

The NOAA Operational Model Archive and Distribution System NOMADS

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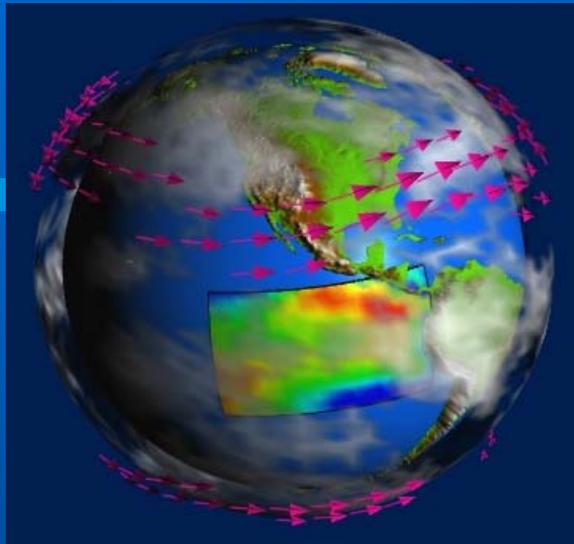
13th Federation Assembly Meeting
Earth Systems Information Partners

TECHNICAL WORKSHOP
Asheville, NC August 18, 2004





Overview



➤ Retrospective analysis and model inter-comparison are necessary to verify and improve short term NWP models, seasonal forecasts, climate simulations, assessment and detection efforts.

➤ Until now there existed no long-term archive for Climate and Weather models.

➤ University and Institutional research goes largely untapped by NOAA scientists. Effort is wasted on data receipt and format issues with no infrastructure to collaborate.

- To overcome this deficiency, some of the Nations top scientists are actively engaged in a grass-roots framework to share data and research findings over the Internet
- NCDC, NCEP and GFDL initiated the NOAA Operational Model Archive and Distribution System.
- NOMADS is a distributed data services pilot for format independent access to climate and weather models and data.

NOMADS
 The NOAA Operational Model
 Archive and Distribution System

Core NOAA NOMADS Collaborators

- ◆ Climate Diagnostics Center (CDC) Boulder, CO
- ◆ Geophysical Fluid Dynamics Laboratory (GFDL) Princeton, NJ
- ◆ National Climatic Data Center (NCDC) Asheville, NC (Project Lead)
- ◆ National Centers for Environmental Prediction (NCEP) Camp Springs, MD
- ◆ Pacific Marine Environmental Laboratory (PMEL) Seattle, WA
- ◆ NOAA Forecast Systems Laboratory (FSL) Boulder, CO

External Core Collaborators

- Center for Ocean-Land-Atmosphere Studies (COLA) (Maryland)
- Department of Energy's Argonne, Los Alamos, Oak Ridge, Lawrence Berkley, Livermore National Laboratories & Information Sciences Institute (ISI), University of Southern California under the Earth System Grid Project
- National Center for Atmospheric Research (NCAR) Colorado
- Unidata Program Center (UCAR/Unidata) Colorado
- LLNL Program for Climate Model Diagnosis and Intercomparison
- NASA's Global Change Master Directory (GCMD) Maryland
- National Coastal Data Development Center
- University of Rhode Island (OPeNDAP Consortium)

External Collaborators include

- Center for Earth Observing and Space Research (CEOSR), NASA-GSFC Maryland
- George Mason University (NASA SI-ESIP), Virginia
- National Severe Storms Laboratory (NSSL), Oklahoma/SSEC University of Wisconsin
- Universities of Alabama (Huntsville), California (Santa Barbara), Washington & Iowa St.
- National Science Foundation (NSF) CyberInfrastructure

International Participants

- British Atmospheric Data Center, Oxfordshire, United Kingdom)
- UK's Natural Environment Research Council (NERK DataGrid Project)
- Committee for Earth Observing Satellites (CEOS) Grid Project
- Climate Action Partnership (CAP), BOM Australia (US Depts. of Commerce, Energy, State, and EPA)

Logos: NOMADS LAKE SIDE, GO-ESP Participant, NOAA, UNIVERSITY OF MARYLAND SYSTEM OF TERRACE CAMPUS, NASA, Unidata, NCAR



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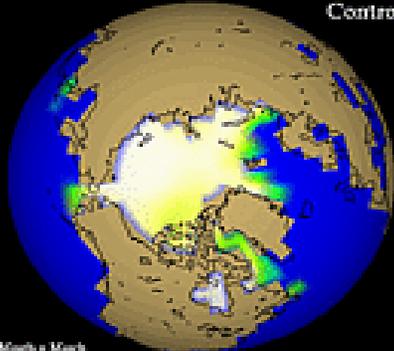


NOMADS Goals

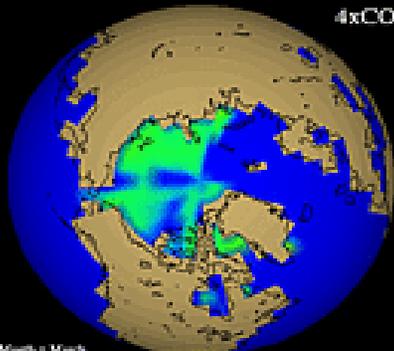
- The goals of NOMADS are to:
 - provide access to models,
 - promote product development,
 - foster research within the geo-science communities (ocean, weather, and climate) to study multiple earth systems using collections of distributed data,
 - expand institutional participation via distributed technologies.

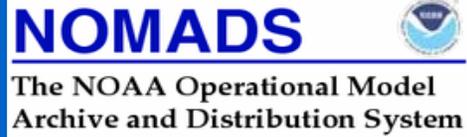
Sea Ice

Control



4xCO₂





The NOMADS Philosophy

- With NOMADS, users at any skill level will be able to obtain weather and climate information: web browsers to advanced scientific data visualization packages. NOMADS is a flexible approach to data access- promoting standards, based upon what users use most.
- As users require new data types, under NOMADS, they can be added or replaced. Over the years, NOAA has developed several different data conventions and data access protocols. NOMADS allows the use of all these most widely used formats.
- This will allow the users to make better, informed decisions about how nature will impact their future, either in their life, or business decisions.



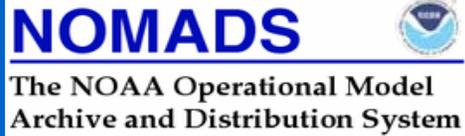
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The NOMADS Philosophy 2

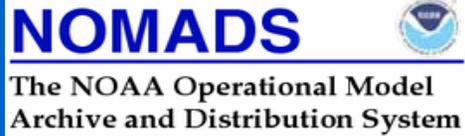
- NOMADS participants serve their data sets through a client-server relationship, that is, the data sets are internet ready and the display is done by the client.
- GDS combines both GrADS, a freeware client (from COLA) and DODS (OPeN-DAP) server to compress and exchange data in many formats with http.
- This means that data appears to the user or client application as a local file!
Like a network file system over the web!
- DODS requests are made by many freeware and commercial high level language clients.
- Simple http queries to the DODS servers can create value added products.



A Distributed Framework

NOMADS is an agreement between agencies who participate to have common ...

- Data and observation distribution software, format independent and description methods (metadata).
- Documentation and organizational framework.
- Forum to plan and organize (science drivers).
- Funding avenue to direct \$ for intra-Agency partnerships ... for university, federal agencies, and organizations, a mechanism to obtain support for the dissemination of their data sets.



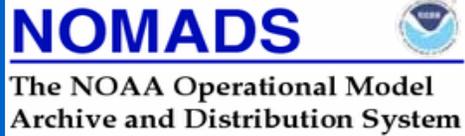
Distributed Framework 2

● So What?

“But I just want the Data”

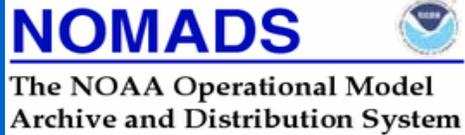
The idea of pulling information, not bytes or data, is new and hard to convey

- NOMADS is a pull technology. Users can become servers of data!
- Why transport millions of files if only a subset is needed?
- Will networks ever keep up with growing data sets?
- Data management at the grass roots level with science driven requirements.
- Many efforts in distributed access. How best to coordinate (metadata) efforts?
- Vision, planning, and cooperation needed w/ Agency attribution!
- A dynamic system, not over engineered and built upon existing users needs but extensible for future requirements.



Scientific Data Networking?

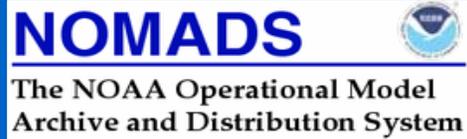
- The users experience is often frustrating—
 - What data of interest exist?
 - Are they going to be useful to me?
 - How can I obtain them in a usable form?
- Time and effort are wasted on data access and format issues.
- As a result atmosphere/ocean/climate data are under-utilized. Model inter-comparison nearly impossible.



Scientific Data Networking 2

NOMADS simplifies scientific data networking, allowing simple access to high volume remote data, unifying access to Climate and Weather models:

- **Data access (client)**
 - Access to remote data in the users normal application
 - IDL / IDV / Matlab / Ferret
 - GrADS (GRIB/BUFR w/ GDS)
 - Netscape / Excel / http (wget)
 - CDAT (PCMDI)
 - **Any netCDF application** (i.e., AWIPS)
 - **Don't need to know the format in which the data are stored.**
- **Data publishing (server)**
 - **Can serve data in various formats**
 - netCDF / GRIB / BUFR / GRIB2
 - HDF (3-5) / EOS
 - SQL / FreeForm
 - JGOFS / NcML
 - DSP
 - ascii, others...
 - **Spatial and temporal sub-setting and host side computations on the fly.**



Collaborating Programs

CAP	Climate Action Partnership	DOC	DOE	EPA	State Dept
CDP	Community Data Portal				NCAR
CEOS	Committee on EO Satellites				NOAA Representative
CEOP	Coordinated Earth Obs Period				NOAA Representative
EPA	Air Quality Models				(in progress)
ESP	Earth Science Portal				Founding Member
NASA	GCMD				Science Advisory Board
NERC	DataGrid				Advisory Committee
NSF	Cyberinfrastructure				Member
NSF	LEAD & Geo-Science Tech Forum (GTF)				Data / Planning Committee
NVODS	/ US GODAE / GOOS				Data Provider
Unidata	THREDDS, NSDL, DLESSE				Data Provider
WCRP	World Climate Research Program				JSC/CLIVAR Briefings

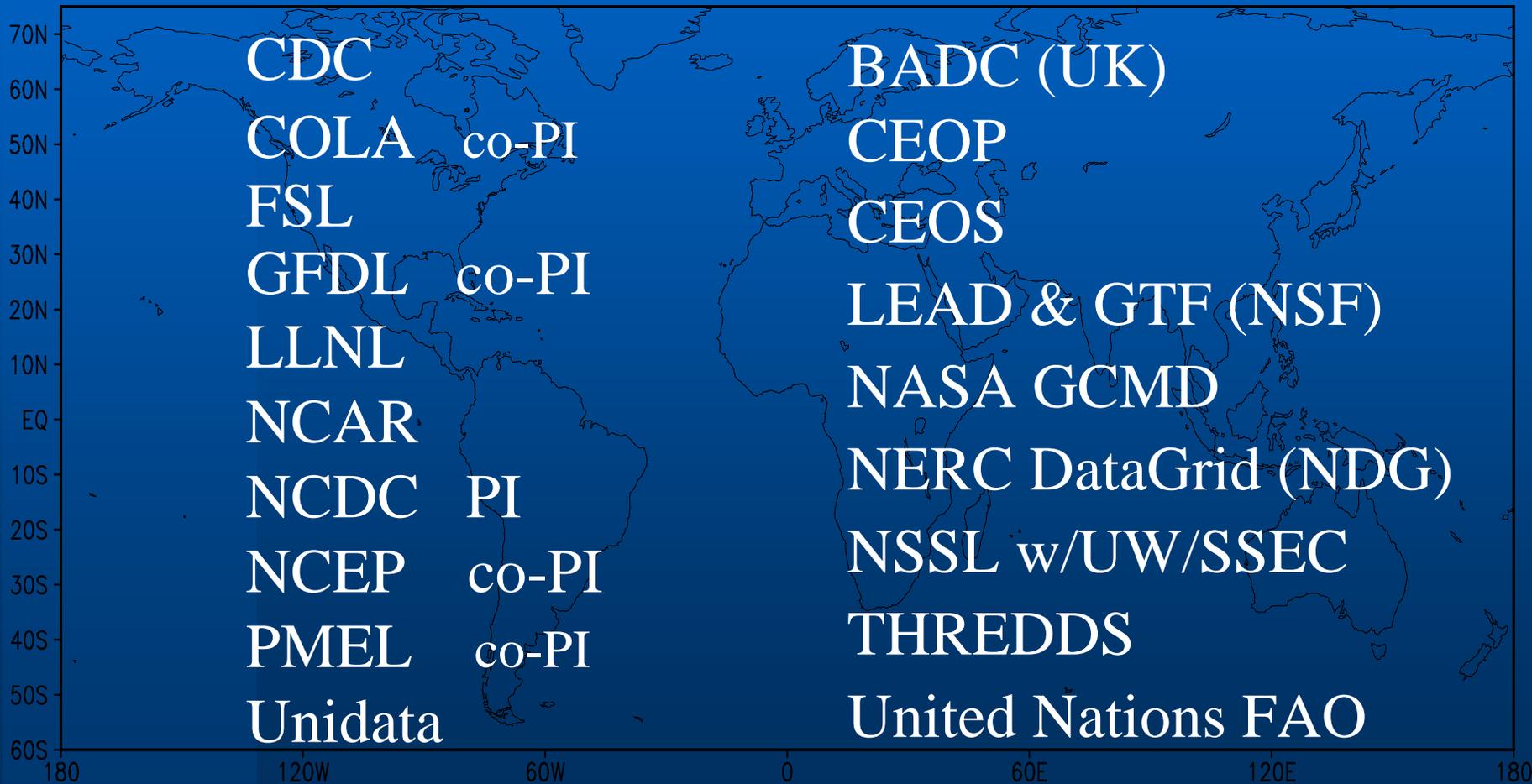


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The Partnerships





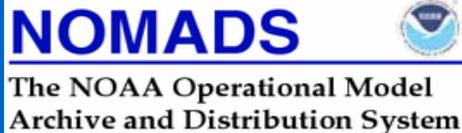
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The Bigger Picture

- NOMADS is a founding member of the Global Organization for Earth System Science Portals (GO-ESSP).
- GO-ESSP is a collaboration designed to build the infrastructure needed to create web portals to provide access to observed and simulated data within the climate and weather communities.
- The infrastructure created within GO-ESSP will provide a flexible framework that will allow interoperability between the front-end and back-end software components. ESP is an international collaboration involving software developers from both Europe and the United States. See <http://esportal.gfdl.noaa.gov/>



Distributed Modeling

- The basic philosophy of distributed modeling is to extend a framework so it can discover and execute libraries of reusable models within OGSA, the Grid and Internet, that are "owned" by domain experts and signed for authenticity. EPA, NASA, NOAA, and others can "publish" official models.
- The Weather Research and Forecast (WRF) model participants (via the ESMF) addresses modular coding design, however an overarching Agency program element for models or for distributed modular computing for AOGCM's **are not being directly addressed**.
- Distributed modeling can be applied to other data forms as well as local and remote data mining operations. Some products can be pre-generated by mining tools, while allowing authorized scientists access to petabytes of archive for exploration.



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NOMADS Uses

- Climate model output and observations are vital to providing timely assessments of climate change and impacts.
- Collaboration between Global Climate Model (GCM) and NWP researchers using large data volumes of data.
- Assess the affect of inadequate spatial and temporal sampling.
- Models can be used to guide the spatial and temporal sampling frequency for observing network design and operation to resolve distributions for specific variables.
- Accurate estimates of future climate variability and trends.
- Long-term protection of climate simulations and NWP analysis.



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NOMADS Uses 2

- NOMADS promotes systematic model evaluation and model inter-comparison; and a feedback mechanism from research to operations.
- Departure of observations from NWP and a fixed reference climatological background can help identify time-dependent changes in the observations. Dynamics in climatological analysis!
- A NWP re-start and re-run capability.



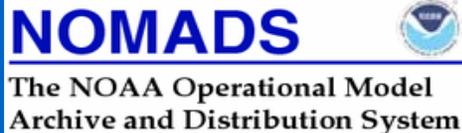
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NOMADS Uses 3

- Model input data assimilation fields for Regional model initialization (e.g., WRF, MM5,) and Regional Climate Models.
- Analysis of historical NWP for operational forecaster training.
- Third-world internet access to NWP for forecast operations.
- Subsets of high volume NWP and GCM avbl over the Internet.

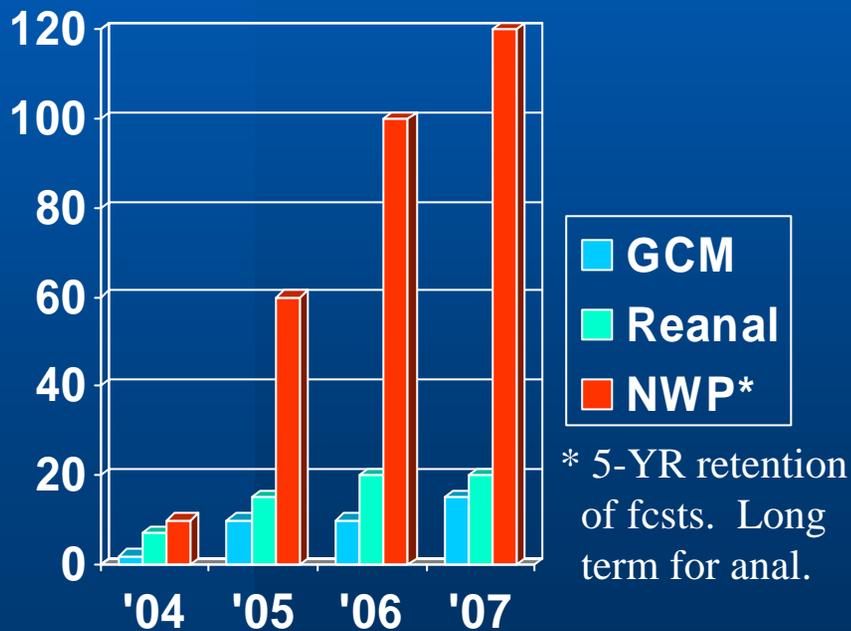


NOMADS Users

- **Data Philosophy and Retention**
 - Data are free.
 - NWP forecast data are retained for five years.
 - Analysis, Reanalysis, observations, and GDAS model input are retained for long term stewardship.
- **Data Users**
 - Resolution of IP addresses indicate a broad range, and consistent use of NOMADS available data:
 - U.S. Agencies, Academic Institutions: K-12 to Research
 - International governments, (Italy, Japan, countries within South America and Africa. Many others).
 - Private Sector and Non-Government Organizations NGO's
 - World Bank, United Nations (FAO), others.

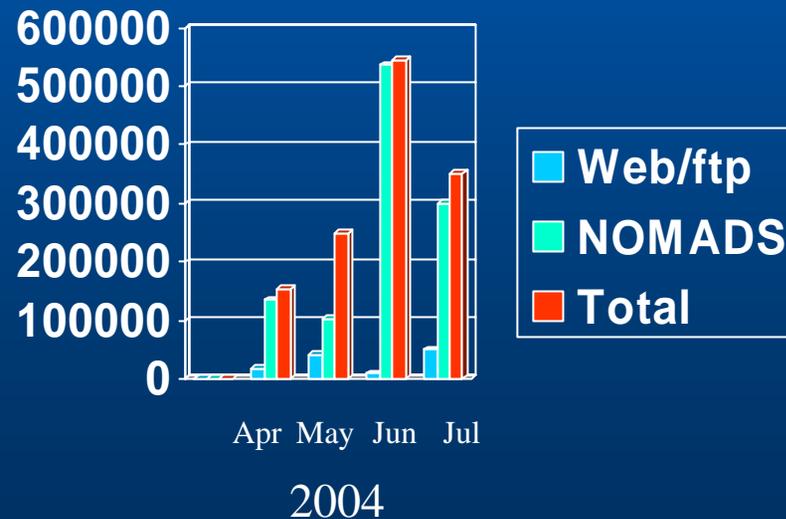


**NCDC Ingest Volume
Tb/Yr**



Existing and Projected Volume

**NOMADS
Downloads / month**





NOAAPort



Data Ingest

**Obs, Eta,
GFS, RUC**

**Hi-Res
GFS, Eta,
NARR and
GDAS**

**Dual
Redundant
Ingest**

Data Management

- Data & Directory structures “merged”
- Daily Data Ingest inter-comparison
- QC and R/T Monitoring
- Index File generation
- Control and OPeNDAP metadata generation
- CVS Backup (code)
- NCDC Archive Interface

Data Access

**Earth System
Grid &
CEOS-Grid**

**NOMADS
Web/DODS**

**NCDC
Archive**

NCEP ftp
GigaPOP

Unidata IDD





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Dynamic Ingest Monitoring

Dual Site Ingest and Dynamic error reporting for a serially complete archive. QC architecture discovered NOAAPort labeling errors.

ARCHIVE STATUS PAGE (2004 / 05) 31 d
--- NCEP HI-RESOLUTION ETA & GFS

Full Cycle Available	A Few Missing FCT hours	Significant Missing Data
Extra Files Found	Cycle Currently Being Processed	Cycle Not Available

| # CTL files / # Fct Hrs | --- Files received for each cycle

Month Navigation

<< 2003 | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | >> 2004

MESO ETA HI - Grid 218 - Status

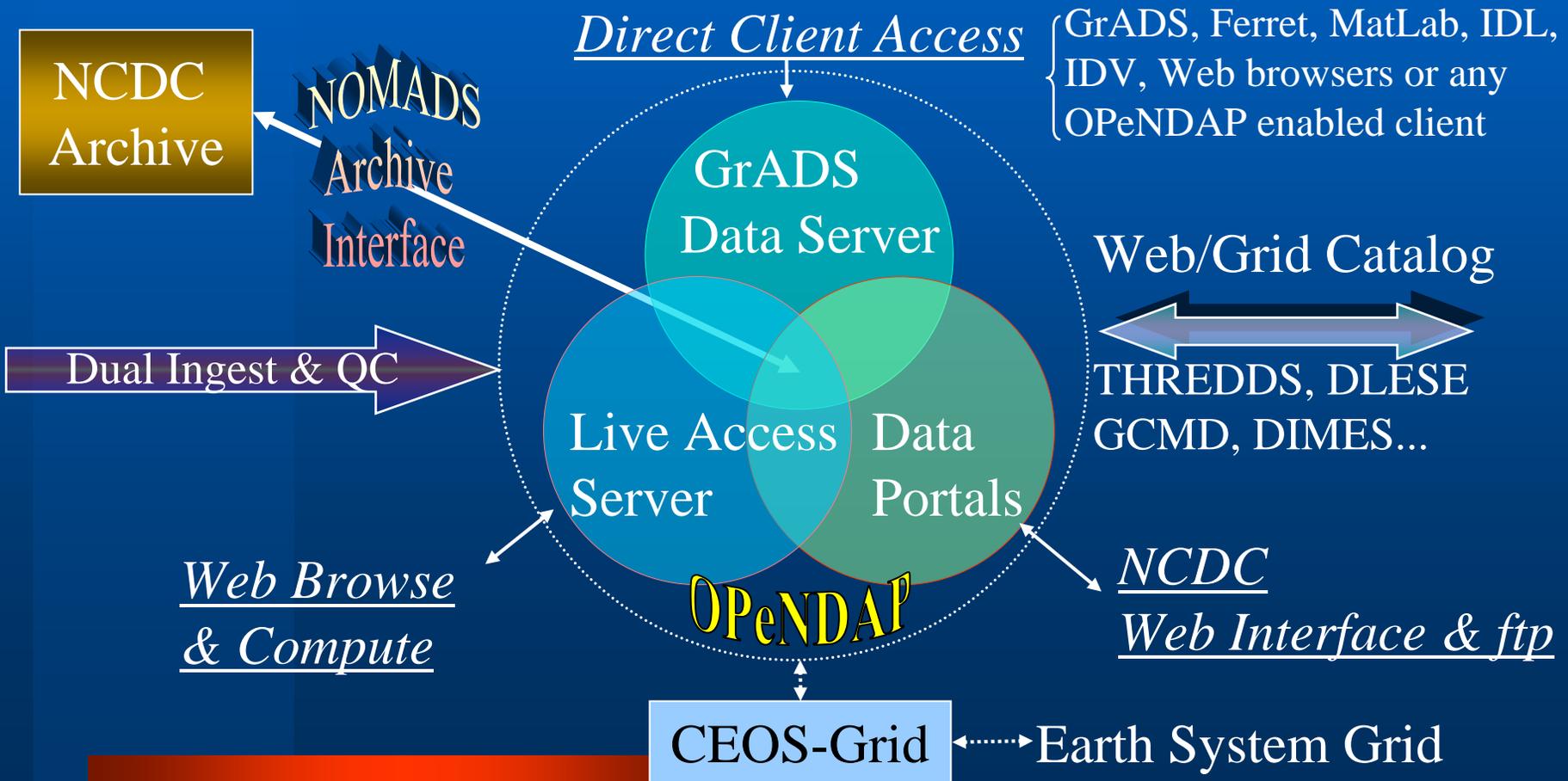
DAY	0000 Z	0600 Z	1200 Z	1800 Z
31				
30				
29				
28				
27	1/21	1/21	1/21	0/0
26	1/21	1/21	1/21	1/21
25	1/21	1/21	1/21	1/21
24	1/21	1/21	1/21	1/21
23	1/21	1/21	1/21	1/21
22	1/21	1/21	1/21	1/21
21	1/21	1/21	1/21	1/21
20	1/21	1/21	1/21	1/21
19	1/21	1/21	1/21	1/21
18	1/21	1/21	1/21	1/21
17	1/21	1/21	1/21	1/21
16	1/21	1/21	1/21	1/21
15	1/21	1/21	1/21	1/21
14	1/21	1/21	1/21	1/21

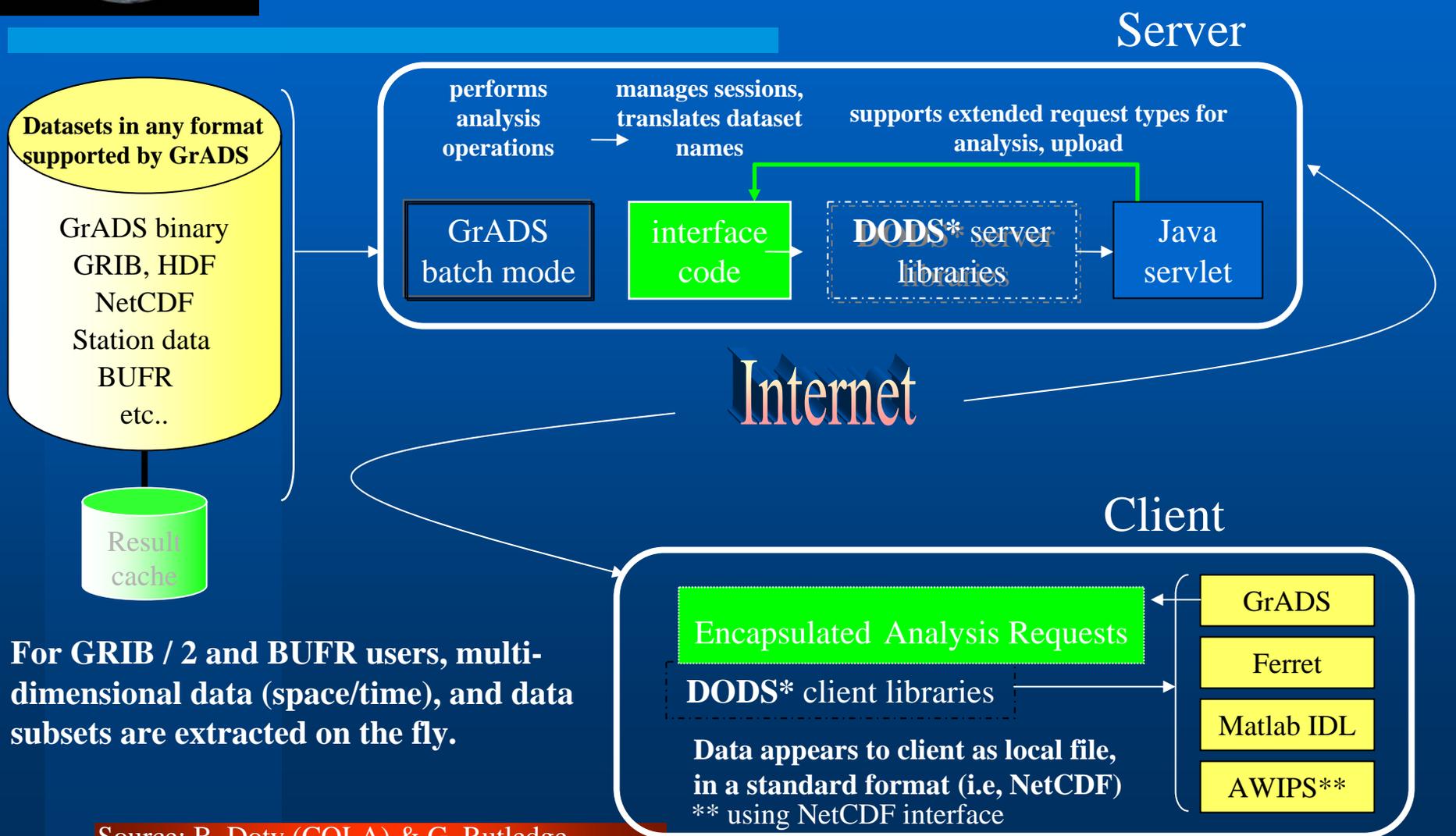
GFS AVN HI - Grid 3 - Status

DAY	0000 Z	0600 Z	1200 Z	1800 Z
31				
30				
29				
28				
27	1/61	1/61	0/0	0/0
26	1/61	1/61	1/61	1/61
25	1/61	1/61	1/61	1/61
24	1/61	1/61	1/61	1/61
23	1/61	1/61	1/61	1/61
22	1/61	1/61	1/61	1/61
21	1/61	1/61	1/61	1/61
20	1/61	1/61	1/61	1/61
19	1/61	1/61	1/61	1/61
18	1/61	1/61	1/61	1/61
17	1/61	1/61	1/61	1/61
16	1/61	1/61	1/61	1/61
15	1/61	0/41	1/61	1/61
14	1/61	1/61	1/61	1/61



Multiple paths to format independent data access:

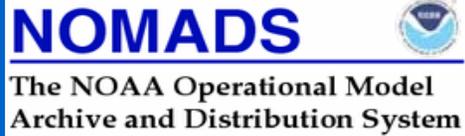




For GRIB / 2 and BUFR users, multi-dimensional data (space/time), and data subsets are extracted on the fly.



- **What's Needed?**
 - **Subsetting**
 - **Format-independence**
 - **Aggregation (GDS, Unidata)**
 - **Compression**
 - **Security**
- **CF – model dataset standards**
 - **structures and semantics**

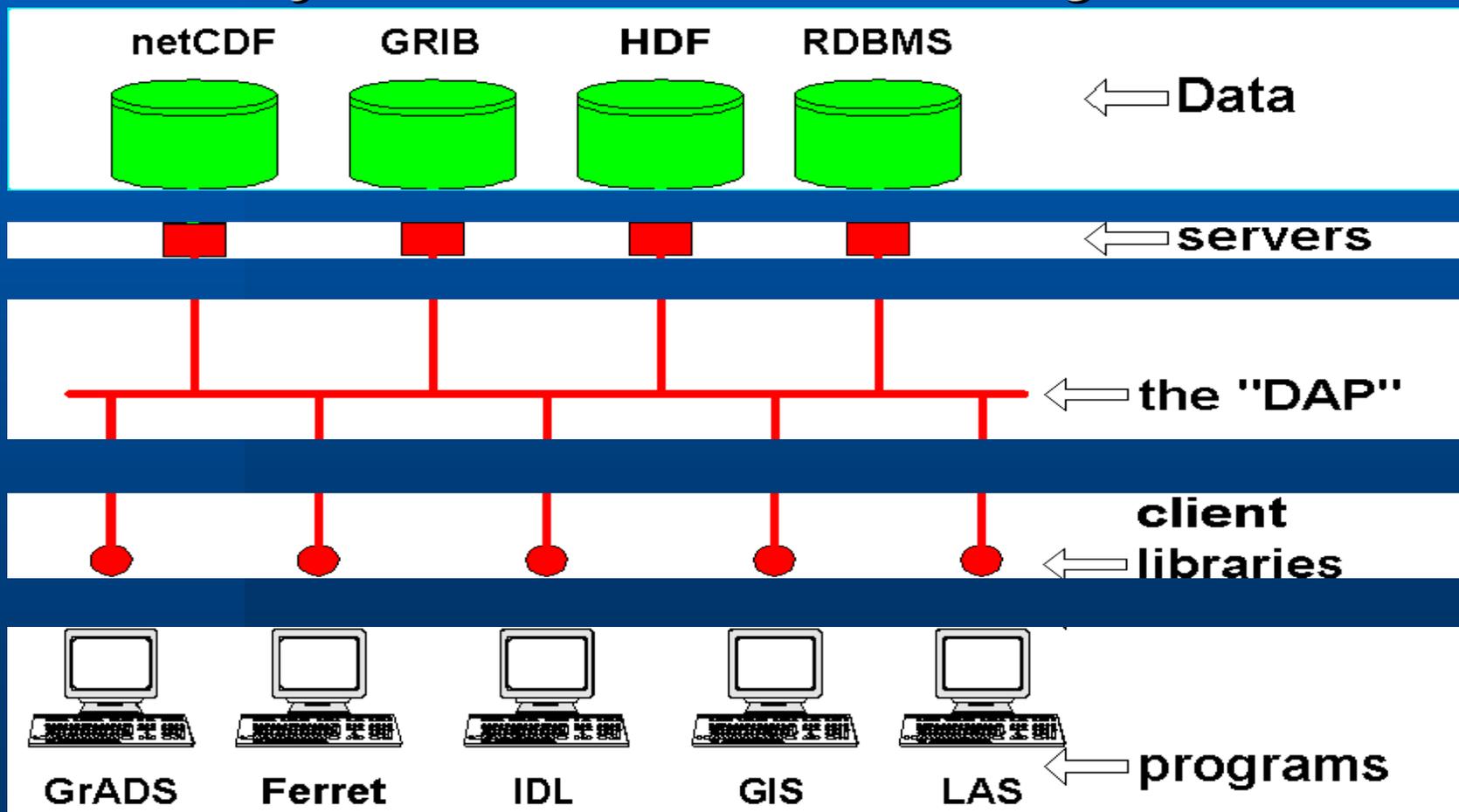


Framework

- NOMADS uses the Open Source XML based OPeNDAP.
- OPeNDAP is a binary-level protocol designed for the transport of scientific data subsets over the Internet. Provides server side data manipulation on-the-fly (e.g., GrADS-DODS).
- Data formats: GRIB, GRIB2, BUFR, HDF, NetCDF, ascii...
Conventions: COARDS, CF, FGDC, DIF...libraries built as necessary.
- APIs: JAVA-OPeNDAP, C++-OPeNDAP, NetCDF, GRIB, BUFR, THREDDS, Python.



Utilize Binary data and metadata through OPeNDAP ...





Interoperability and OPeNDAP

OPeNDAP does not *mandate* semantic interoperability although it does allow for it.

- The OPeNDAP data access protocol supports containers for semantic metadata, but places no requirements on the contents of these containers.
- Some data sets are well described, others are not.



Interoperability and OPeNDAP

The two types of metadata suggest two levels of interoperability:

- **Syntactic interoperability** – Consistent format representation across data sets.
- **Semantic interoperability** – Consistent semantic interpretations of the data.

OPeNDAP mandates syntactic interoperability via a strict syntactic description of all data available via the system.



Syntactic and Semantic Metadata

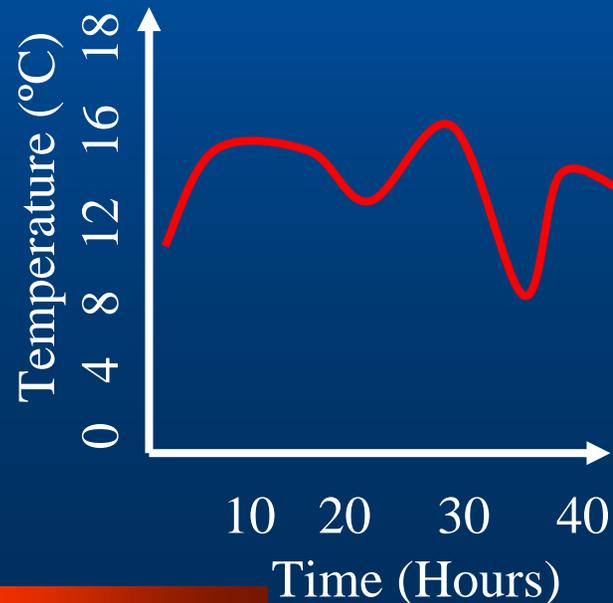
The required metadata falls in two classes:

- **Syntactic** metadata – Information about the data types and structures at the computer level - the syntax of the data; **e.g., variable T is a 20x40 element floating point array**
- **Semantic** metadata – Information about the contents of the data set. **e.g., variable T is sea surface temperature with units of °C**



Syntactic and Semantic Metadata

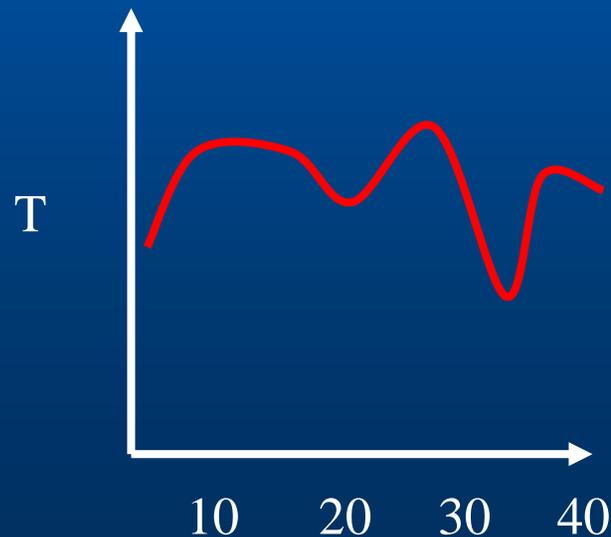
- **Semantic** metadata provides the information needed to label the axes in a plot:





Syntactic and Semantic Metadata

- **Syntactic** metadata provides the information needed to read and plot the data, but in general not to label the axes.





Objective of OPeNDAP

- To provide a data access protocol allowing for machine-to-machine interoperability with semantic meaning in a distributed, heterogeneous data environment
 - ➔ **The scripted exchange of data between computers, without human intervention.**



OPeNDAP System elements

- Servers
- Clients
- Aggregation Server
- Processing Servers
- Ancillary Information Services
- Browser Interfaces
- Data System Integrators (ODC)



Servers

- Servers receive requests and provide responses via the DAP.
- Servers convert the data from the form in which they are stored to the OPeNDAP data model.
- Servers provide for subsetting of the data.



Aggregation Server

- The Aggregation Server receives requests and makes responses via the DAP **and** It makes requests and receives responses via the DAP.
- The Aggregation Server presents a single data object to the user for multi-file data sets of arrays or grids.



Processing Servers

- The processing server performs operations on the data in addition to transformation to the OPeNDAP data model and subsetting, e.g.
 - Average
 - Sum
 - ...
- There are currently two examples of processing servers:
 - GrADS Data Server (GDS)
 - Ferret Data Server (FDS)



Anagram Server

Anagram - a modular Java framework for high-performance scientific data servers (<http://grads.iges.org/anagram/>)

What is Anagram?

Anagram is a prototype framework designed to ease the development of the diverse data servers which will be needed as the community moves towards distributed data processing.

It provides a collection of reusable components that address the needs common to high-performance scientific data servers. In particular, Anagram can greatly facilitate the development of new servers that support the OPeNDAP (a.k.a. DODS) subsetting protocol on a diverse range of back-end data storage formats.

GDS and Ferret DODS Server



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Responsibility

- **Note that in distributed systems responsibility is distributed. The data and metadata lies with the data providers.**
 - The data access protocol lies with OPeNDAP.
 - Application packages (Matlab, Ferret, GrADS, IDL, IDV, Excel...) with the developers of these packages.
 - Data location: GCMD, THREDDS, DIMES, ...



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Data Availability Overview

CDC: Reanalysis, climate weather models, in-situ

GFDL: Coupled Models, Control and Perturbation
Integrations and historical 20th century simulations
using solar, volcano, GHG and aerosol forcings.

FSL: MADIS mesoNets, Hi-Res RUC-II

NCAR: Community Climate System Model / Land Surface
CO2 predictive models (VEMAP), Reanalysis / Eta

NCDC: Archive for NCEP model input/output / Select NCDC
Observation datasets, Ocean/Ice WAVE, NARR, SST's...

NCEP: Real-time Input/Output, Reanalysis (I&II), Ensembles, Sea
Ice Ocean, CDAS, Hourly Eta, Climate Forecast Models...

LLNL: AMIP / Probabilistic information

PMEL: Ocean and Climate datasets



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NCDC and NCEP Data

- **NCDC NOMADS Archive**
 - NWP from NCEP
 - POR: 2002 to Real-Time
 - **Eta** (12km); **GFS** (1 degree); **GDAS**; **NARR** 12km 30yrs
 - RUC-II 20/40km; Ocean and Ice WAVE Models
 - NCDC Reference Data Sets (Reynolds SST's, GHCN...)
 - NCDC Mirror site to NCEP NOMADS for Eta & GFS
- **NCEP Real-Time NOMADS**
 - Global Forecast System GFS 1 degree
 - **Hourly Eta** at 12km
 - Regional Spectral Model (RSM) and Ensembles
 - Climate Data Assimilation System (CDAS)
 - AMIP Climate Monitoring, Climate Forecast Model
 - NCEP/NCAR Global Reanalysis 1&2



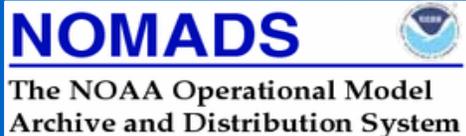
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Model Input: NCEP GDAS

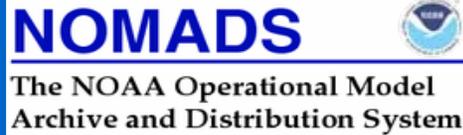
- NOMADS saves the minimum data necessary to regenerate model output products as close as possible to NCEP operations.
- The analysis files will be in the models own coordinate system.
- Files are constructed with computer and computational efficiency in mind, and not in standard coordinate systems.
- Programs to convert these files are available upon request:
 - spectral to gaussian
 - gaussian to lat/lon
 - sigma to pressure



NCEP GDAS (cont.)

- The minimum set for Global Spectral Forecast Model and the Spectral Statistical Interpolation Cycling Analysis System contains ~0.5Gb /run:
 - NOAA-15/16 AMSU-A/B TOVS 1B Radiances (IEEE)
 - Analysis Bias Corrected Information / Obs Toss List
 - SFC U/A, ACRS, Aircft (BUFR)
 - 6HR fcst guess from previous run (BUFR)
 - ERSCAT Sat obs / HIRS 14/15, MSU TOVS (IEEE)
 - Guess prep and and fcst guess output (BUFR)
 - Analysis ready QC'ed Obs. (prepBUFR)
 - Profiler, TOVS, Wind Obs. (BUFR)
 - SFC Analysis Restart Files
 - SST's (GRIB), Radar VAD Winds (BUFR)

So, how can I find this data?



THREDDS Data Providers

- [University of Alabama Huntsville](#) (Sara Graves, Rahul Ramachandran, Steve Tanner, Ken Keiser)
- [ARM](#) (Atmospheric Radiation Measurement, Chris Klaus)
- [CDC](#), the Climate Diagnostic Center (Roland Schweitzer)
- [COLA](#), Center for Oceans Land Atmosphere (Joe Wielgosz)
- [University of Florence](#) (Stefano Nativi)
- [GMU](#), George Mason University (Menas Kafatos and Ruixin Yang)
- [IRI/LDEO](#), International Research Institute/Lamont Doherty Earth Observatory (Benno Blumenthal)
- [ESG](#), the Earth System GRID (Luca Cinquini, NCAR/SCD)
- [IRIS DMC](#), Incorporated Research Institutes for Seismology Data Management Center (Rob Casey)
- [NCAR](#), the National Center for Atmospheric Research (Don Middleton)
- [NCDC](#), the National Climatic Data Center (Ben Watkins)
- [NGDC](#), National Geophysical Data Center (Ted Habermann)
- **NOMADS**, NOAA Operational Model Archive and Distribution System, (Glenn Rutledge, NCDC)
- [University of Oklahoma](#) (Kelvin Droegemeier)
- [PMEL](#), the Pacific Marine Environment Laboratory (Steve Hankin)
- [FNMOC](#), Fleet Numerical Meteorological and Oceanographic Center (Phil Sharfstein)
- [SSEC](#), the Space Science and Engineering Center., U. of Wisconsin-Madison (Steve Ackerman, Tom Whittaker)
- [Unidata Community](#) ADDE servers (Tom Yoksas, Unidata Program Center)
- [CIRESIN](#) (Consortium for International Earth Science Information Network, Bob Downs)
- [CUAHSI](#) (Consortium of Universities for Advancement of Hydrologic Science, David Maidment)
- [ESIG/NCAR](#) (NCAR Environmental Societal Impacts Group, Bob Harriss)
- [Earthscope](#) (UCAR UNAVCO, Chuck Meertens)
- [GEON](#) (GEOphysical Network, Chaitan Baru, UCSD San Diego Supercomputer Center)
- [ESRI GIS Community](#) (ESRI, Inc., Jack Dangermond, President)

The Unidata DODS Page

DODS Datasets

[Click here to submit a dataset](#)

Keywords:

separate multiple keywords with spaces

Search with Constraints

Show All Datasets

Hide All Datasets

Constraints: none

Provider:

- ▼ Antarctic Cooperative Research Centre, Tasmanian Partnership for Advanced Computing (TPAC)
- ▼ Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS)
- ▼ Center for Ocean Land Atmosphere Studies (COLA)
- ▼ Columbia University/LDEO - International Research Institute (IRI/LDEO)
- ▼ Florida State University - Center for Ocean-Atmospheric Prediction Studies (COAPS)
- ▼ George Mason University - Seasonal to Interannual Earth Science Information Partner (SIESIP)
- ▼ Gulf of Maine Ocean Observing System (GoMOOS)
- ▼ Maine - Department of Marine Resources (Maine DMR)
- ▼ Monterey Bay Aquarium Research Institute (MBARI)
- ▼ Naval Oceanographic Office (NAVOCEANO)
- ▼ NASA/GSFC - Goddard Distributed Active Archive Center (GDAAC)
- ▼ NASA/JPL - Physical Oceanography Distributed Active Archive Center (PODAAC)
- ▼ NASA/JPL - Ocean Earth Science Information Partner (OceanESIP)
- ▼ NASA/MSFC - Global Hydrology Resource Center (GHRC)
- ▼ NCAR - Vegetation/Ecosystem Modeling and Analysis Project (VEMAP)
- ▼ NOAA - Atlantic Oceanographic & Meteorological Laboratory (AOML)
- ▼ NOAA - Chesapeake Bay Program Office
- ▼ NOAA - Climate Diagnostic Center (CDC)
- ▼ NOAA - Forecast Systems Laboratory (FSL)
- ▼ NOAA - Geophysical Fluid Dynamics Laboratory (GFDL)
- ▼ NOAA - National Center for Environmental Prediction (NCEP)
- ▼ NOAA - National Climatic Data Center (NCDC)

And now the OPeNDAP Home Page <http://www.opendap.org/>



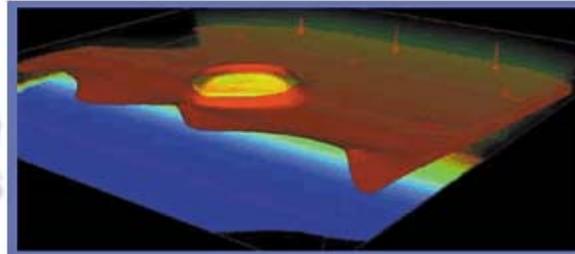
NOMADS



The NOAA Operational Model
Archive and Distribution System

Collaborator: NASA GCMD

A GCMD Portal to
Model Output
Data Sets



National Partnership for Advanced Computational
Infrastructure
Feature Image (3/08/00)

Keyword Search

Agriculture

- [Forestry](#) - [Soils](#) - [more](#)

Atmosphere

- [Temperature](#) - [Winds](#) - [more](#)

Biosphere

- [Vegetation](#) - [Wetlands](#) - [more](#)

Cryosphere

- [Sea Ice](#) - [Snow Cover](#) - [more](#)

Human Dimensions

- [Environmental Impacts](#) -
[Human Health](#) - [more](#)

Land Surface

- [Land Use / Land Cover](#) -
[Soils](#) - [more](#)

Oceans

- [Temperature](#) - [Circulation](#) -
[Coastal Processes](#) - [more](#)

Paleoclimate

- [Ice Cores](#) - [Tree Rings](#) - [more](#)

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[Radar](#) - [more](#)

Sun-Earth Interactions

- [Solar Activity](#) -
[Sunspots](#) - [more](#)



NOMADS

The NOAA Operational Model
Archive and Distribution System

Access to Community Data

The collage features the following logos and text:

- GOFC-GOLD**: Global Observation for Forest and Land Cover Dynamics
- NOAA**
- CEOS**: Committee on Earth Observation Satellites
- Bureau for Africa**
- GOSIG**
- ESIP FEDERATION**
- RSMAS**
- CCOS**: Climate Change Observing System
- NCAR**
- ANTARCTIC MASTER DIRECTORY**
- CLIVAR**: Climate Variability & Predictability World Climate Research Programme
- ORNDAP**
- WDC**
- USDA**
- NIPR**
- World Water Forum / World Water Council**
- UN**
- GTOS**: Global Terrestrial Observing System
- Model Data**
- NASA**
- GLOBEC**

GCMD Portals

GCMD DODS/OPeNDAP Portal

 A Global Change Master Directory Portal for the
**Open-source Project for a
Network Data Access Protocol**

Find DODS/OPeNDAP-Related Data Sets by Topic:

 Agriculture forestry, soils ...	 Land Surface land cover, erosion ...	Data Set Text Search <input type="text"/> <input type="button" value="Go"/> Advanced Search
 Atmosphere precipitation, temperature ...	 Oceans circulation, salinity ...	
 Biosphere vegetation, zoology ...	 Paleoclimate tree rings, land records ...	
 Climate Indicators air temperature, drought ...	 Snow and Ice frost, snow cover ...	
 Human Dimensions environmental impacts, land use ...	 Spectral / Engineering radar, visible imagery ...	
 Hydrosphere snow & ice, water quality ...	 Data Centers - Locations - Instruments - Platforms - Projects	

 [Search the entire GCMD database](#)

 NASA Website Privacy and Security Statement, Disclaimer and Accessibility Certification
Responsible NASA Official: Lola Olsen · Curator/Content Owner: Gene Major
Contact GCMD User Support for assistance

<http://gcmd.gsfc.nasa.gov/Data/portals/dods/>

 A Global Change Master Directory Portal for the
**Open-source Project for a
Network Data Access Protocol**

Keywords	Spatial Extent	Time Range
This field is required. <input type="text"/> in <input type="text" value="Full Text"/> <input type="radio"/> and <input type="radio"/> or <input type="text"/> in <input type="text" value="Full Text"/>	This field is optional. Include? <input type="radio"/> YES <input checked="" type="radio"/> NO N <input type="text"/> W  E <input type="text"/> S Trouble with the map applet?	This field is optional. Include? <input type="radio"/> YES <input checked="" type="radio"/> NO Time period of interest is during <input type="text"/> Jan. <input type="text" value="1"/> 1950 through Mar. <input type="text" value="09"/> 2004
Select the number of records to view: <input type="text" value="15"/>	Select the viewing format: <input type="text" value="Display"/>	<input type="button" value="SEARCH"/> <input type="button" value="Reset"/>
 Search the entire GCMD Database		Instructions
 NASA Website Privacy and Security Statement, Disclaimer and Accessibility Certification Responsible NASA Official: Lola Olsen · Curator/Content Owner: Gene Major Contact GCMD User Support for assistance		

http://gcmd.gsfc.nasa.gov/Data/portals/dods/freetext/ft_search.html

Selected Datasets

- ? SeaWinds on QuikSCAT Level 2B data product
- ? BRF - Black Rock Forest Open Lowland Terrestrial Station
- ? CDC_NCEP_Reanalysis_Products_Spectral
- ? CDC_NCEP_Reanalysis_Products_Surface_Flux
- ? CDC_NCEP_Reanalysis_Products_Tropopause_Level
- ? COADS 1-degree Equatorial Enhanced
- ? 5.5km East Coast AVHRR Archive

Additional Criteria

- Directory
- 1995 ...
 - 1996 ...
 - 1997 ...
 - 1998 ...
 - 1999 ...
 - 2000 ...
 - 2001
 - 1 ...
 - 10 ...
 - 11
 - 12 ...
 - 2 ...
 - 3 ...
 - 4 ...
 - 5 ...
 - 6 ...
 - 7 ...

- 195 files:
- d01305070339.pvu.Z
 - d01305165022.pvu.Z
 - d01305182858.pvu.Z
 - d01306065308.pvu.Z
 - d01306181823.pvu.Z
 - d01307064240.pvu.Z
 - d01307180747.pvu.Z
 - d01308063205.pvu.Z
 - d01308175700.pvu.Z
 - d01309062233.pvu.Z
 - d01309174621.pvu.Z
 - d01310061107.pvu.Z
 - d01310174031.pvu.Z
 - d01311060044.pvu.Z
 - d01311172542.pvu.Z
 - d01312055023.pvu.Z
 - d01312072950.pvu.Z
 - d01312171523.pvu.Z

Directory Regex:

- lat: lat=[0 : 1023]
 - lon: lon=[0 : 1023]
 - Grid {
 - dsp_band_1: lat=[350 : 351]lon=[500 : 512]
 - lat: lat=[350 : 351]
 - lon: lon=[500 : 512]
- } dsp_band_1;

Remove Selected Remove All Favorite

Select All Deselect All Reset CE

Output Settings

Output

The ODC

NOMADS

The NOAA Operational Model
Archive and Distribution System



Other Portals: NCAR

NCAR

Community Data Portal

UCAR

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The Community Data Portal (CDP) is a collection of earth science datasets from NCAR, UCAR, UOP, and participating organizations in the following research areas:

- oceanic
- atmospheric
- space weather
- turbulence

Search for Datasets

Search for Earth Science datasets by metadata keyword:

[Search Tips](#)

Login

Login with your Gatekeeper account for one click access to NCAR Mass Store downloads.

Username

Password

Applications

Live Access Server

CDP News

New [MOZART](#), [CCSM](#) Datasets

Browse Dataset Catalogs

- [NCAR](#)
 - [ACD/MOZART Model](#)
 - [ACD Model Evaluation Data](#)
 - [ATD campaigns](#)
 - [CGD/CAS Climate Analysis Data](#)
 - [CGD/CCSM Model](#)
 - [SCD/DSS Section](#)
 - [SCD/VETS Section](#)
 - [WACCM Model](#)
- [UCAR](#)
 - [Unidata](#)
- [Universities](#)
 - [ENLIL Heliospheric Model](#)

So, how can I get this data?



NOMADS



The NOAA Operational Model
Archive and Distribution System

NOMADS Main Page

[NCDC](#) / [Climate Resources](#) / [NOMADS](#) / [Search](#) / [Help](#)

	<p><i>The NOAA Operational Model Archive and Distribution System (NOMADS) is a pilot project designed to provide real-time and retrospective format independent access to climate and weather model input and output data.</i></p> <p>About NOMADS FAQ</p>	
<p>Status Reports</p>	<p>NOMADS </p> <p>The NOAA Operational Model Archive and Distribution System</p>	<p>Program Plan and Data Management Vision</p>
<p>Using NOMADS</p>	<p>NOMADS Data Portals</p> <p>NOMADS Web Interface</p>	<p>Participants</p>

[NCDC](#) / [Climate Resources](#) / [NOMADS](#) / [Search](#) / [Help](#)

<http://www.ncdc.noaa.gov/oa/climate/nomads/nomads.html>

Created by Glenn.Rutledge@noaa.gov



NOMADS

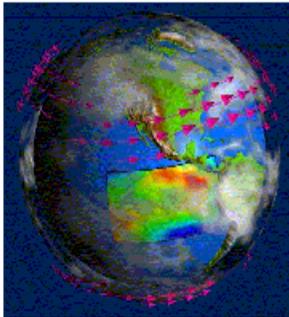
The NOAA Operational Model
Archive and Distribution System



NCDC Web Interface

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Model Resources | [About](#) | [Inventories](#) | [Get/View Data](#) | [Publications](#) | [Other Resources](#)

Model Resources



- ◆ [About NCDC's Model Resources](#)
- ◆ [Model Data Inventories](#)
- ◆ [Get / View Model Data](#)
- ◆ [Publications](#)
- ◆ [Other Model Data Resources](#)

[NCDC](#) | [Contents](#) | [Satellite](#) | [Climate](#) | [Radar](#) | [Model](#) | [Search](#) | [Help](#)
Model Resources | [About](#) | [Inventories](#) | [Get/View Data](#) | [Publications](#) | [Other Resources](#)

Three primary
methods for data
access:

- Web Interface
- OPeNDAP
- ftp w/ on the fly
Grib subsetting

On-line or
Off-line (archive)

Server-side data
Computations...



The NCDC Web Interface originally developed at NCEP:

NCEP NWP Model Datasets in NCDC Repository

model	grid/scale	freq	plot	ftp	http	nomads gds	contact 1	contact 2
GFS Analysis and Forecasts								
GFS-AVN	201	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-AVN	202	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-AVN	203	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-AVN	211	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-AVN	213	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-MRF	201	00Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-MRF	202	00Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-MRF	203	00Z	plot	ftp4u	http	gds	Glenn Rutledge	T
GFS-MRF	205	00Z	plot	ftp4u	http	gds	Glenn Rutledge	T
ETA Analysis and Forecasts								
Early-ETA	212	00,12Z	plot	ftp4u	http	gds	Glenn Rutledge	T
Meso-ETA	211	00,12Z	plot	ftp4u	http	gds	Glenn Rutledge	T
Meso-ETA	212	00,06,12,18Z	plot	ftp4u	http	gds	Glenn Rutledge	T

Variable:

- capes 1 level * Convective Available Potential Energy (Surface) [J/kg]
- cins 1 level * Convective Inhibition (Surface) [J/kg]
- p 1 level * Total Precipitation [kg/m^2]
- pc 1 level * Convective Precipitation [kg/m^2]
- ps 1 level * Surface Pressure [Pa]
- pwat 1 level * Entire Atmosphere Precipitation [kg/m^2]
- rh2m 1 level * Meter Relative Humidity [%]
- slpe 1 level * Sea Level Pressure, ETA re...
- t2m 1 level * Meter Temperature [K]
- u10m 1 level * Meter U Winds [m/s]
- v10m 1 level * Meter V Winds [m/s]

Note: Some of the above listed variables may not be available at your location or model level. To see what data is present, use your Back button to return to the main page and use the review links at the bottom of the page or see the following table:

none	-273.16 (K->C)
none	1.8(x-273.16)+32 (K->F)
none	*86400 (PRATE->mm/day)
none	*0.03456 (LHTFL->mm/day)
none	/25.4 (kg/m^2->inches)
none	/100 (Pa->mb)
none	*864 (Pa/s->mb/day)
none	*1.94254 (m/s->knots)
none	*10
none	*100
none	*1000
none	*10000
none	*100000
none	*1000000
none	/10
none	/100
none	/1000
none	/10000
none	/100000

Level: 1

extra operation 1: (none) 2: (none)

Data available from 00Z 28 dec 2003 to 06Z 29 dec 2003 at 6 hour intervals

Time: 00Z 28 dec 2003

Map projection: lat-lon (180E) only for custom maps long: 280 long: width 50 lat: -60 lat: height 60

Draw: shaded Contour interval: def white: def Plot size: 800x600

NOMADS leverages efforts across the community.



NOMADS
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NCEP "Web Plotter"

- Developed at NCEP.
- NCDC ingests 250K grids/day. POR 2002 to present.

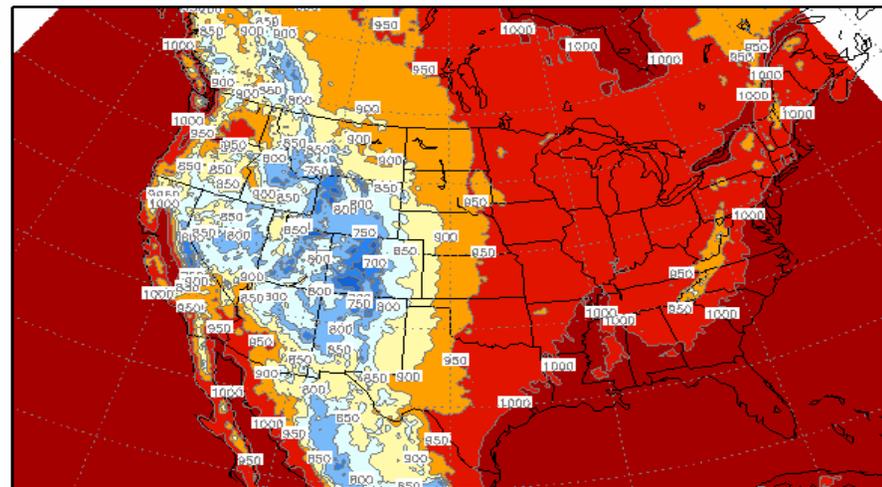
- Any one of these accessible in seconds
Via: OpENDAP
GDS
ftp
Web Plotter
LAS (soon)

NOMADS Interactive Web Plotter - Order # 1052 ./meso-eta-hi_218_20040529_1800_fff.ctd

PRESsfc 1000

18Z29may2004 to 06Z01jun2004

PRESsfc 18Z29MAY2004





NOMADS



The NOAA Operational Model
Archive and Distribution System

Providers: NCEP

N.O.M.A.D.S.

N.O.M.A.D.S. NOAA Operational Model Archive Distribution System



[Real Time NOMADS NCEP Component](#)

Caution: this web server is in testing mode. Applications are being developed and we are using it for live testing.

Forecasts may not be current and historical data set may not be complete.

[Comprehensive forecast archives and reanalysis-2 daily archives on this machine.](#)



NOMADS



The NOAA Operational Model
Archive and Distribution System

Providers: GFDL



geophysical fluid
dynamics laboratory

[About Us](#) | [Research](#) | [Products and Services](#) | [References](#) | [Technical Services](#) | [Meetings and Seminars](#)

Spotlight on NOMADS

NOMADS is being developed as a Unified Climate and Weather Archive to provide Web access to model information so that users can make decisions about their specific needs. This spans time scales from days (weather), to months (El Nino), to decades (global warming). For more, see NCDC's [nomads](#) page.

Spotlight on ESP

The Earth Science Portal (ESP) is a

[gfdl's home page](#) > [products and services](#) > data portal

gfdl's data portal

Our Data Portal Services

Public data sets from GFDL are made available through the GFDL Data Portal. The data portal is designed to provide access to: data attributes, and graphical display the data. Download provides "http" access to download complete files. Display of data attributes includes global attributes and the variables available in the files. Graphical display uses the Live Access Server to graphically display the data.

Our Public Data Files

Registration for the GFDL Data Files is free. Users are requested to complete the Registration Form for Public Data Files (found on the Data Portal) before they first begin using the data portal. Information from this form will be used to provide registered users with news on when additional data files are added, and when corrections are made to existing public data. The information gathered will not be used for any purposes other than to provide Portal Services.

Data Storage

The data files on the data portal are stored in netCDF (network Common Data Form), and can be identified by the suffix ".nc". The files conform with the CF Conventions for the standardization of netCDF files. More information about netCDF is available at [http://www.cgd.cornell.edu/netcdf/](#)



NOMADS



The NOAA Operational Model
Archive and Distribution System

Providers: FSL

FSL NOMADS Data Portal

Forecast Systems Laboratory NOMADS Data Portal



The [Forecast Systems Laboratory \(FSL\)](#) has made available the following data as a [NOAA Operational Model Archive and Distribution System \(NOMADS\)](#) [Data Access Protocol \(OPeNDAP \(Formerly DODS\)\)](#)-enabled clients may be used to access and display these data:

- [Meteorological Assimilation Data Ingest System \(MADIS\)](#) (restricted)
- [20km Backup Rapid Update Cycle \(RUC\)](#)
- Coastal Storms Initiative (CSI) (coming soon)

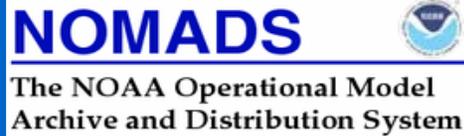
[Forecast Systems Laboratory \(FSL\)](#)

[NOAA Operational Model Archive and Distribution System \(NOMADS\)](#)

[Open source project for Network Data Access Protocol \(OPeNDAP\)](#)

[Distributed Oceanographic Data System \(DODS\)](#)

So, how can I work with this data?



Tools for Users

- Pare down large file sizes of high resolution data and products.
- (re-) Group different data sets to create needed products – such as initialization files for model development, analysis, and intercomparison.
- Subset the data sets in parameter space
- Subset the data sets in physical space
- Subset the data sets in temporal space

... Using http to extract data from a NOMADS OPeNDAP Server:

- `http://140.90.198.156:9090/dods/eta/eta20030527/eta_00z.ascii?tmpprs[0:0][0:0][130:130] [290:290]`

the order of the square bracket values is:

- `[time][level][lat][lon]`
- where lat is measured from the south pole (0) to NP (180)
- In units represented by the metadata descriptor file.
- (Use a “wget” and the URL in cron or a cgi-bin script provides needed values.)

Example for OLR:

Retrieving ascii from binary GRIB ulwrfssc (OLR) from NCEP

wget w/ OLR example

File (url): level, lat, lon (time is known using [Fn])

-- I need to know what variable I want and where in the given coordinate system:

ULWRFssc 1 level * surface Upward long wave flux [W/m²] (lat/lon)

-- and where the data is located (url):

<http://nomad2.ncep.noaa.gov:9090/dods/gdas/rotating/gdas2003092000/>

-- then pull an ascii value directly from grib binary using OPeNDAP constraint:

[.ascii?ulwrfssc\[0:1\]\[140:140\]\[200:200\]\](http://nomad2.ncep.noaa.gov:9090/dods/gdas/rotating/gdas2003092000/.ascii?ulwrfssc[0:1][140:140][200:200]\)

Returned by http:

256

This is ULWRFssc in W/m² !!!

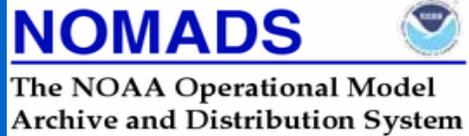
You can easily develop scripts

Imagine the power here for users of NWP data–

Data is extracted on the fly- without large expensive data ingest systems, no grib decoding necessary.

**One just gets the INFORMATION desired.
Many other examples freely avbl...**

All that's needed for forecast operations...?



Examples: Grads Script

*Initialize GrADS and get the latest available model run

```
'reinit' '!date -u +%y%m%d%H > dummy'
```

```
modeldate = read(dummy)
```

```
newdate = sublin(modeldate,2)
```

```
year = substr(newdate,1,2)
```

```
month = substr(newdate,3,2)
```

```
day = substr(newdate,5,2)
```

```
hour = substr(newdate,7,2) fhr = hour-2
```

```
'sdfopen http://nomads.ncdc.noaa.gov:9090/dods/NCDC\_NOAAPort\_RUC/20
```

```
'year month'/20'year month day'/ruc2_236_20'year month day'_ 'fhr'00_fff'
```

*Prepare the map

```
'set mpdset hires'
```

```
'set mproj scaled'
```

```
'set lat 25 45'
```

```
'set lon -95 -75'
```

```
'set grid off'
```

```
'set grads off'
```



NOMADS



The NOAA Operational Model
Archive and Distribution System

Examples: Grads Script

*Query the user for a variable to plot and display it prompt 'What variable would you like to display?'

```
' pull variable
```

```
'set t 2'
```

```
'd 'variable
```

```
*'run cbarn.gs'
```

```
'q time'
```

```
date = subwrd(result, 3)
```

```
hour = substr(date, 1, 3)
```

```
day = substr(date, 4, 2)
```

```
mon = substr(date, 6, 3)
```

```
iyр = substr(date, 9, 4)
```

```
'draw title RUC2 'variable' : 'hour' 'mon' 'day', 'iyр
```

```
'set t 1'
```

```
time='query time'
```

```
time
```

```
timea = substr(result, 8, 3)
```

```
timeb = substr(result, 11, 2)
```

```
timec = substr(result, 13, 3)
```

```
timed = substr(result, 16, 4)
```

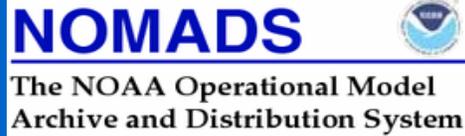
```
'draw string 0.25 0.40 Model run from '
```

```
'draw string 0.25 0.25 ' timea '-' timeb '-' timec '-' timed ''
```

```
'draw rec .19 .13 2.23 0.55 '
```

These two slides show the entire programming effort to obtain real-time RUC models and display or analyze that data!

Many scripts exist with a large Grads member Community and a growing Script library...



The GrADS Script Library

- The IGES/COLA GrADS Script Library

<http://grads.iges.org/grads/gadoc/gadocindex.html>

COLA → GRADS → Documentation → Index

“S” → “Script Library”

```

* January Mean 500 Height (1981 to 1989) minus (1990 to 1998)
* Mean & Standard Deviation for all 10 ensembles
* Time required: 60 secs
'reinit'
'!date'
* baseURL = 'http://motherlode.ucar.edu:9090/dods/_expr_'
* GKR 2/13/03 New NCAR URL
baseURL = 'http://dataportal.ucar.edu:9191/dods/'
expr = 'ave(z,t=387,t=483,12)-ave(z,t=495,t=591,12)'
xdim = '0:360'
ydim = '20:90'
zdim = '500:500'
tdim = '1nov1978:1nov1978'

```

At left is the complete script for generating mean and sdev at 500mb analyzing 18 years of “Climate of the 20th Century” over the Internet:

Traditional vs. NOMADS methods:

Data volume transported: 100Gb vs. 2Kb

Time to access data: 2 days vs. 60 sec

Code development: days vs. minutes

Fortran based LOC: 1000 vs. 50 LOC

```

'dfopen 'baseURL'_expr_{C20C/C20C_A}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_B}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_C}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_D}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_E}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_F}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_G}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_H}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_I}'{'xdim','ydim','zdim','tdim}'
'sdfopen 'baseURL'_expr_{C20C/C20C_J}'{'xdim','ydim','zdim','tdim}'

'define resa = result.1'
'define resb = result.2'
'define resc = result.3'
'define resd = result.4'
'define rese = result.5'
'define resf = result.6'
'define resg = result.7'
'define resh = result.8'
'define resi = result.9'
'define resj = result.10'
say 'got data'

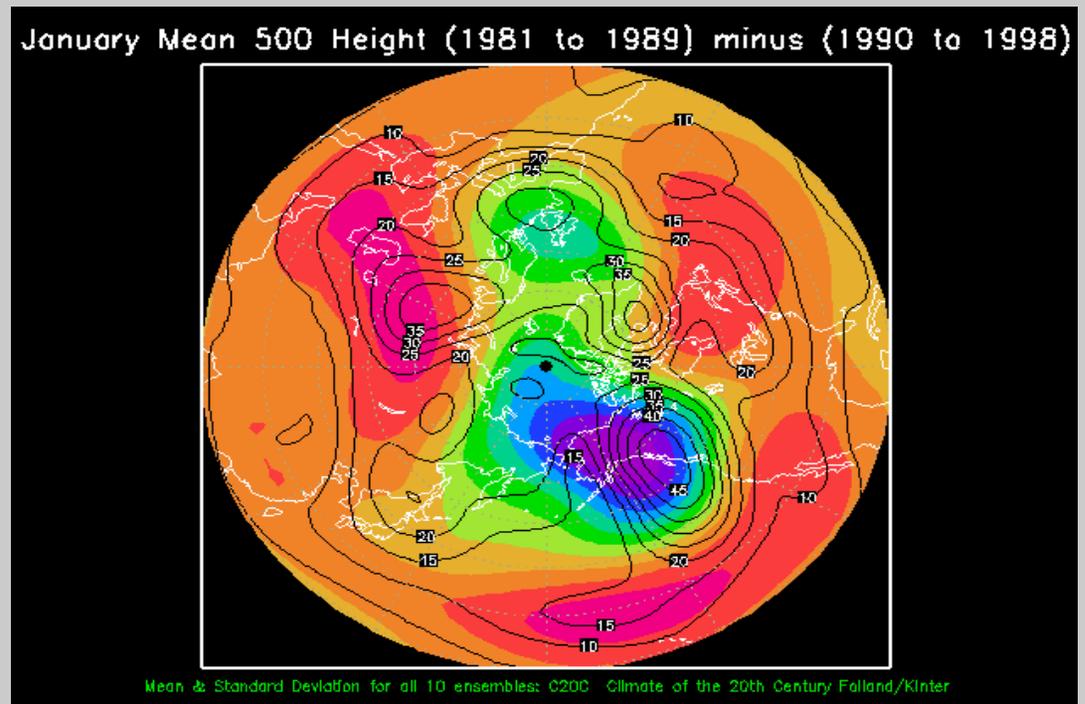
'set lev 500'
'set lat 20 90'

'define mean = (resa + resb + resc + resd + rese + resf + resg + resh + resi + resj)/10'

'define d1 = (pow(resa-mean,2)) ; 'define d2 = (pow(resb-mean,2))'
'define d3 = (pow(resc-mean,2)) ; 'define d4 = (pow(resd-mean,2))'
'define d5 = (pow(rese-mean,2)) ; 'define d6 = (pow(resf-mean,2))'
'define d7 = (pow(resg-mean,2)) ; 'define d8 = (pow(resj-mean,2))'
'define d9 = (pow(resi-mean,2)) ; 'define d10 = (pow(resj-mean,2))'
'define stddev = pow((d1 + d2 + d3 + d4 + d5 + d6 + d7 + d8 + d9 + d10)/10,0.5)

'set gxout shaded'
'set mproj nps'
'display mean'
'draw title January Mean 500 Height (1981 to 1989) minus (1990 to 1998)'
'set string 3 bc 1'
'draw string 5.5 .5 Mean & Standard Deviation for all 10 ensembles:
'C20C Climate of the 20th Century Folland/Kinter'
*cbarh'
'set gxout contour'
'set ccolor 0'
'display stddev'
'!date'

```



MATLAB: A Commercial Client

- `server='nomad2:9090';`
- `directory='/dods/gdas/rotating/'; fext='ascii';`
- `model='gdas'; datestr='YYYYMMDDHH'; varname='hgt';`
- `varlevs='1';`
- `Arrc=[['t1','t2'],['nlev1','nlev2'],['ilat1','ilat2'],['ilon1','ilon2']];`
- `urlstring=[http://',server,directory,model,datestr,'.',fext,'?',varname,a`
`rrc];`
- `url = java.net.URL(urlstring); % connect to web page`
- Try
 - `stream = openStream(url)`
 - `ireader = java.io.InputStreamReader(stream);`
 - `breader = java.io.BufferedReader(ireader);`
- `Line = readLine(breader); disp(line);`

Unidata's IDV & NOMADS Access

Data selector

File Edit Displays Data Help

Data sources: Formulas
dods://nomads.ncdc.noaa.gov:9090

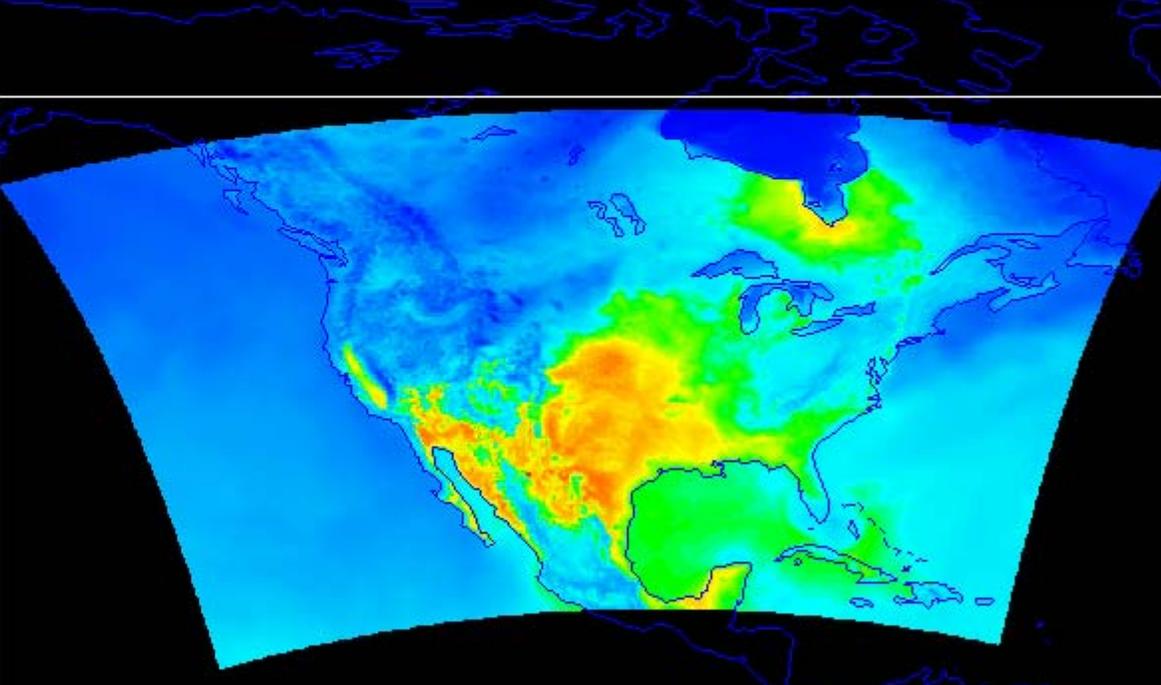
Fields: 2D grid
convective available po

Displays: Contour Plan view
Color-Filled Contour Plan View

Unidata IDV

File Edit Displays Data Help

View Maps 2003-06-24 00:00:00Z



#1 12m Color-Shaded Plan View 272.6 314.9

Memory: 30.49/51.93 MB (58%) Latitude: 42.7 Longitude: -149.2 Altitude: -8568.5 m

Data source selection

Files/Urls Gridded data Image data Radar Data Point

Data source type: Default

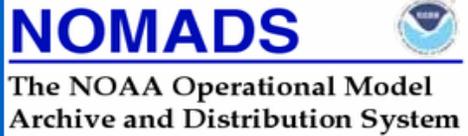
Look in: glenn.rutledge

- .java
- .jpi_cache
- .metapps
- Application Data
- Cookies
- Desktop
- Favorites
- Ire

File name:

Files of type: All Files (*.*)

Url: http://nomads.ncdc.noaa.gov:9090/dods/NCDC_NOAAP

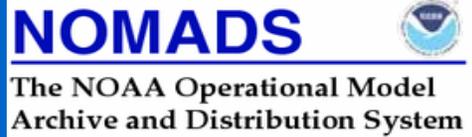


National Digital Forecast Database

- **Value added retailers who make value added products can use NOMADS GDS to get the meteorological data they need without downloading entire files.**
- **Users (forecasters) of NDFD can create their own products using GDS server accessing only data they need. No need for image generation of ensembles...**
- **GDS reduces the bandwidth needed to create products in weather service operations.**
- **For internet-2 bandwidth, servers at Regional Centers can distribute data to WFO's for their operations.**



Value Added Products (cont.)



Ensemble Probabilities

TODAY is: 2004, 08, 13

Please select :

STATION NAME

ASHEVILLE_MUNICIPAL NC US

STATION Latitude: 35.43 STATION Longitude: -82.55

Date (HR/DD/MM/YY)GMT

08 | 13 | 08 | 04

Cycle

00z

Create an event:

Temperature:

Notes: you can create a temperature event by giving a lowest temperature or a highest temperature or a range of temperature. For example, for freezing event, giving lowest temperature lower than 32F and do not check the highest temperature.

Lowest TEMP: Higher than UNIT: K

Highest TEMP: Higher than UNIT: K

Precipitation

Higher than 1 mm/day

Wind Speed

Higher than UNIT: m/sec

Click YES to show URL query for ensemble members:

- NO
- YES

<http://nomad3.ncep.noaa.gov/cgi-bin/var/ensprob1.pl>

Event Probability

Reset

Ensemble Probabilities: a demo (cont.)

TODAY is: 2004, 08, 13 The station is: ASHEVILLE_MUNICIPAL NC US

Lat: 35.43 N, Lon:-82.55 W

FORECAST: 12 Z, aug 13, 2004

Event:

Precipitation, gt 1 mm/day

member=c0

URL is: [http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040813/ensc0_00z_1x1.ascii?pratesfc\[2:2\]\[125:125\]\[277:277\]](http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040813/ensc0_00z_1x1.ascii?pratesfc[2:2][125:125][277:277])
rainmem=1.3824

member=n1

URL is: [http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040813/ensn1_00z_1x1.ascii?pratesfc\[2:2\]\[125:125\]\[277:277\]](http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040813/ensn1_00z_1x1.ascii?pratesfc[2:2][125:125][277:277])
rainmem=1.0368

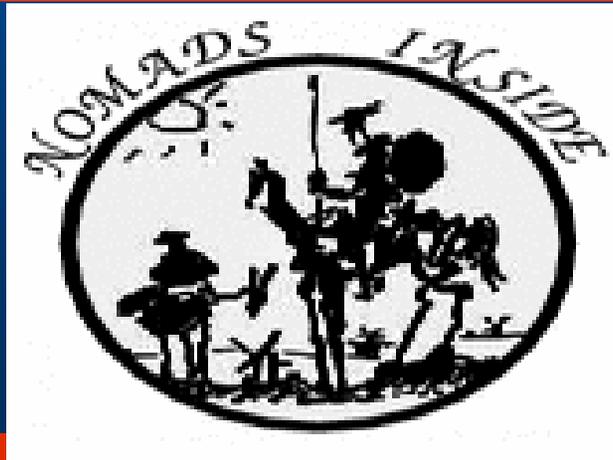
member=n2

...



NOMADS: OPeNDAP Enabled *Portals*

CDC:	http://www.cdc.noaa.gov/cgi-bin/nph-nc/Datasets/
COLA:	http://cola8.iges.org:9090/dods
FSL:	http://nomads.fsl.noaa.gov/
GFDL:	http://nomads.gfdl.noaa.gov/
NCDC:	http://nomads.ncdc.noaa.gov/
NCEP:	http://nomad1.ncep.noaa.gov/
Unidata:	http://www.unidata.ucar.edu/cgi-bin/dods/datasets/





NOMADS



The NOAA Operational Model
Archive and Distribution System

For more information...

- For more Program Information see:
<http://www.ncdc.noaa.gov/oa/climate/nomads/nomads.html>
- To get data:
NOAA NCDC Main Page → Climate → *Model Resources*
<http://nomads.ncdc.noaa.gov>
- Or contact:
Glenn.Rutledge@noaa.gov

Selected Publications:

<http://www.ncdc.noaa.gov/oa/model/publications/publications.html>

Live Demo and Questions...