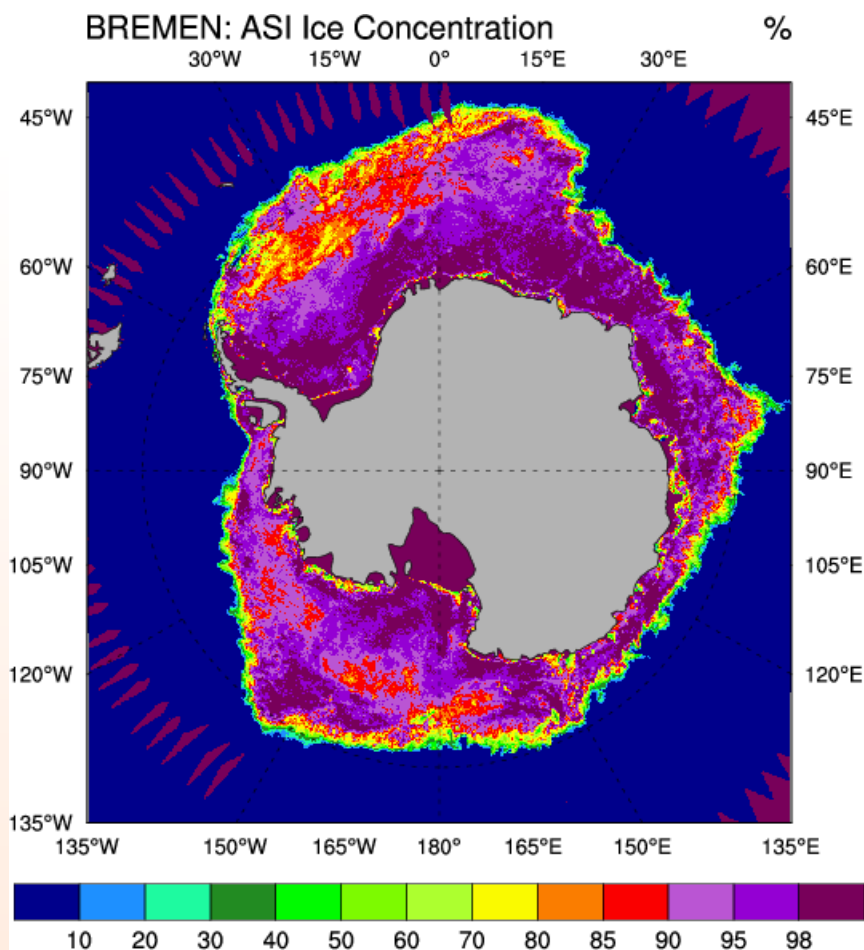
Three different 'SSM/I' data sets: weekly average for Oct 1-7, 2007



High and low resolution data sets

Sea ice retrievals from AMSR-E

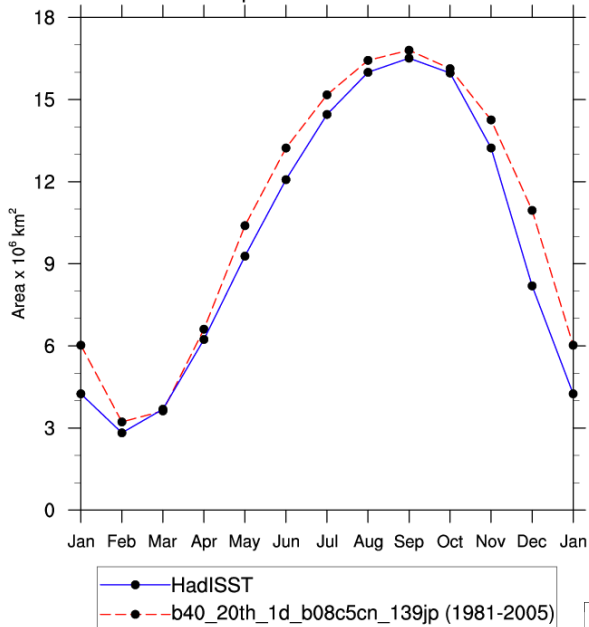
NOAA OIv2/ HadISST



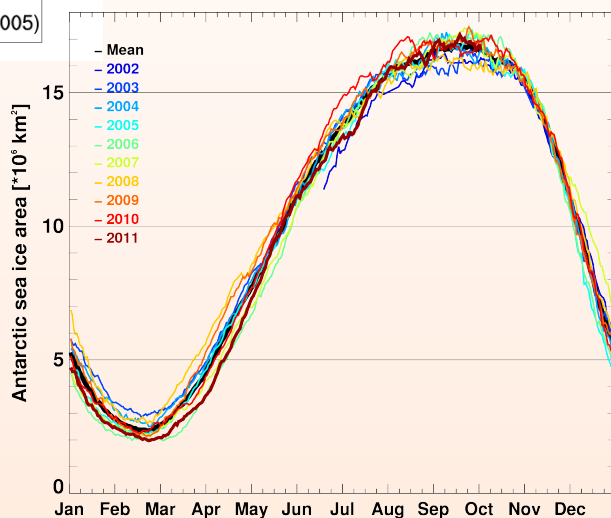
CAM5/HadISST

Annual Cycle Global Mean Climatology

Southern Hemisphere Sea-ice area



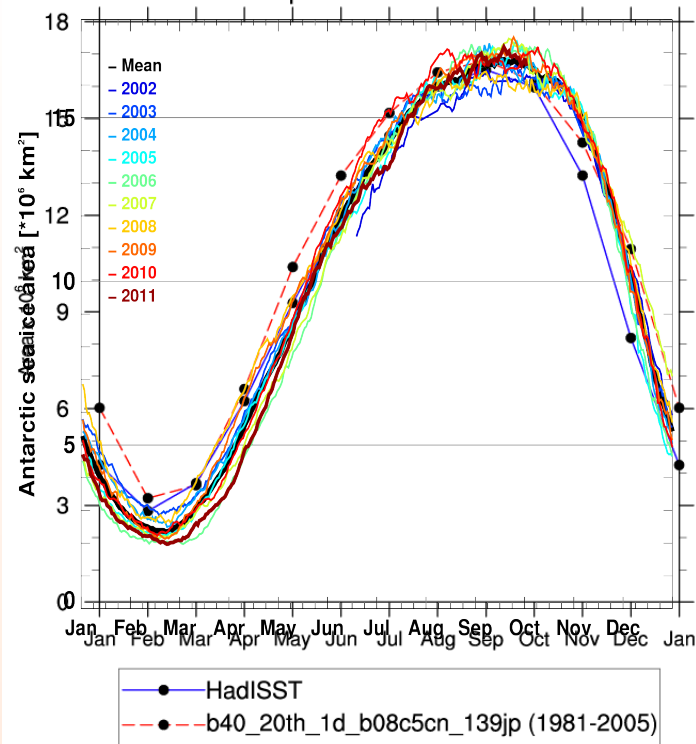
AMSR-E (Bremen)



CAM5/AMSR-E

Annual Cycle Global Mean Climatology

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Summary

- Although models are improving, increased complexity, higher resolution and regional/decadal emphasis place new demands on observational data
- The Climate Data Guide will help you find the right data set for your purpose and understand its strengths and limitations
- CESM Working groups' diagnostics data sets will be included
- Your contributions are needed to help make it a valuable community resource
- Antarctic sea ice is highlighted as one area where observations matter

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