Latest Developments on the Live Access Server

Steve Hankin - NOAA/PMEL

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Looking for another	**Suggestions?**
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Joe Sirott	
Richard Rogers	
Jerry Davison	

Funded by:
- NOAA
- NASA
- US Navy
- NSF
- NOPP

Ver. 1.0 – 1994

I hate outlines

- Review
- What's new
- What's next

Review

Def init ion

Main Entry: **L· A· S**
Pronunciation: 'el-ay-es
Function: noun

1. a configurable product server for 1 to 4D geo-science datasets

Merriam-Webster Dictionary
2005 Hankin edition

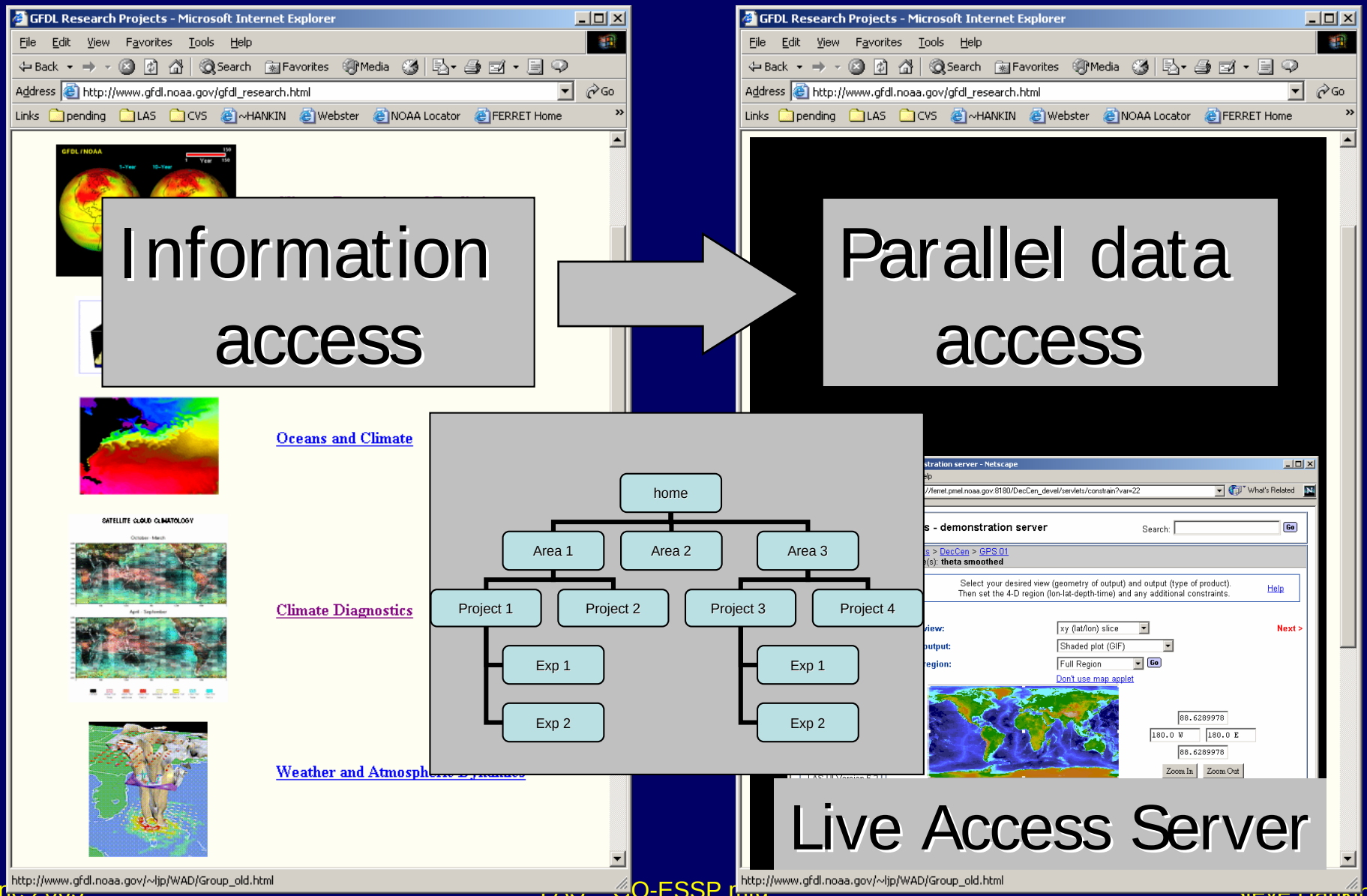
Review

"Configurable":

- Information hierarchy
- Variables and products
- User Interface
- Sister servers

Architecture basics

A science “home page”

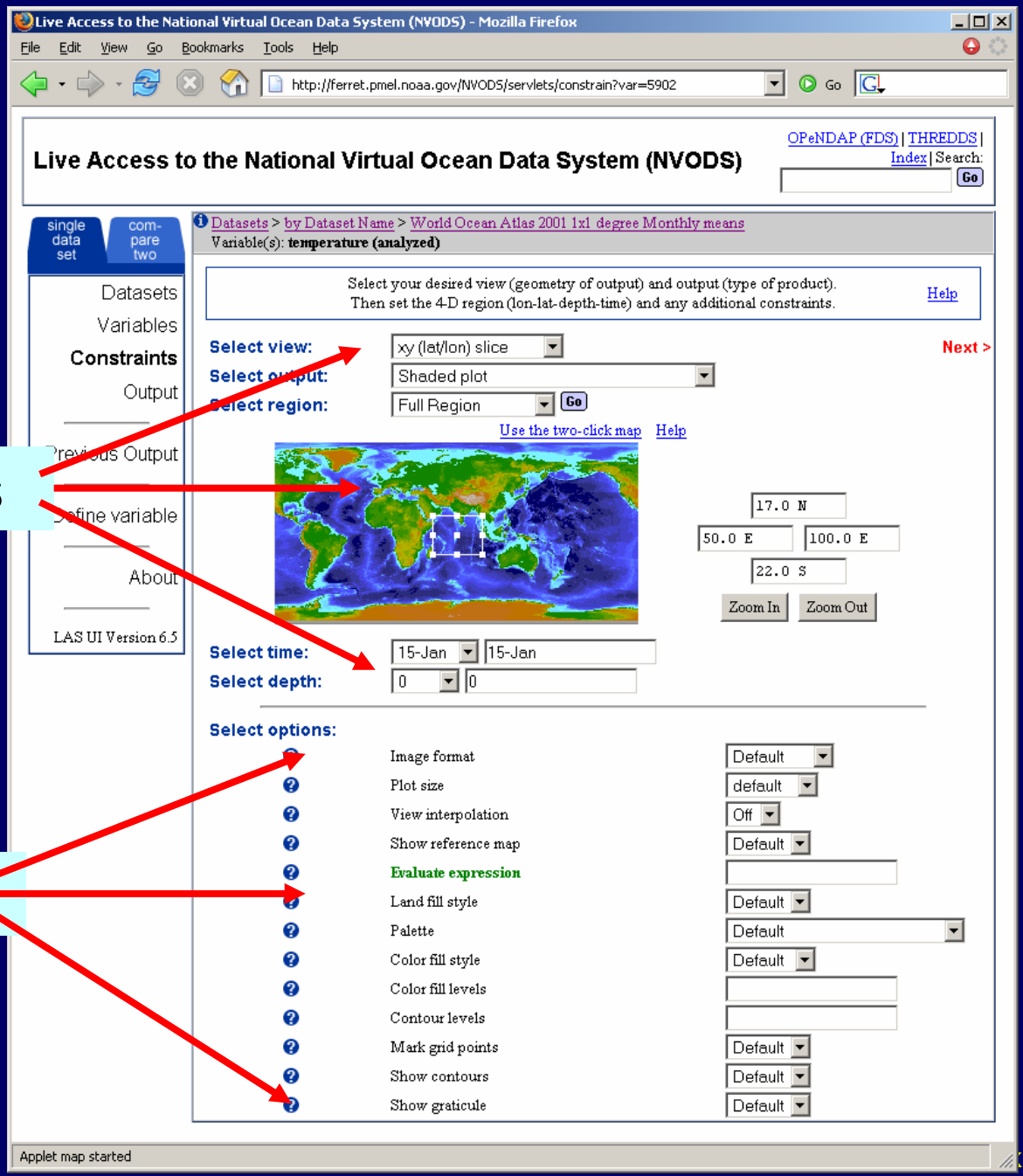


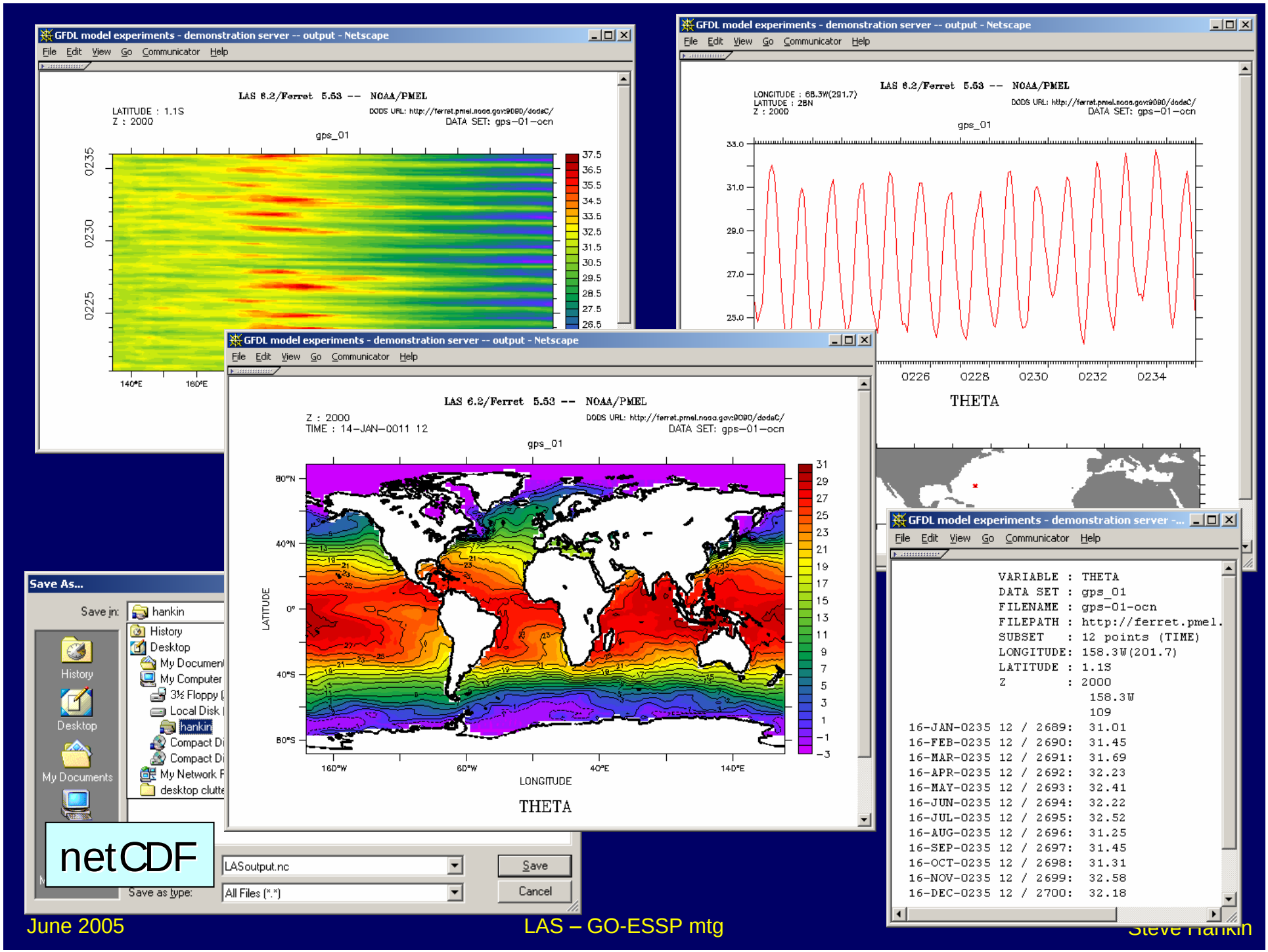
Information hierarchy: NVODS LAS as an example

A typical "main" window of the user interface

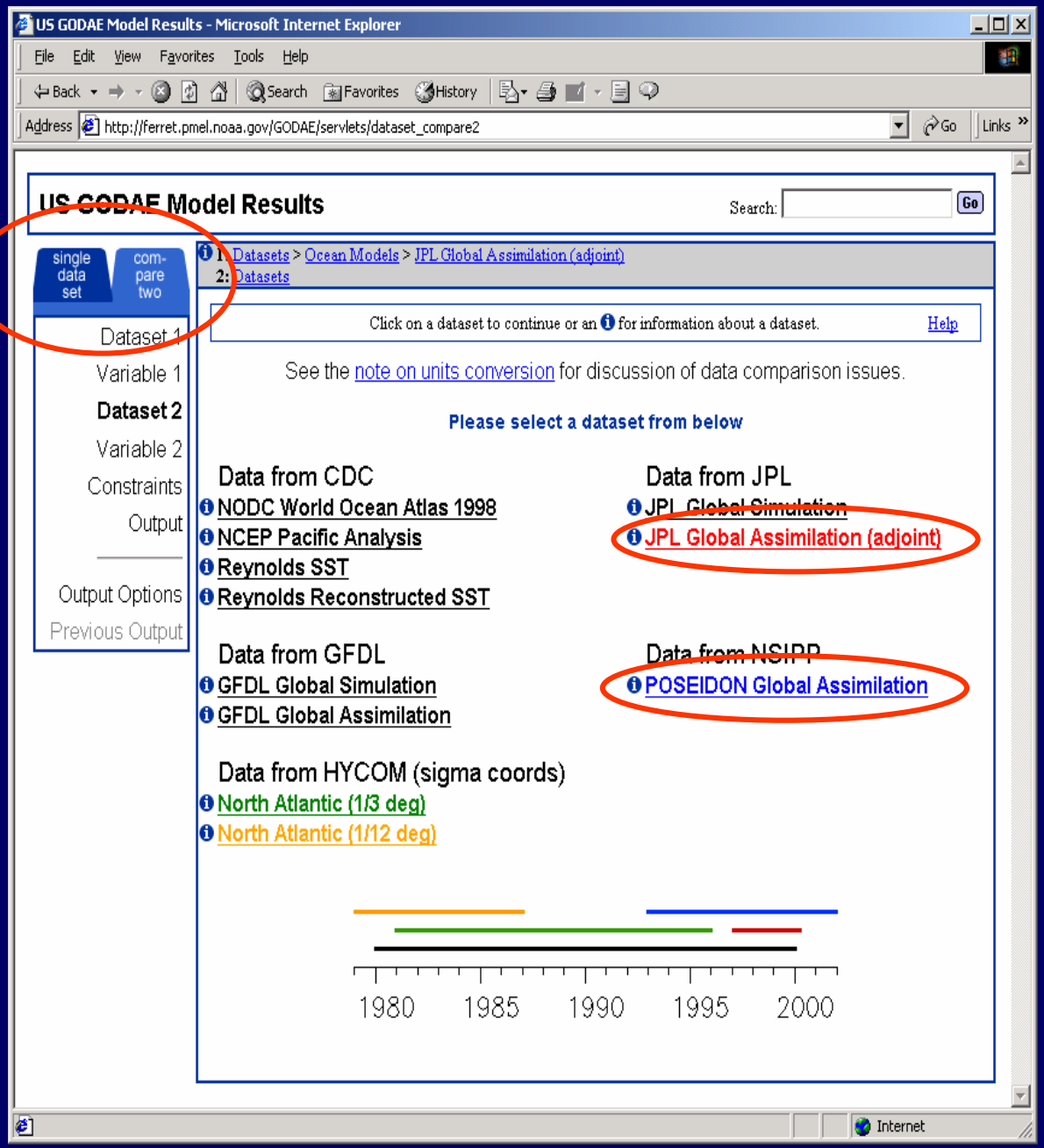
basic constraints

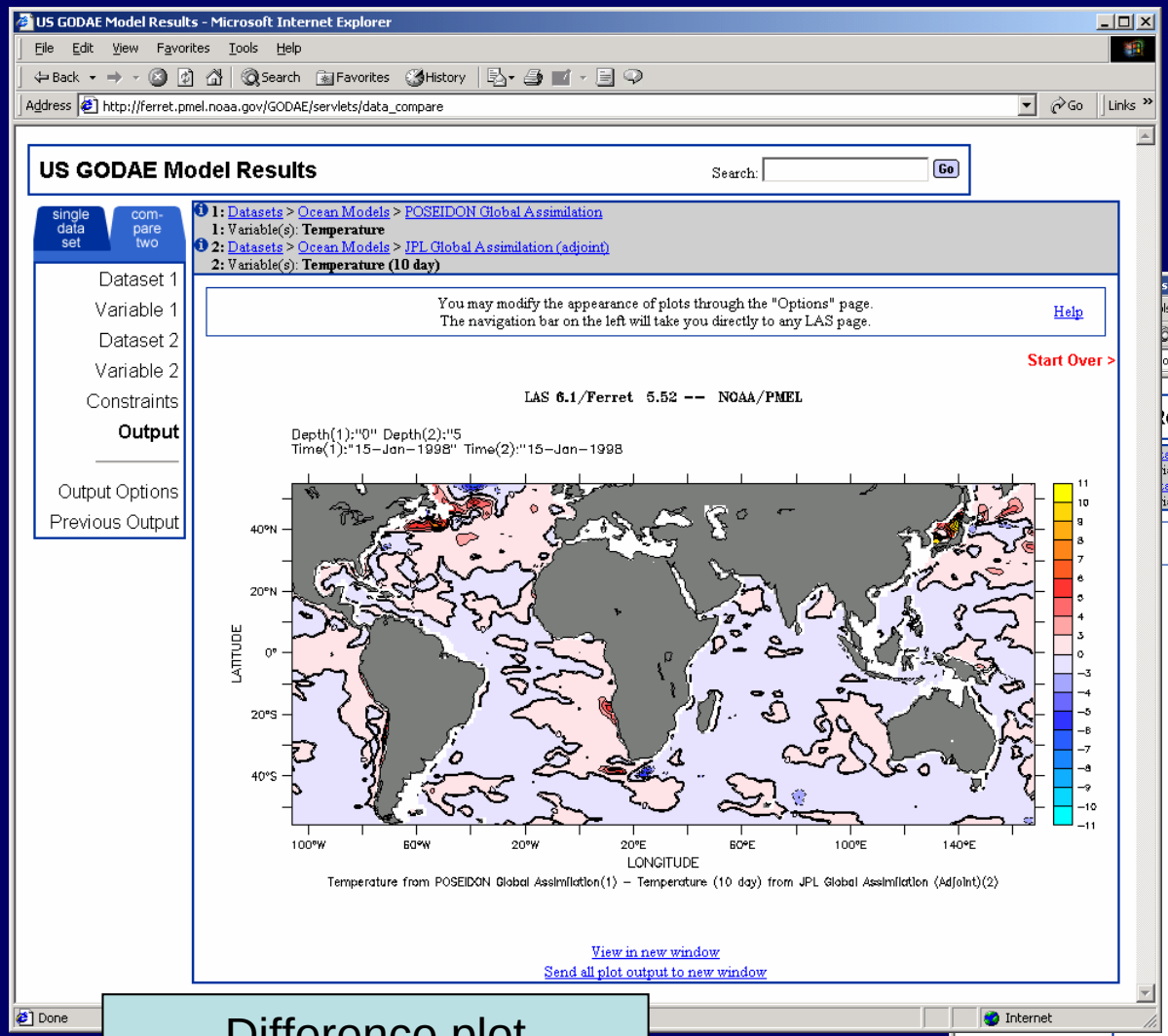
configurable options

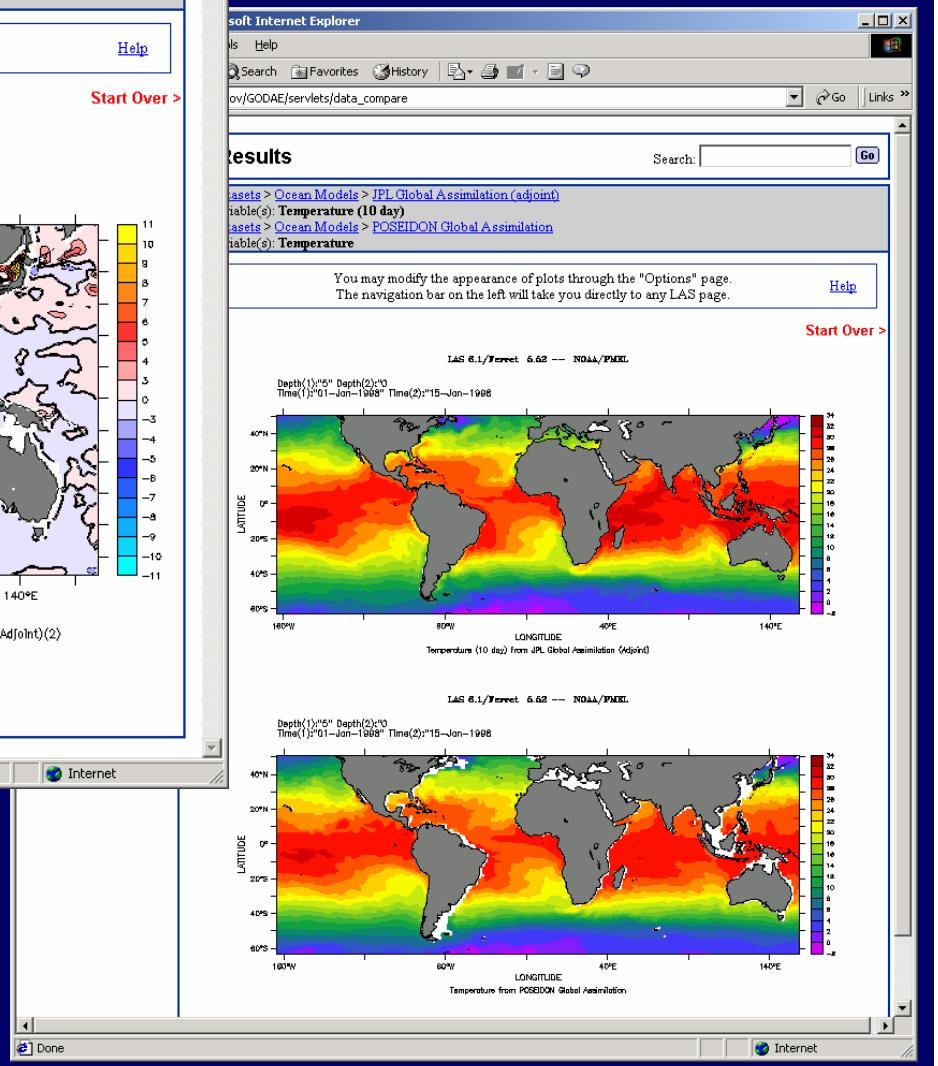



GFDL model experiments - demonstration server -- output - Netscape
File Edit View Go Communicator Help
LAS 6.2/Ferret 5.53 -- NOAA/PMEL
LATITUDE : 1.1S
Z : 2000
DODS URL: http://ferret.pmel.noaa.gov:9090/dodsC/
DATA SET: gps-01-ocn
gps_01
0235
0230
0225
140°E
160°E
37.5
36.5
35.5
34.5
33.5
32.5
31.5
30.5
29.5
28.5
27.5
26.5
LONGITUDE : 68.3W(291.7)
LATITUDE : 2BN
Z : 2000
33.0
31.0
29.0
27.0
25.0
0226
0228
0230
0232
0234
THETA
Z : 2000
TIME : 14-JAN-0011 12
80°N
40°N
0°
40°S
80°S
LATITUDE
160°W
60°W
40°E
140°E
LONGITUDE
31
29
27
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
Save As...
Save in:
hankin
History
Desktop
My Documents
My Computer
3½ Floppy
Local Disk
Compact Di
My Network F
desktop clutte
LASoutput.nc
Save as type:
All Files (*.*)
Save
Cancel
VARIABLE : THETA
DATA SET : gps_01
FILENAME : gps-01-ocn
FILEPATH : http://ferret.pmel.
SUBSET : 12 points (TIME)
LONGITUDE: 158.3W(201.7)
LATITUDE : 1.1S
Z : 2000
158.3W
109
16-JAN-0235 12 / 2689: 31.01
16-FEB-0235 12 / 2690: 31.45
16-MAR-0235 12 / 2691: 31.69
16-APR-0235 12 / 2692: 32.23
16-MAY-0235 12 / 2693: 32.41
16-JUN-0235 12 / 2694: 32.22
16-JUL-0235 12 / 2695: 32.52
16-AUG-0235 12 / 2696: 31.25
16-SEP-0235 12 / 2697: 31.45
16-OCT-0235 12 / 2698: 31.31
16-NOV-0235 12 / 2699: 32.58
16-DEC-0235 12 / 2700: 32.18
netCDF

Compare variables from different datasets

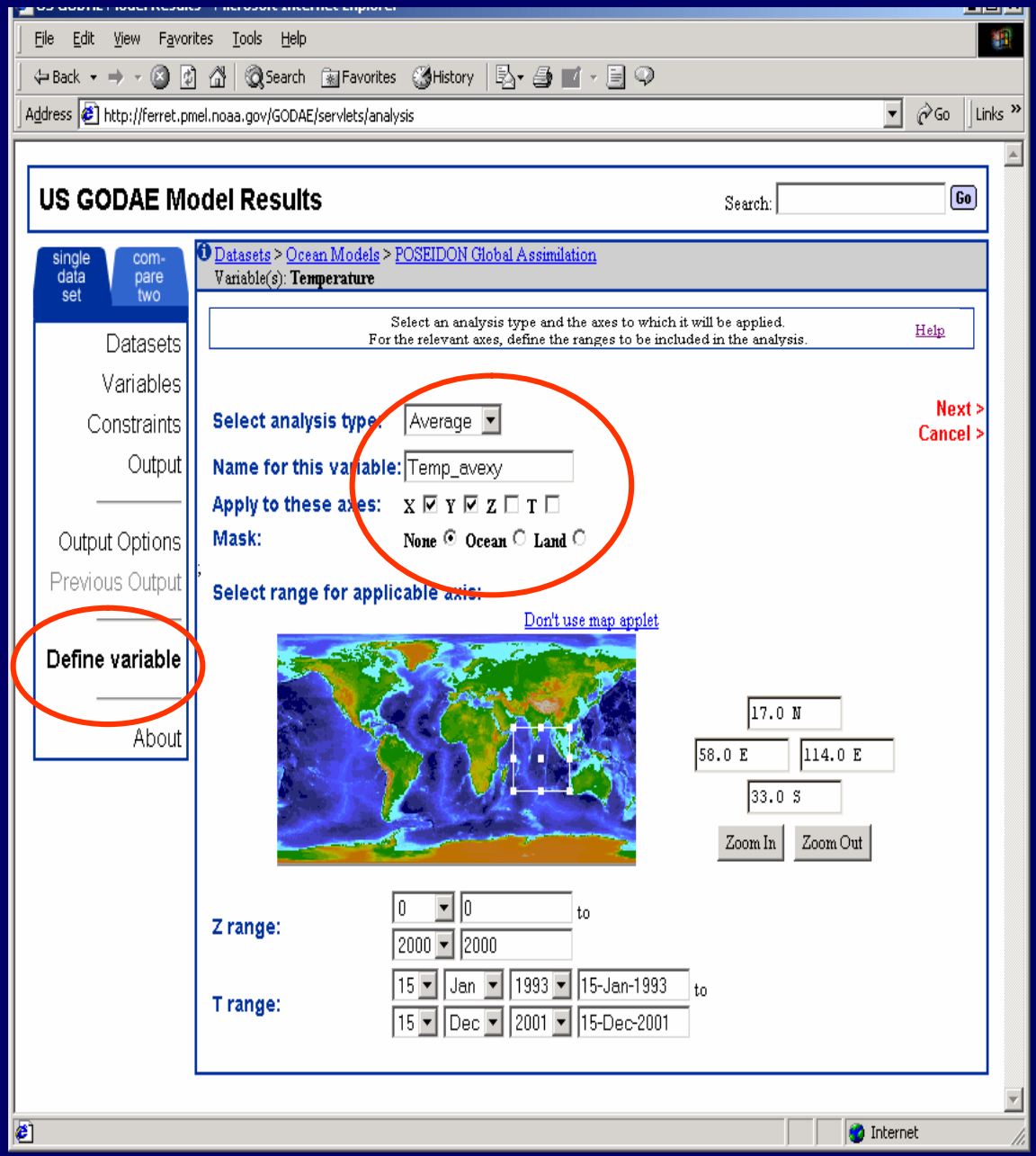






Difference plot
(regridding as required)

Compute simple analyses



File Edit View Favorites Tools Help

Back Search Favorites History

Address http://ferret.pmel.noaa.gov/GODAE/servlets/data Go Links

US GODAE Model Results

Search: Go

single data set | com-pare two

Datasets
Variables
Constraints
Output

Output Options
Previous Output

Define variable

About

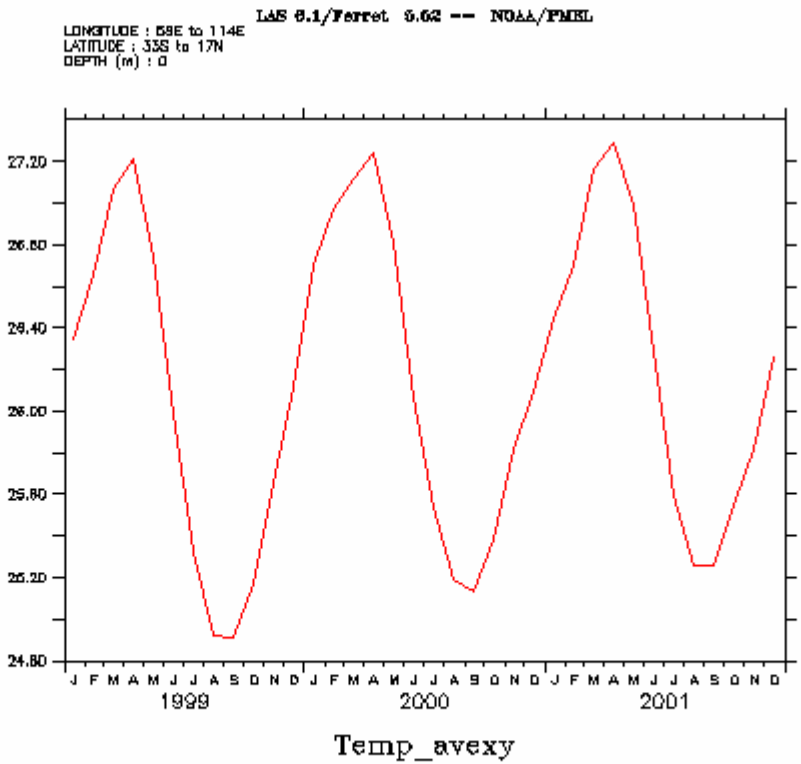
Datasets > Ocean Models > POSEIDON Global Assimilation

Variable(s): **Temp_avexy (from Temperature.ave(x=58.0:114.0)ave(y=-33.0:17.0))**

You may modify the appearance of plots through the "Options" page.
The navigation bar on the left will take you directly to any LAS page.

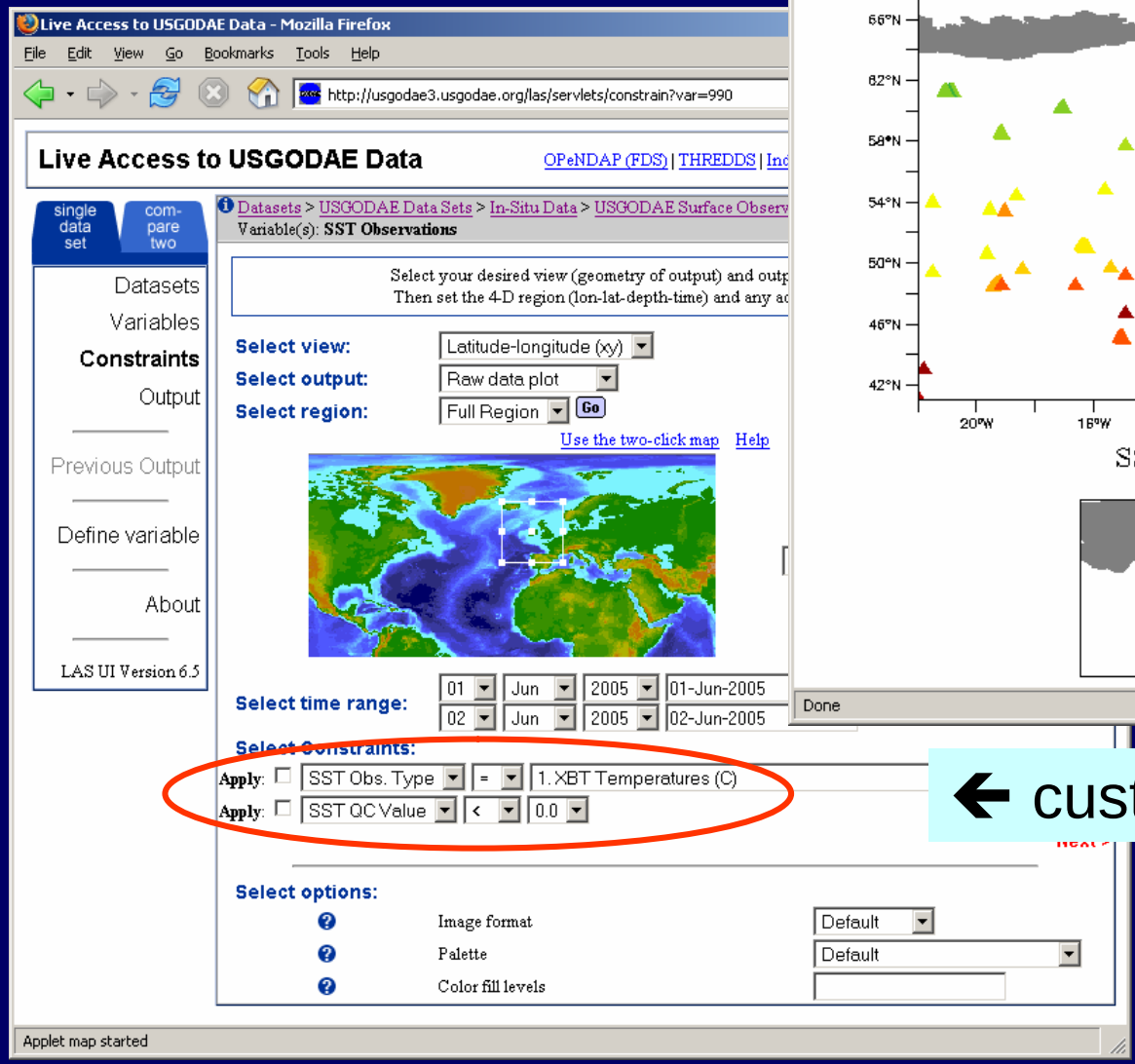
Help

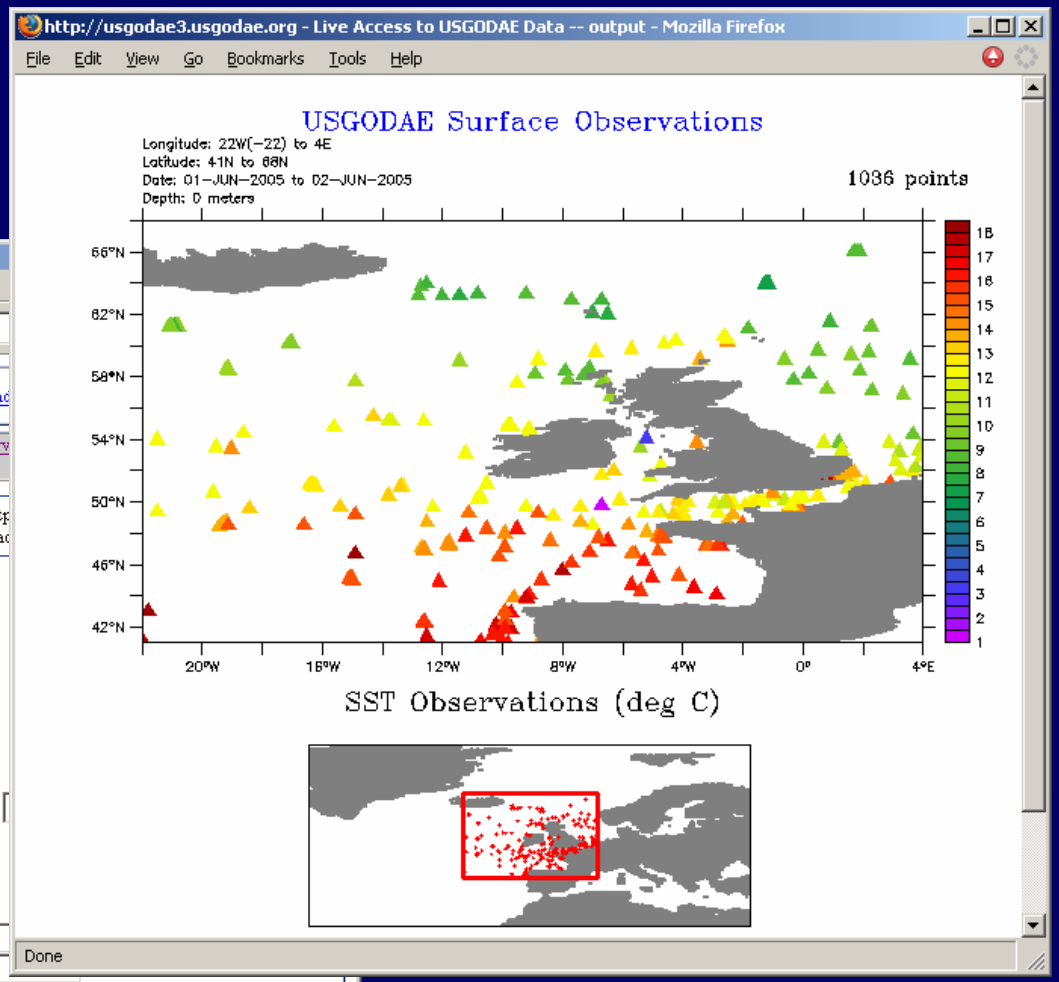
Start Over >



Done Internet

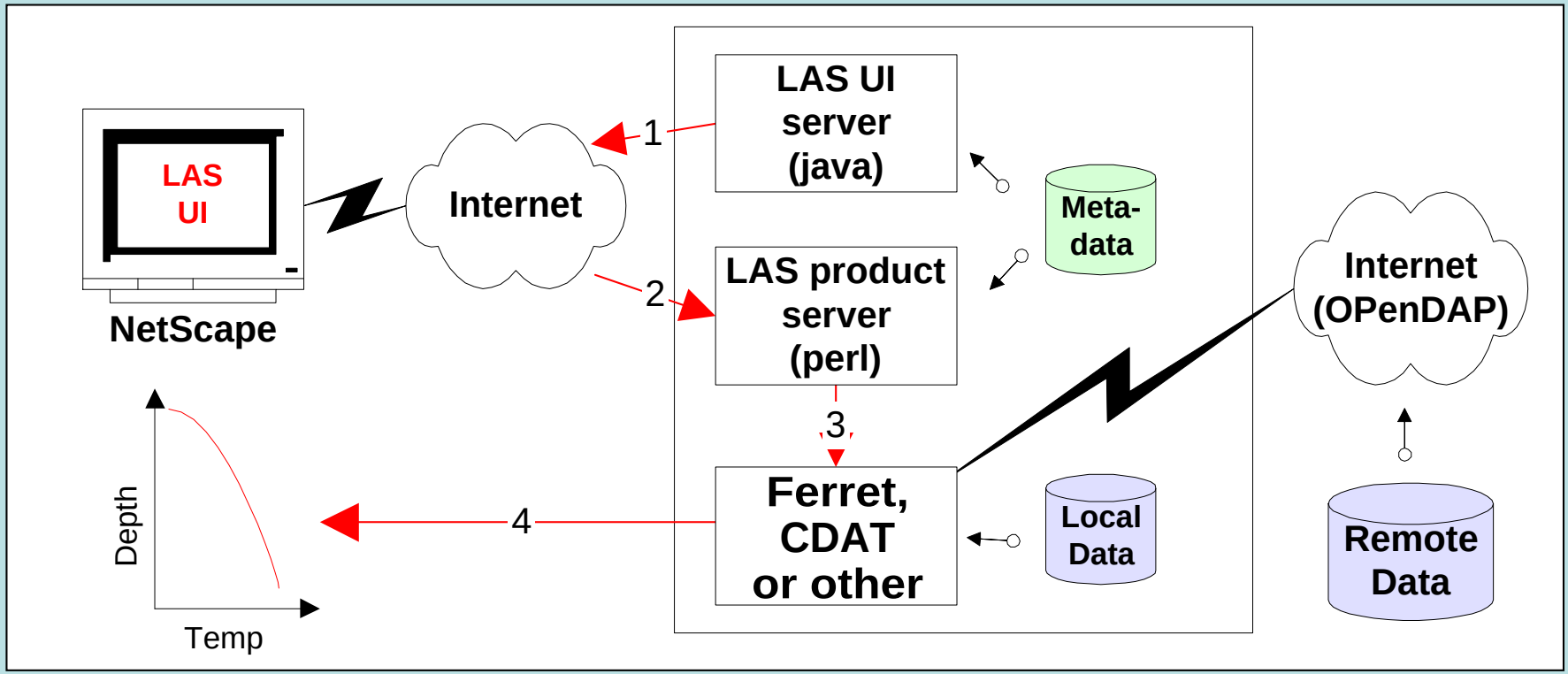
In-situ observations



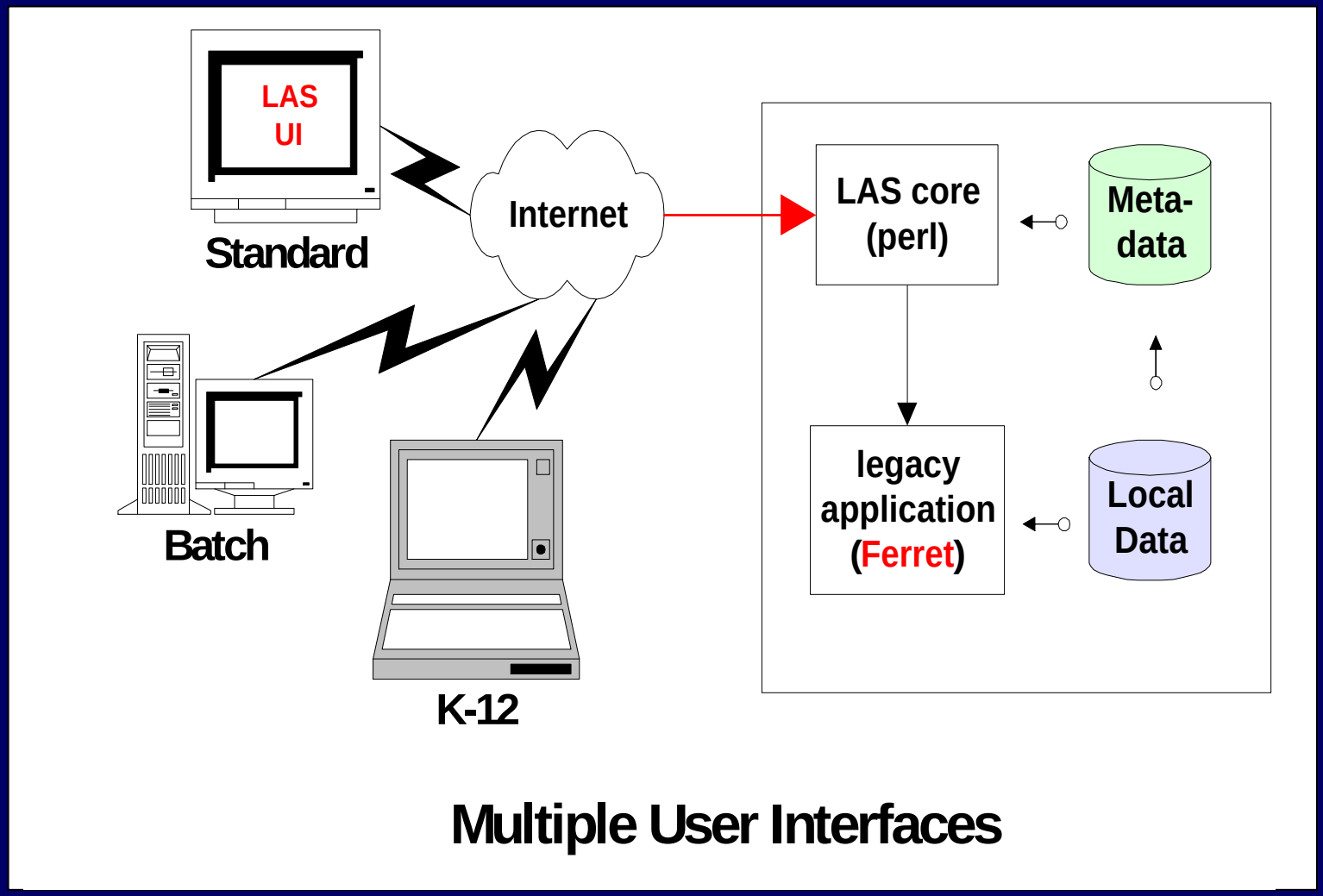


← custom "constraints"

LAS -- an "Information Product Server"

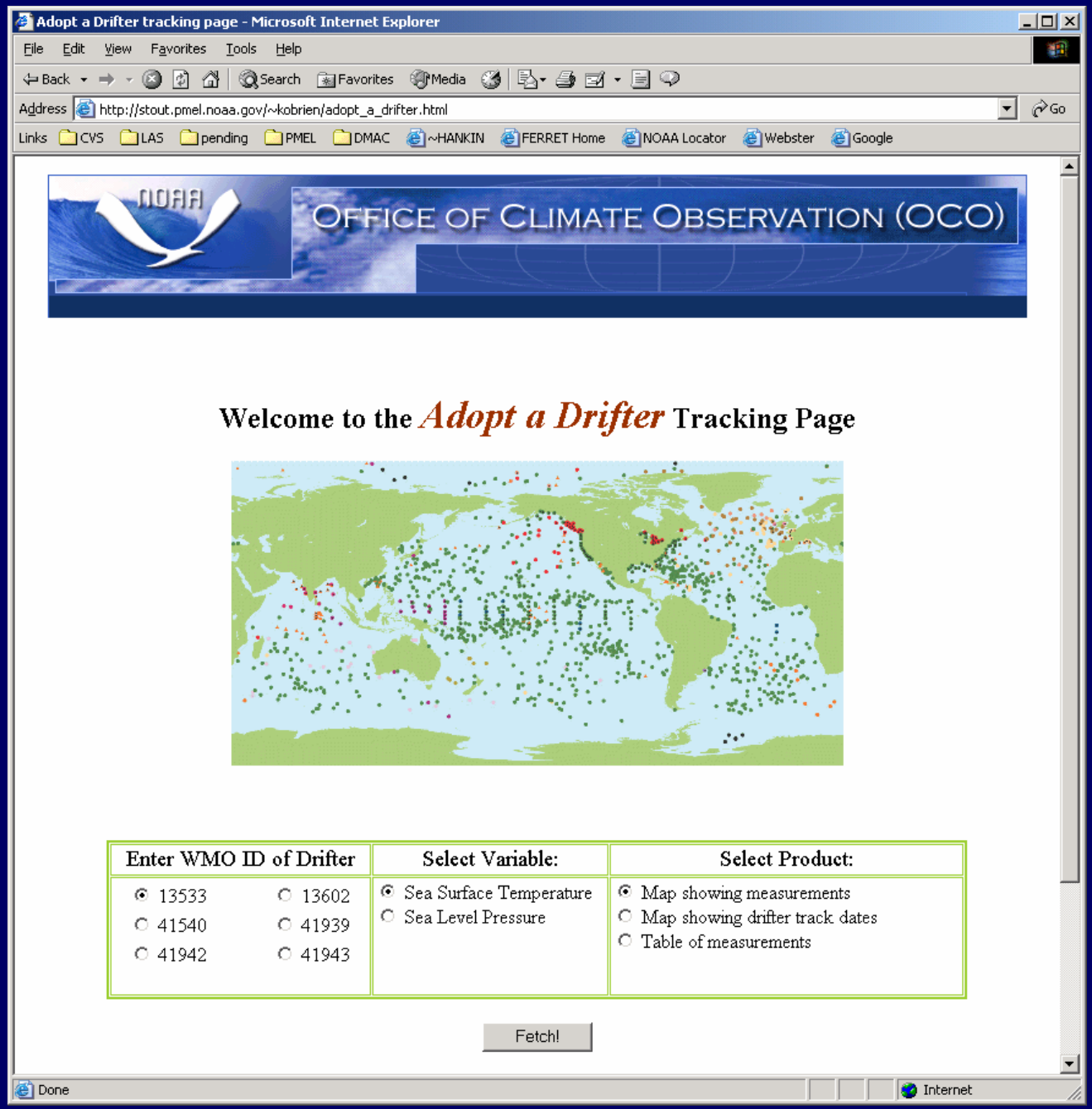


- XML Metadata contains the "intelligence"
- Back end applications do the real work
- OPeNDAP provides remote data access



The UI talks to LAS through an XML "web service"

radical custom UIs: e.g. for K-12 students



(LAS v6.5 includes a JavaScript API)

"Scripted" access to LAS

Query available data sets:

```
>lasls http://cpu/LAS
```

Query variables in data set "model_1":

```
>lasls http://cpu/LAS  model_1
```

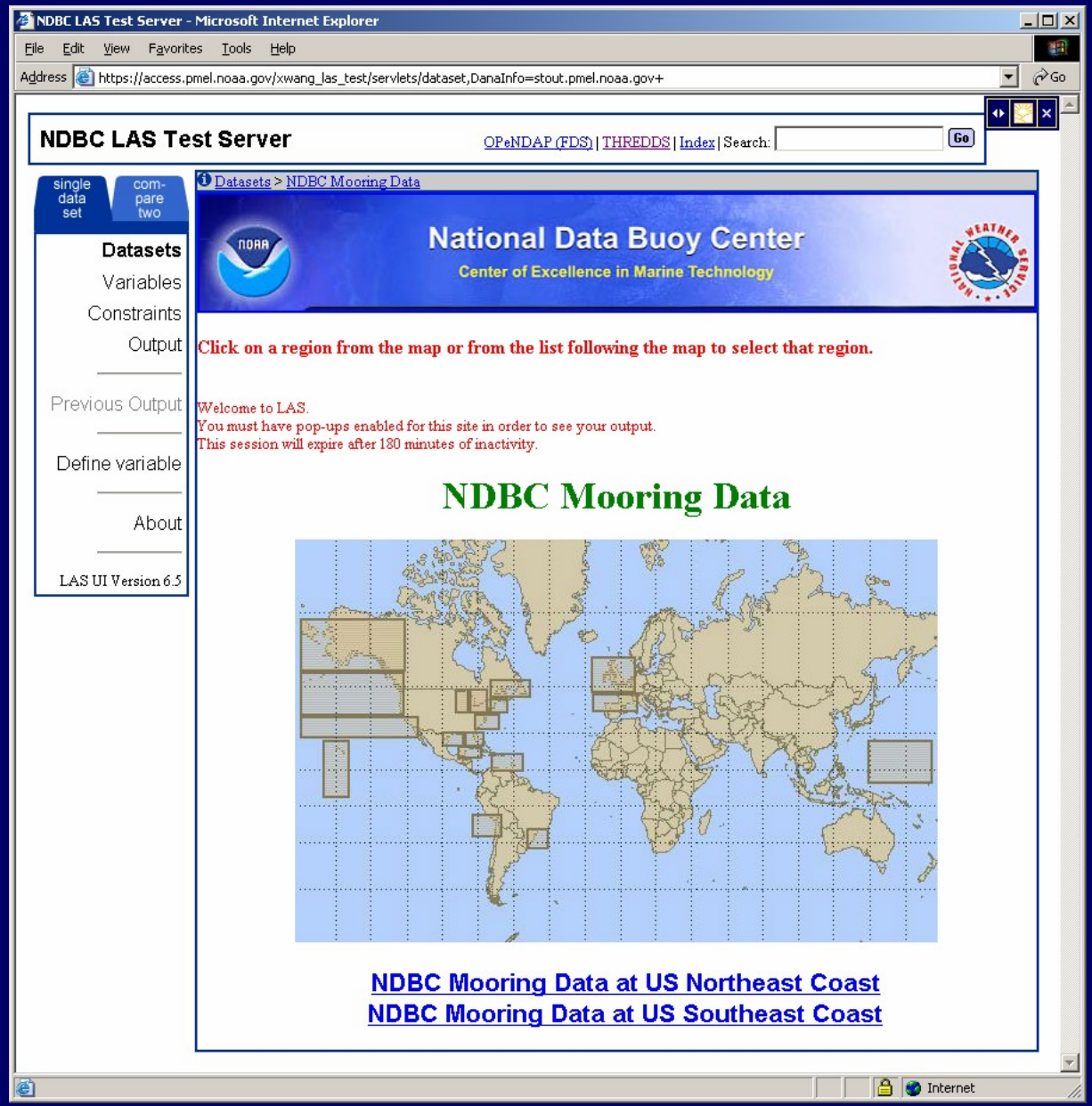
Query space-time domain:

```
>lasls http://cpu/LAS  model_1  sst
```

Request a subset of data as a file: ("asc" for ASCII format)

```
>lasget  -x 20:60  -y 20:60  -t 11-Dec-2000  -f asc
       http://cpu/LAS  model_1 sst
```

Custom-ized UIs: variations on familiar look and feel



I hate outlines

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LAS and THREDDS

THematic **R**ealtime **E**nvironmental **D**istributed **D**ata **S**ervices
(from Unidata)

-- an XML summary of a data collection --

1. LAS can generate a THREDDS catalog
2. LAS will auto-configure from a THREDDS catalog

THREDDS output

GFDL Data Portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

GFDL Data Portal OPeNDAP (FDS) | THREDDS | Index Search: Go

single data set | com-pare two

Datasets > GFDL Data portal

Welcome to LAS.
You must have pop-ups enabled for this site in order to see your output.
This session will expire after 180 minutes of inactivity.

Datasets
Variables
Constraints

Click on a dataset to continue or an ℹ for information about a dataset. Help

Welcome to the GFDL Data Portal

http://data1.gfdl.noaa.gov:8380/DataPortal/servlets/thredds - Microsoft Internet Explorer


```
<?xml version="1.0" ?>
- <catalog name="LAS THREDDS Inventory Catalog" version="1.0"
    xmlns="http://www.unidata.ucar.edu/namespaces/thredds/InvCatalog/v1.0"
    xmlns:xlink="http://www.w3.org/1999/xlink">
  - <dataset name="Pacific Marine Environmental Lab">
      <service name="las.xml"
        base="http://data1.gfdl.noaa.gov/DataPortal-FDS/LAS/"
        serviceType="DODS" />
    - <dataset name="AMIP 12b Exp 01">
        <dataset name="evaporation rate"
          urlPath="amip_12b_01all_nc/evap" serviceName="las.xml" />
        <dataset name="height" urlPath="amip_12b_01all_nc/hght"
          serviceName="las.xml" />
        <dataset name="LW flux down at surface"
          urlPath="amip_12b_01all_nc/lwdn_sfc"
          serviceName="las.xml" />
        <dataset name="LW flux up at surface"
          urlPath="amip_12b_01all_nc/lwup_sfc"
          serviceName="las.xml" />
        <dataset name="meridional wind component"
          urlPath="amip_12b_01all_nc/vcomp" serviceName="las.xml" />
        <dataset name="meridional wind stress"
          urlPath="amip_12b_01all_nc/tau_y" serviceName="las.xml" />
        <dataset name="omega vertical velocity"
          urlPath="amip_12b_01all_nc/omega" serviceName="las.xml" />
        <dataset name="sea level pressure"
          urlPath="amip_12b_01all_nc/slp" serviceName="las.xml" />
        <dataset name="specific humidity"
          urlPath="amip_12b_01all_nc/sphum" serviceName="las.xml" />
        <dataset name="SW flux up at surface"
          urlPath="amip_12b_01all_nc/swup_sfc"
          serviceName="las.xml" />
        <dataset name="temperature" urlPath="amip_12b_01all_nc/temp"
          serviceName="las.xml" />
```


LAS Help - Netscape

THREDDS Catalog

The THREDDS project is bridging the gap between data providers and data users.

A THREDDS catalog is available from each LAS installation (6.5 and above) by connecting to the same URL as the LAS, but substituting **thredds** for **dataset** in the URL.

Clicking here will deliver an XML THREDDS catalog. You can copy the link location by right clicking the link and selecting **Copy Link Location**, **Copy Shortcut** or a similar option. Paste the URL of the catalog into your favorite THREDDS client to use the data sets installed in this LAS in that client. Clicking the THREDDS XML Catalog link may result in a blank page in the Web browser. View the page source to see the XML document.

1. LAS can generate a THREDDS catalog
2. LAS will auto-configure from a THREDDS catalog

"addXML" == LAS utility to configure data sets

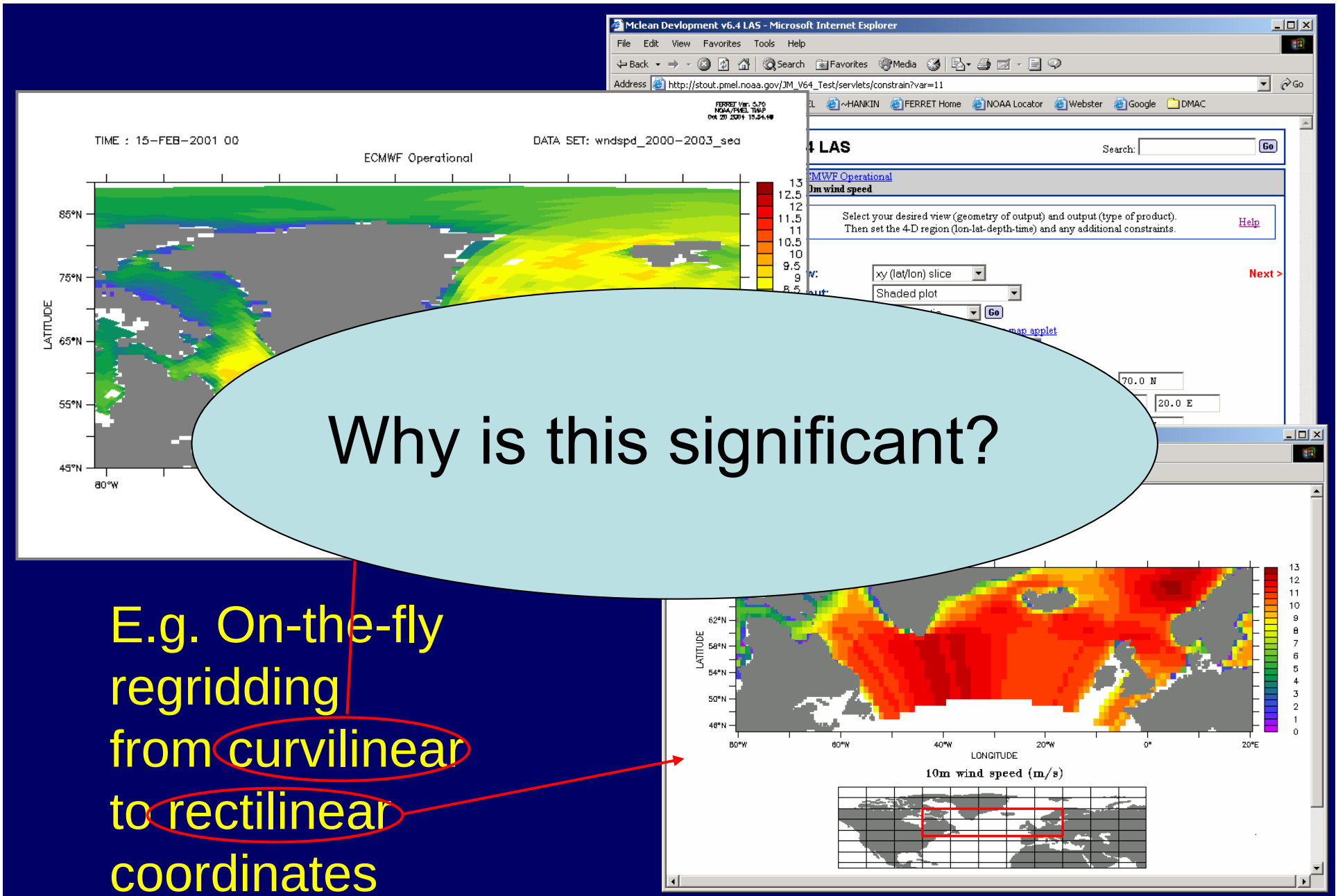
Point addXML at a THREDDS catalog and you get an LAS to access that catalog. E.g. for

- OPeNDAP servers
- GDS and Unidata aggregation servers
- Other LAS servers

LAS and OPeNDAP

FDS = "Ferret Data Server"

- OPeNDAP output for LAS-served data
- Built on 'Anagram' Java framework
  (like "GDS" -- from C.O.L.A.)

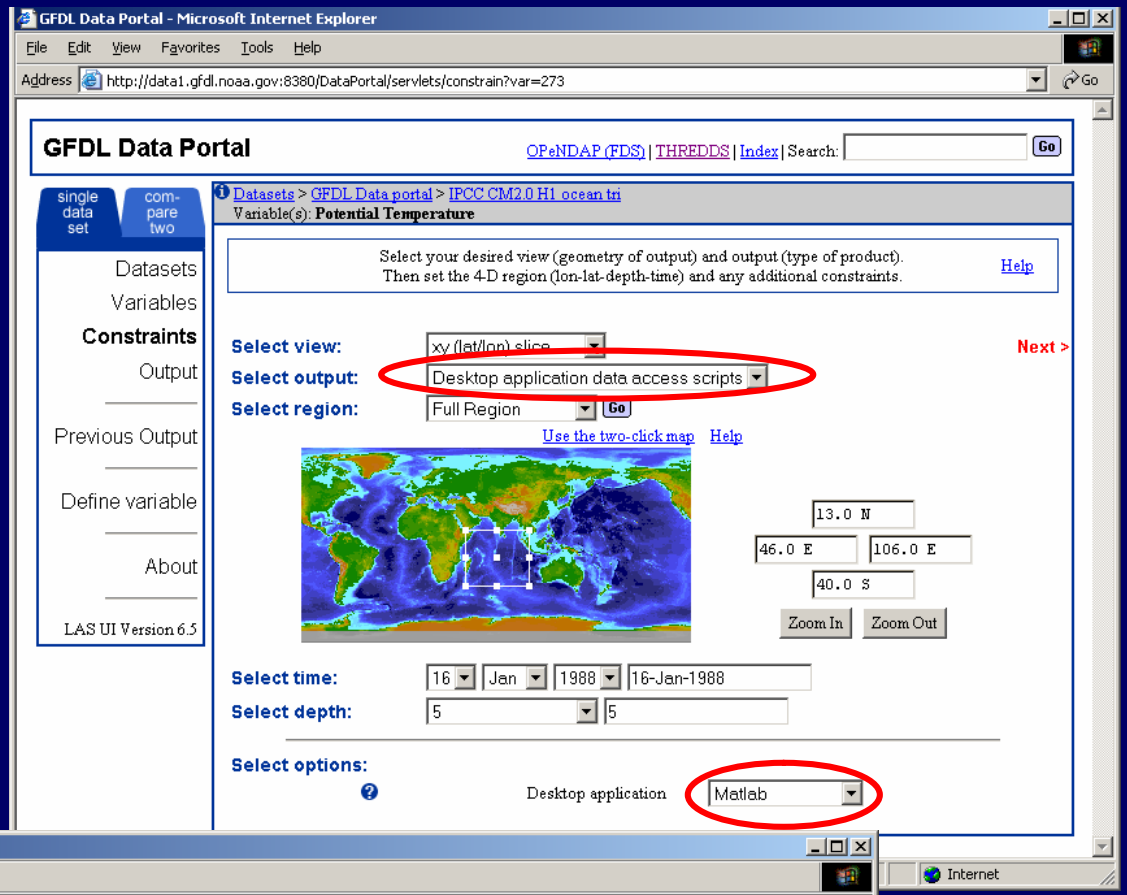


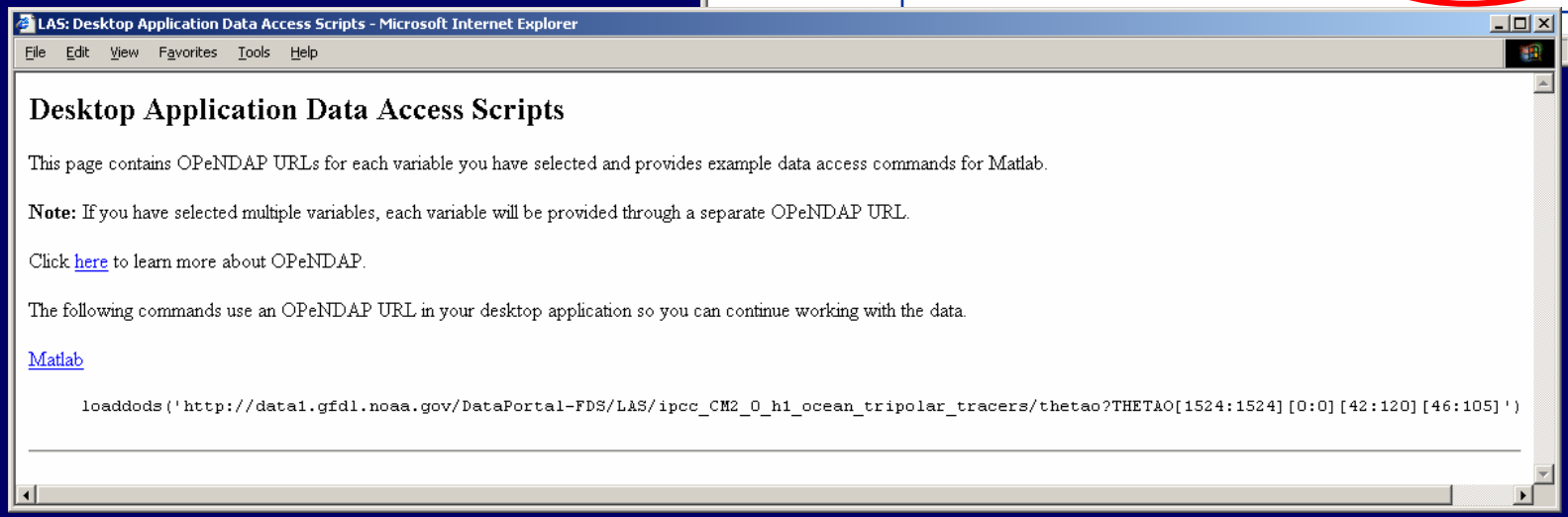
Why is this significant?

E.g. On-the-fly regridding from curvilinear to rectilinear coordinates

FDS serves this rectilinear "view" through OPeNDAP

LAS browsing can be continued at the desktop





Continuing at the desktop …

Open the remote dataset (“foo”) like any filename

http://server/FDS/foo

FDS provides server-side analyses:

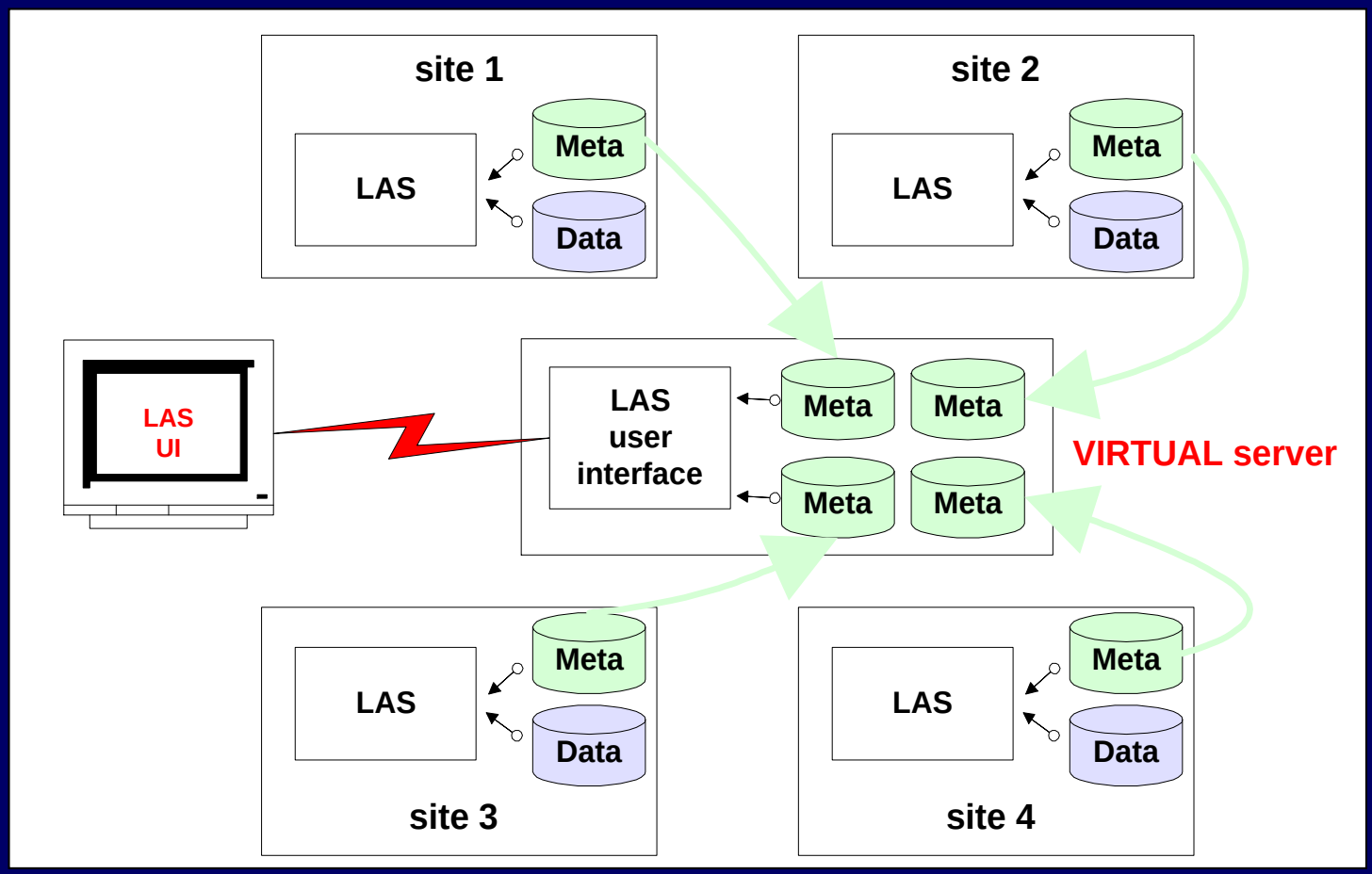
(Z-average of “TEMP”)

http://server/FDS/_expr_{foo}{Tave=TEMP[Z=@AVE]}

FDS employs “delayed analysis”

– the whole dataset appears to be transformed

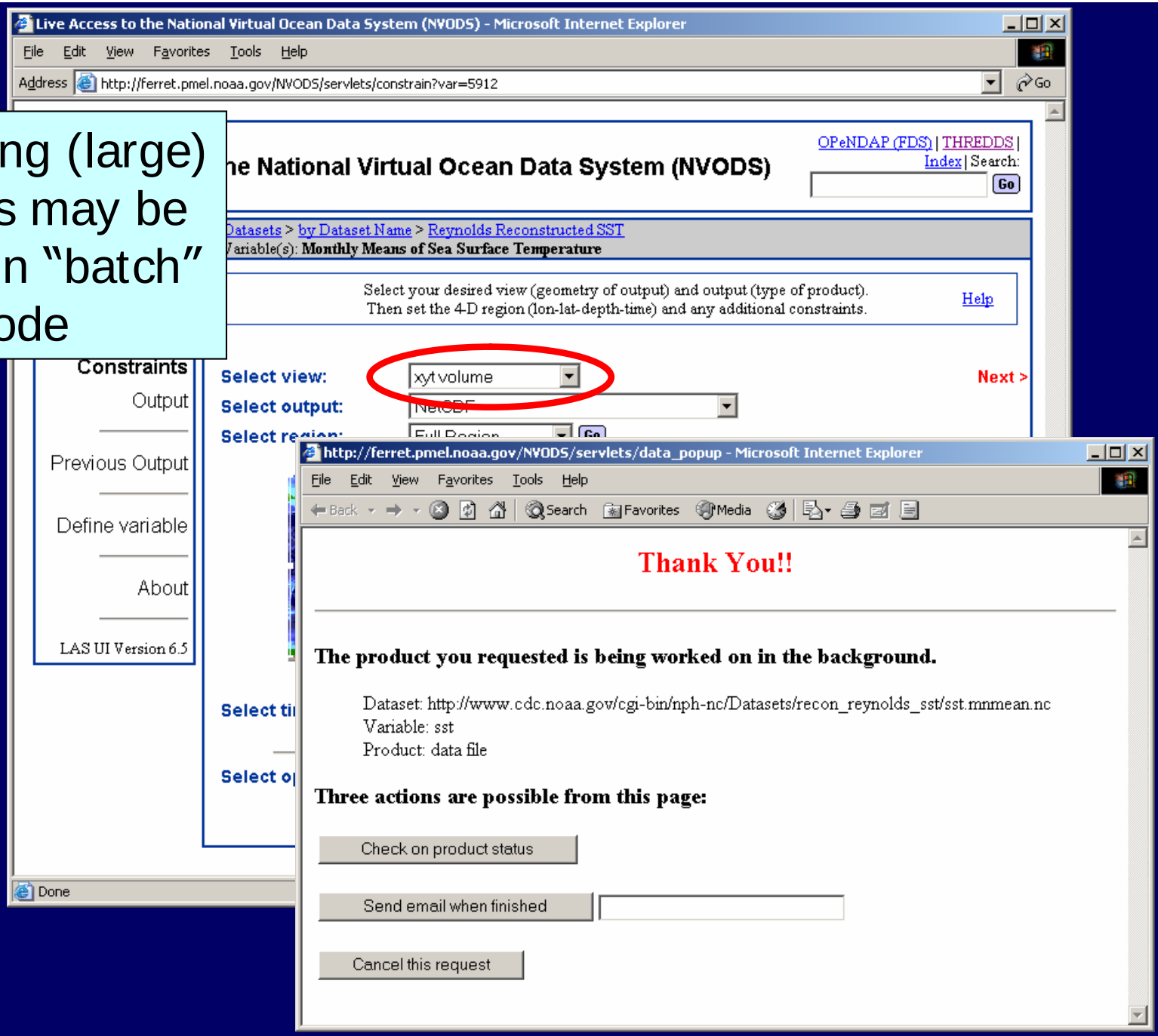
Collaborating “sister” servers



Comparison between datasets becomes straightforward:

Servers request regridded data from one another via FDS.

Demanding (large) products may be created in "batch" mode



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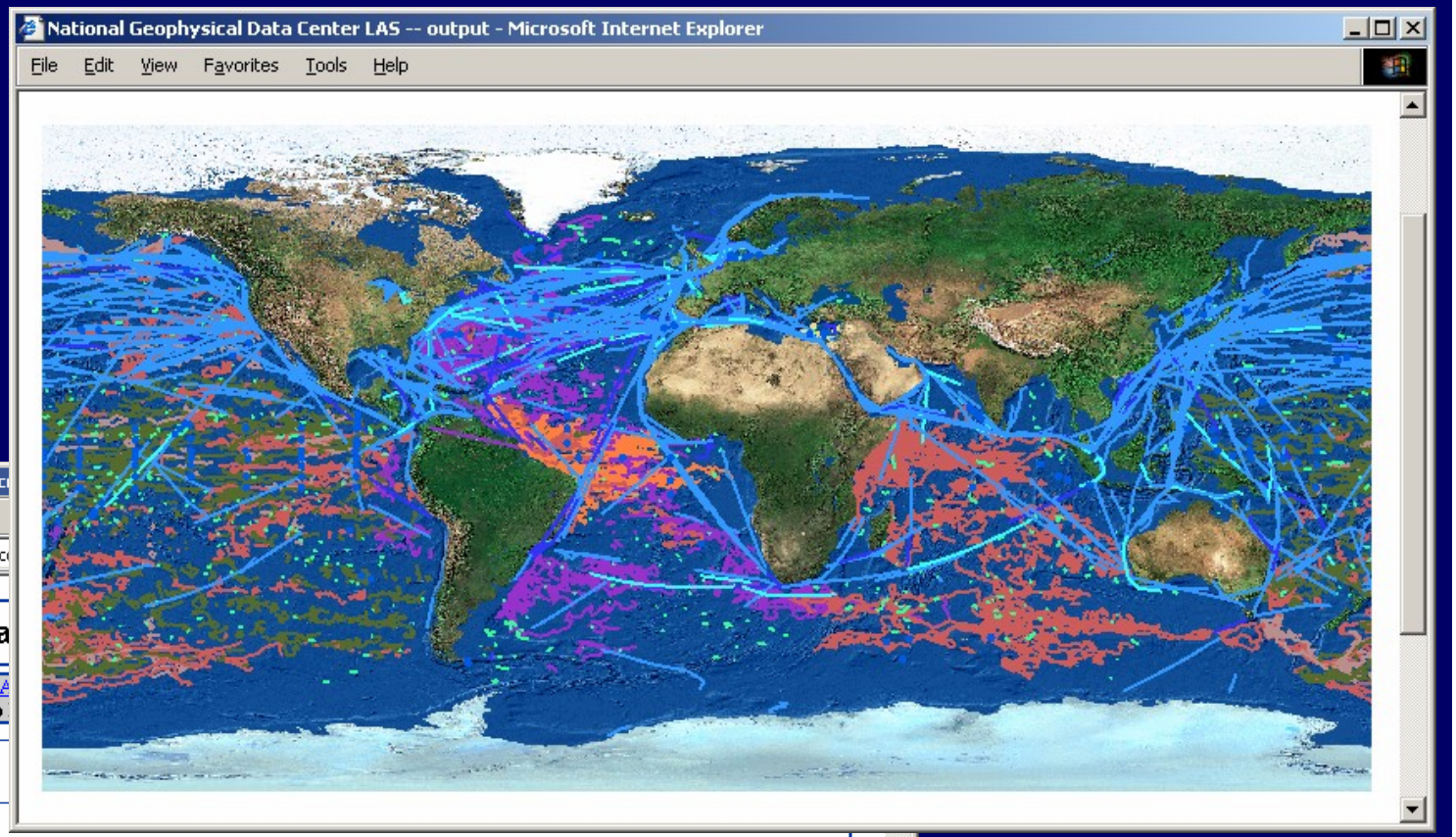
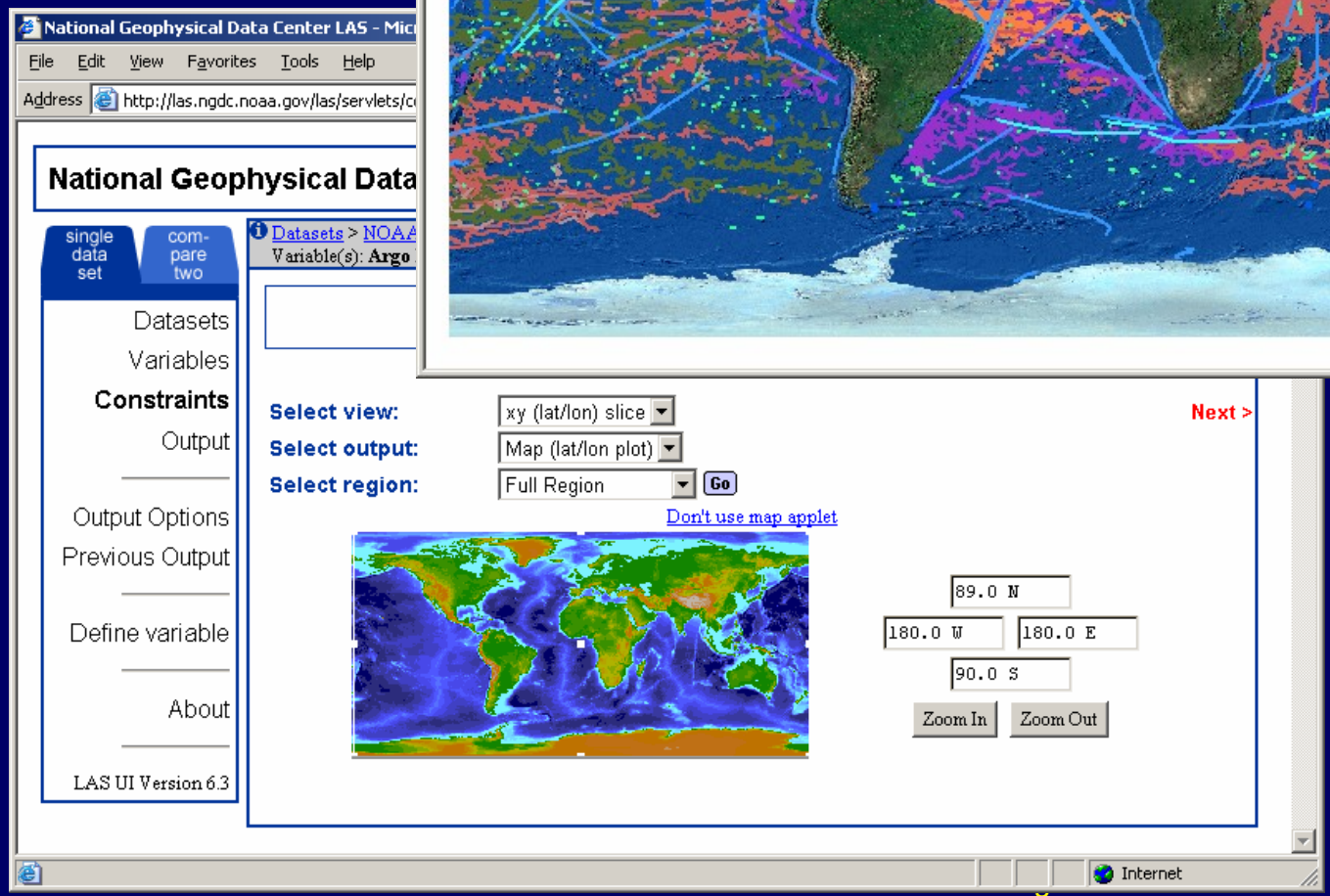
LAS & GIS





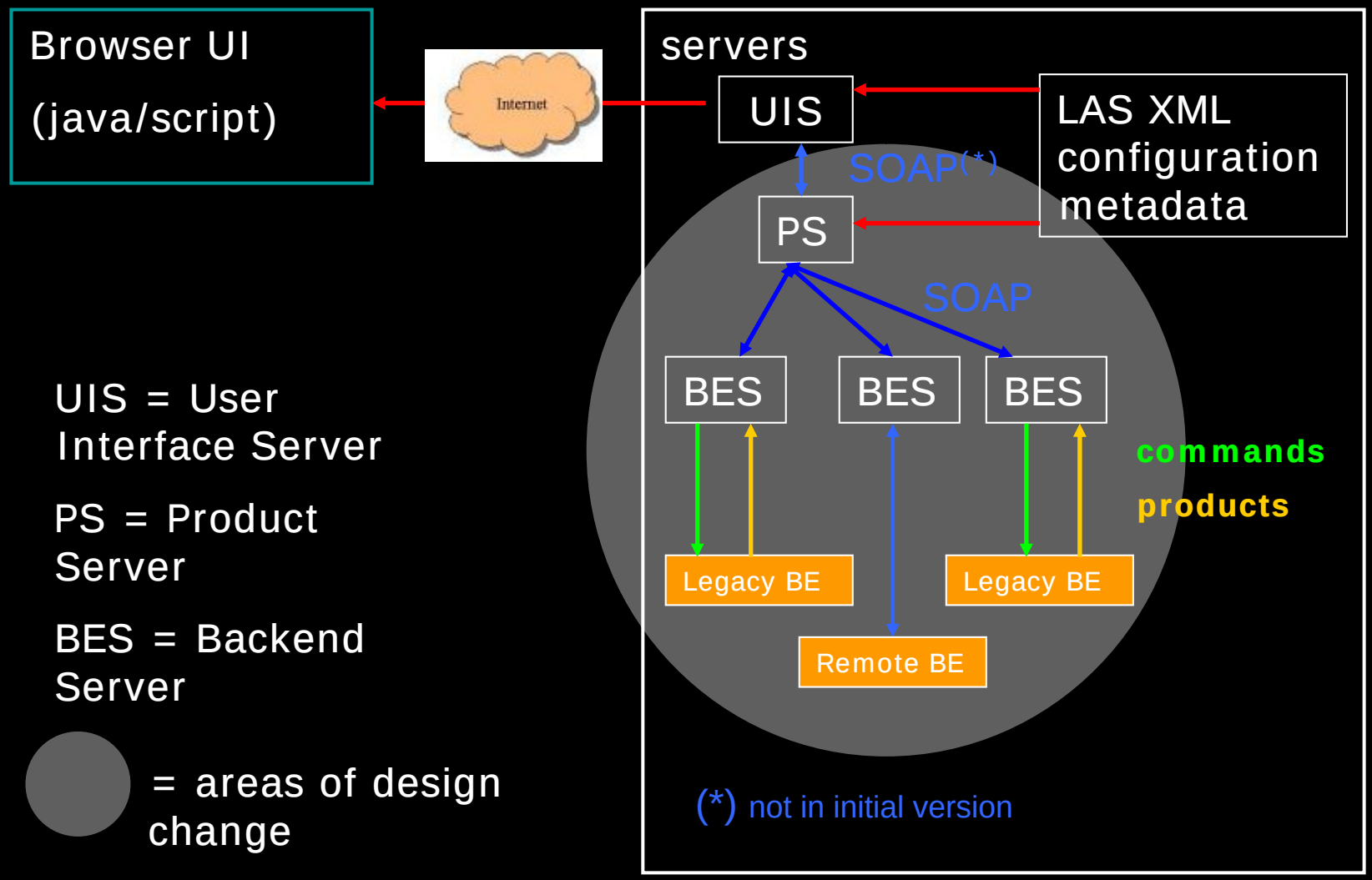
ArcIMS "back-end" to LAS

Steve Hankin

LAS & GIS

- LAS to respond to OGC protocols
  - WMS and WCS (maybe WFS, too)
- LAS UIs in the style of a GIS
- GIS-friendly output products
  - ASCII Grid
  - GeoTIFF
  - ShapeFiles

Component Design for LAS Product Server



UIS = User Interface Server

PS = Product Server

BES = Backend Server

= areas of design change

Current Product Server (Perl) splits into two components (Java)

1. Product Server
   - Parses and completes incoming requests
   - Provides logic for caching, batch, security, …
   - May request products from more than one Back-end Servers (compound products)
2. Back-end server
   - Produces products using legacy apps or Web services
   - Isolated from LAS logic and configuration

Back-end request protocol utilizes JavaBeans exchanged via SOAP

Implementation Details

- Java Servlet based on the Anagram framework from COLA.
- Similar redesign was already planned to accommodate component design for security models
- Singleton instances of PS and BES classes in Servlet container means low memory and fast response
- Jakarta Axis SOAP framework

Conclusion: “Configurable”

<u>Adaptable to input data</u>

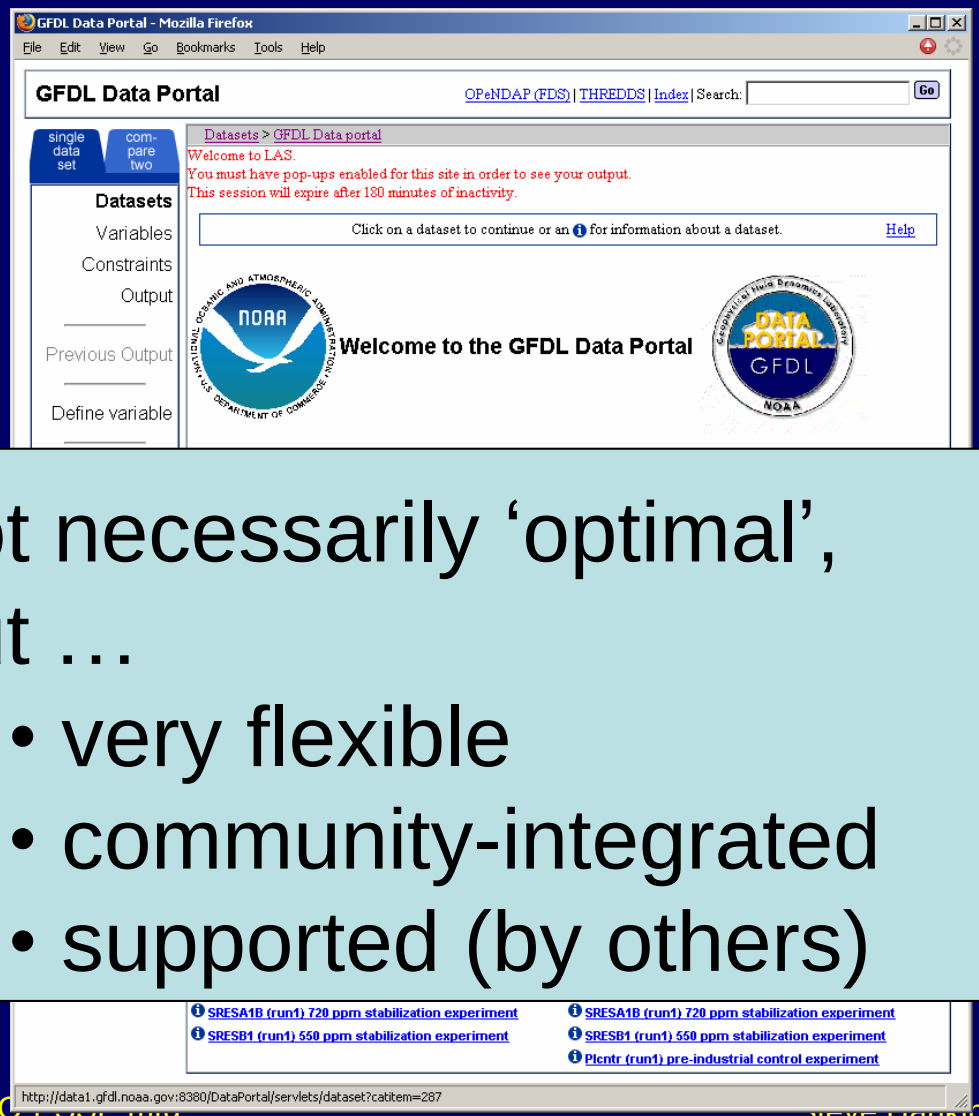
- Models, satellites, *in-situ*
- Local, distributed

<u>Adaptable to output products</u>

- scientific graphics
- extracted subsets
- analysis and comparison

to conclude:
the ecological niche of LAS …

"a configurable product server for 1 to 4D geo-science datasets"



not necessarily 'optimal', but …

- very flexible
- community-integrated
- supported (by others)

Who is using LAS?

- US Federal agencies
  - NOAA (PMEL, CDC, GFDL, NCDC, NGDC, NODC, NMFS, ...)
  - NASA (NSIIP, Goddard DAAC, JPL, …)
  - Navy (FNMOC/GODAE, NAVO)
  - DOE (LLNL, Oak Ridge)

- Research Institutions
  - NCAR
  - MBARI
  - WHOI
  - RSMAS
  - URI/GSO
  - JISAO
  - IPRC
  - COLA

- International
  - France (IFREMER, Mercator, CNRS, Aviso, Mersea, IPSL)
  - UK (UK Met Office, NERC(*))
  - Germany (Alfred Wegner Instuitute)
  - Canada (Halifax harbor moorings)
  - Australia (CSIRO)
  - India (Center for Modeling and Simulation)

http://www.ferret.noaa.gov/LAS

Current (major) LAS projects at PMEL …

- REASoN ("thematic servers")
- GODAE (ocean model inter-comparison)
- HYCOM (HYbrid Coordinate Ocean Model)
- OSMC (Observing System Monitoring Center)
- GFDL data portal (model output dissemination)
- Ocean CO2 *in situ* data management

Thank you