

**INSTITUT PIERRE  
SIMON LAPLACE**

*DES SCIENCES DE L'ENVIRONNEMENT*



# OPeNDAP

## CDMS / VTK / Qt – Mapper

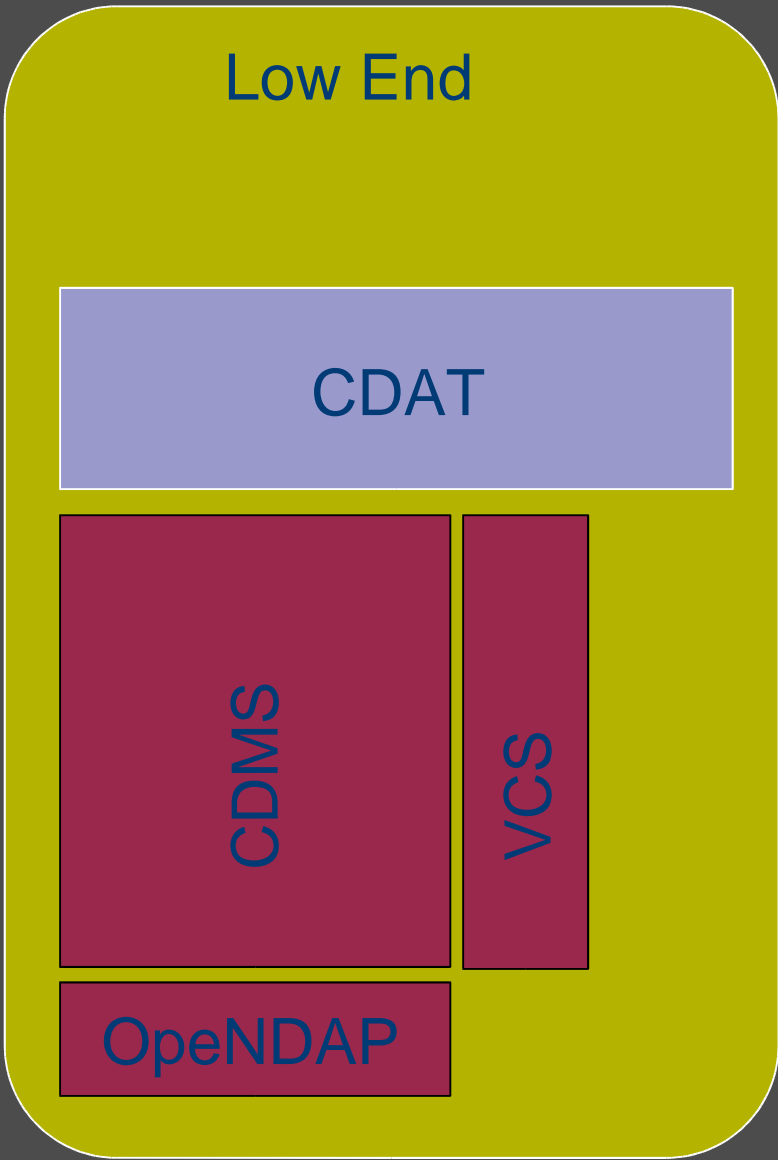


Patrick Brockmann  
IPSL France

07/10/2004

# Approach

PrepIFS



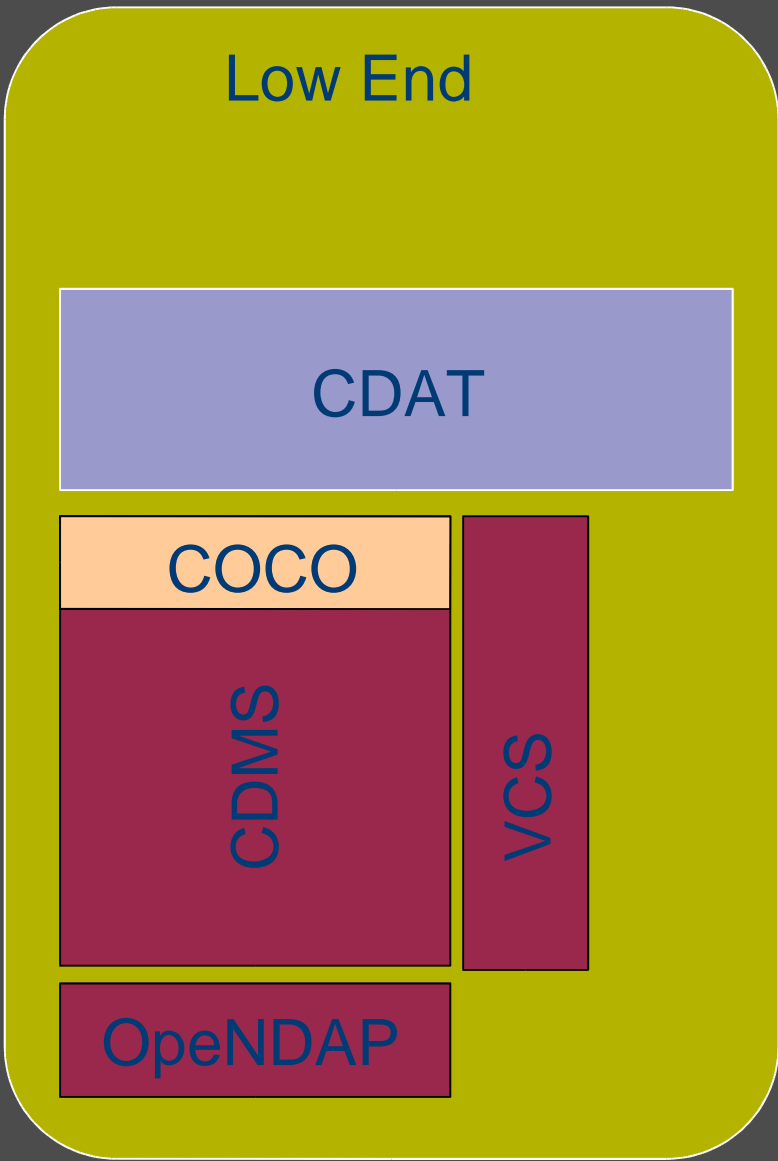
*Applications*

*Softwares*

*Libraries*

# Approach

PrepIFS



Applications

Softwares

Libraries

# Approach

PrepIFS

Low End

High End

CDAT

OpenDX

COCO

Meshfill graphic method

CDMS

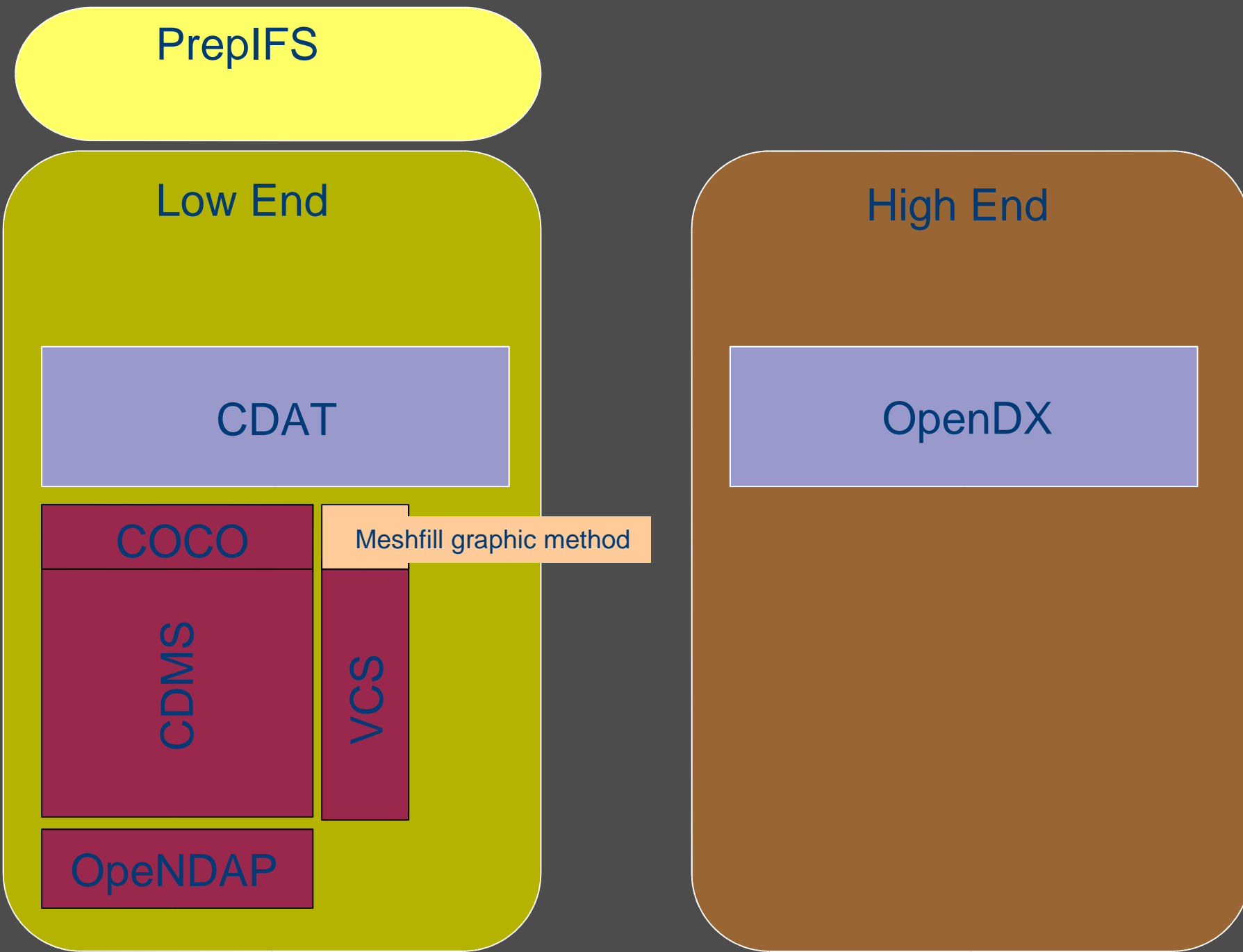
VCS

OpeNDAP

Applications

Softwares

Libraries



# Approach

PrepIFS

Low End

CDAT

COCO

CDMS

VCS

VTK

OpeNDAP

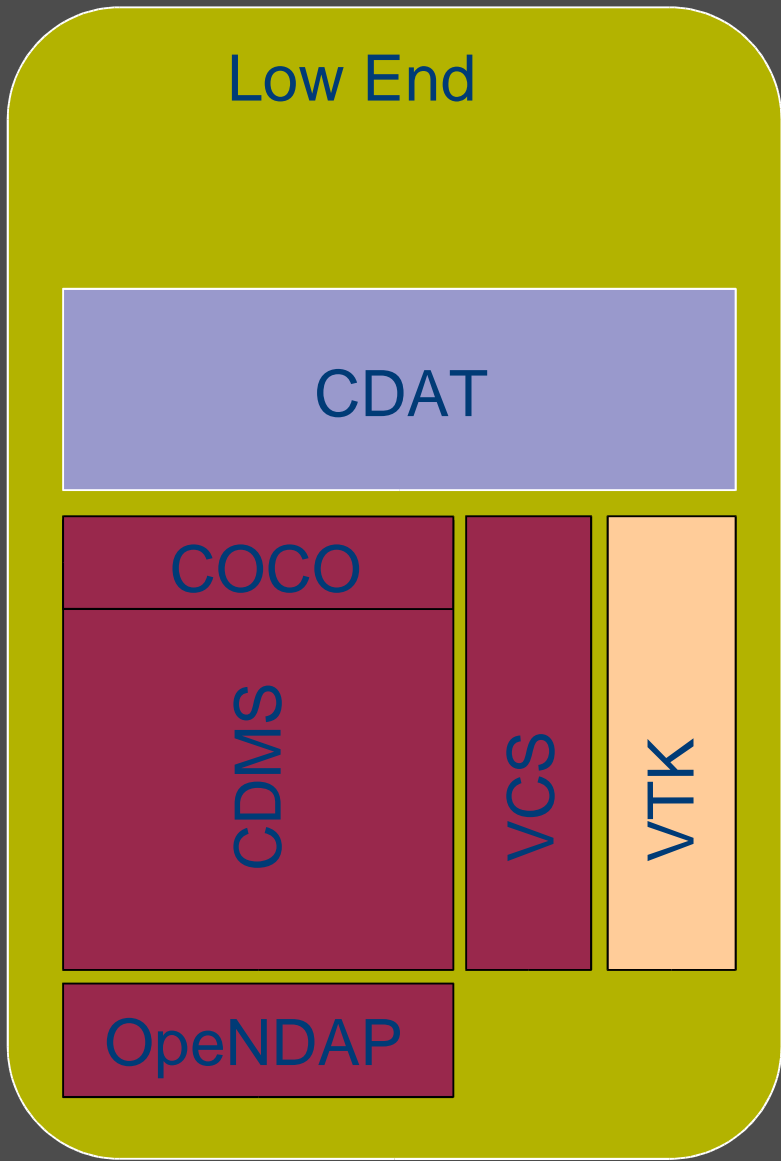
High End

OpenDX

Applications

Softwares

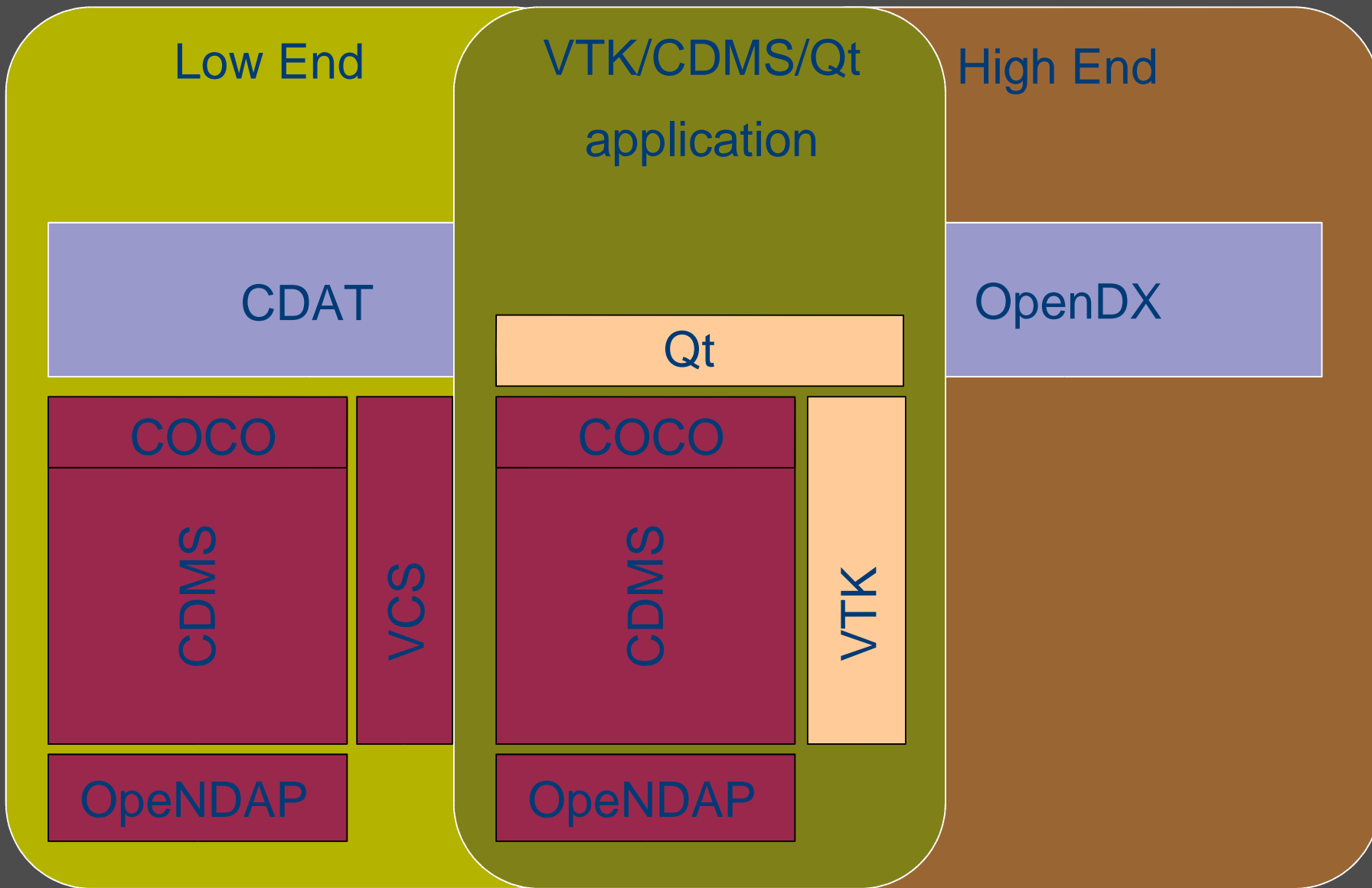
Libraries



# Approach

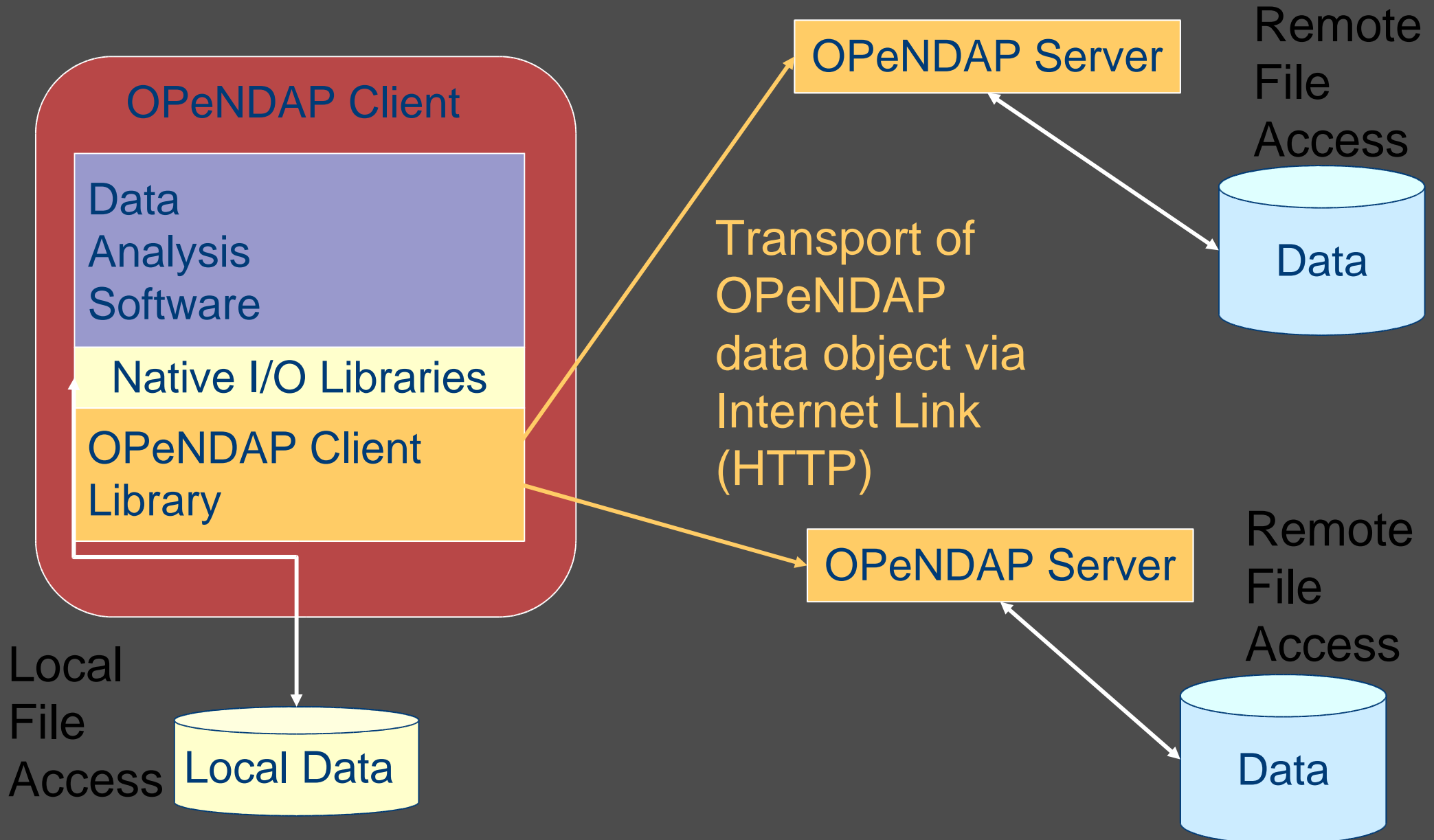
PrepIFS

Applications  
Softwares  
Libraries





# What is OPeNDAP?






# IPSL OpeNDAP/DODS server


Index of /prism - Mozilla

File Edit View Go Bookmarks Tools Window Help





http://dods.ipsl.jussieu.fr/prism/

Home Bookmarks Support Le Monde.fr : ... Courrier intern... Le Monde dipl... IPSL Projet M...

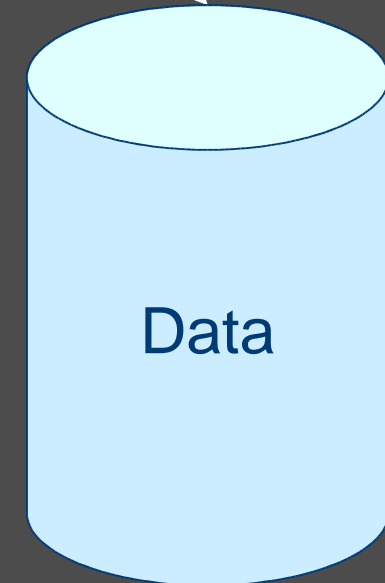
 Institut Pierre Simon Laplace



This place on the IPSL OpenDAP/DODS Server is dedicated to the PRISM Project

<a href="#">Name</a>	<a href="#">Last modified</a>	<a href="#">Size</a>	<a href="#">Description</a>
 <a href="#">Parent Directory</a>		-	
 <a href="#">gridsCF/</a>	27-Aug-2004 16:37	-	
 <a href="#">output/</a>	06-Oct-2004 11:33	-	
 <a href="#">wp4a/</a>	01-Oct-2004 15:37	-	

<http://dods.ipsl.jussieu.fr/prism>





# IPSL OpeNDAP/DODS server

OPeNDAP Server

**DODS Dataset Access Form**

**Action:** Get ASCII | Get DODS Data Object | Show Help

**Data URL:** [http://dods.ipsl.jussieu.fr/cgi-bin/nph-dods/mc2ipsl/2L04/Oce/SE/2L04\\_SE\\_1860\\_1869\\_grid.nc.html](http://dods.ipsl.jussieu.fr/cgi-bin/nph-dods/mc2ipsl/2L04/Oce/SE/2L04_SE_1860_1869_grid.nc.html)

**Global Attributes:**  
Conventions: "GDT 1.3"  
file\_name: "2L04\_1m\_18600101\_18600130"  
production: "An IPSL model"  
TimeStamp: "2004-APR-01 17:33:48 GMT-"  
associate\_file: "cpl\_oce\_tau.nc cpl\_oce\_tau.nc 2L04\_1m\_18600101\_18600130 icemod.nc"

**Variables:**

- nav\_lon:** Array of 32 bit Reals [y = 0..180] units: "degrees\_east" valid\_min: -179.7507019 valid\_max: 180. long\_name: "Longitude" nav\_model: "Default grid"
- nav\_lat:** Array of 32 bit Reals [y = 0..180] units: "degrees\_north" valid\_min: -78.19058228 valid\_max: 89.61389923 long\_name: "Latitude" nav\_model: "Default grid"
- depth:** Array of 32 bit Reals [depth: 0..1000] units: "meters" valid\_min: -1000.0 valid\_max: 1000.0 long\_name: "Depth" nav\_model: "Default grid"

**Moyenne saisonnières océaniques par décennie. - Mozilla**

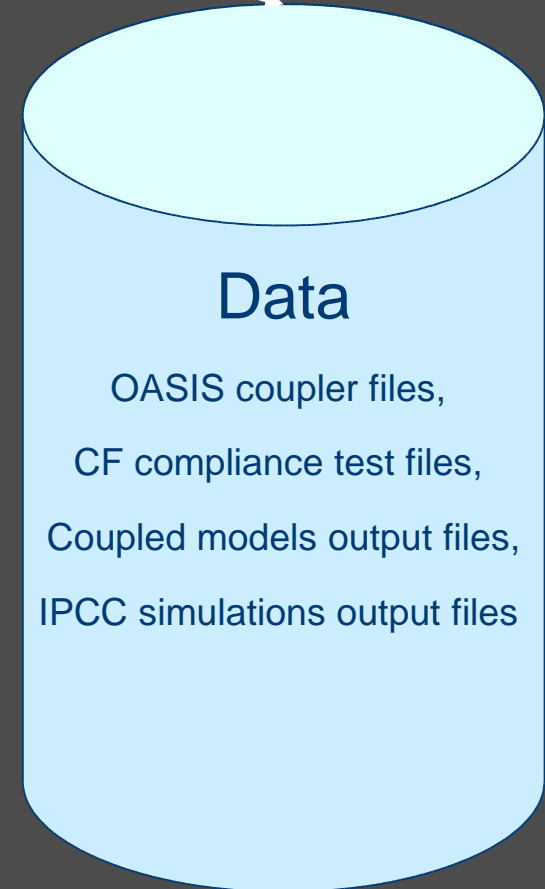
[http://dods.ipsl.jussieu.fr/mc2ipsl/2L18/Ocean\\_SE.php?date\\_debut=1840&date\\_fin=1860](http://dods.ipsl.jussieu.fr/mc2ipsl/2L18/Ocean_SE.php?date_debut=1840&date_fin=1860)

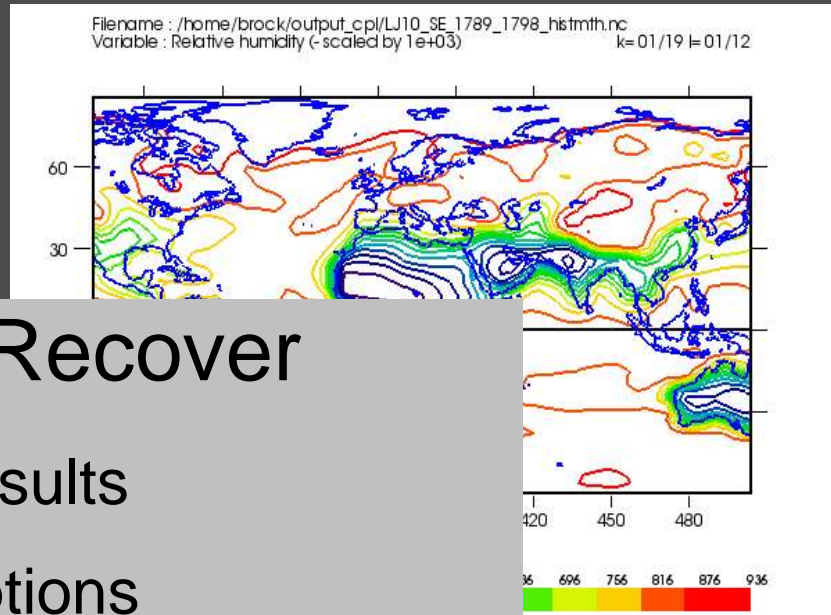
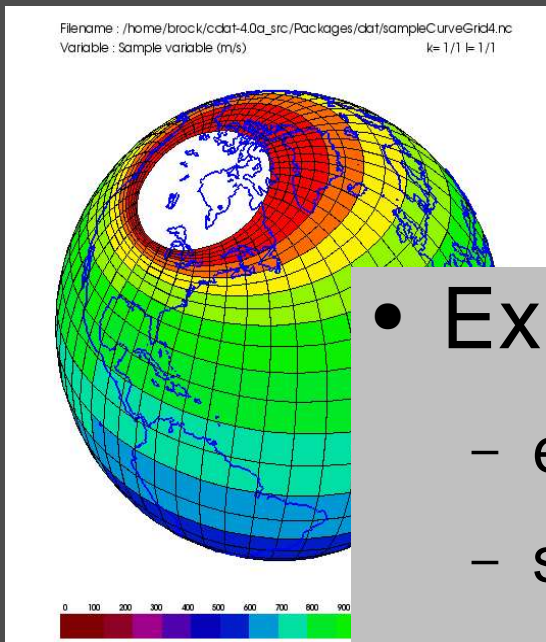
**INSTITUT PIERRE SIMON LAPLACE**  
DES SCIENCES DE L'ENVIRONNEMENT

MC2 HOMEPAGE | SCÉNARI | VARIABLES | **IPSL\_CM4.1** | IPSL\_CM4.0 | IPSL\_CM2

**Moyenne saisonnières océaniques par décennie.**

Fichier brut	Variables du fichiers	Accès fichiers :	
GRID_T	<a href="#">grid_T.dump</a>	FTP Access :	DODS Access :
		1840-1849 : <a href="#">IPSL IDRIS</a>	1840-1849 : <a href="#">IPSL IDRIS</a>
		1850-1859 : <a href="#">IPSL IDRIS</a>	1850-1859 : <a href="#">IPSL IDRIS</a>
		1860-1869 : <a href="#">IPSL IDRIS</a>	1860-1869 : <a href="#">IPSL IDRIS</a>
		1870-1879 : <a href="#">IPSL IDRIS</a>	1870-1879 : <a href="#">IPSL IDRIS</a>
		1880-1889 : <a href="#">IPSL IDRIS</a>	1880-1889 : <a href="#">IPSL IDRIS</a>
		1890-1899 : <a href="#">IPSL IDRIS</a>	1890-1899 : <a href="#">IPSL IDRIS</a>
		1900-1909 : <a href="#">IPSL IDRIS</a>	1900-1909 : <a href="#">IPSL IDRIS</a>
		1910-1919 : <a href="#">IPSL IDRIS</a>	1910-1919 : <a href="#">IPSL IDRIS</a>
		1920-1929 : <a href="#">IPSL IDRIS</a>	1920-1929 : <a href="#">IPSL IDRIS</a>
		1930-1939 : <a href="#">IPSL IDRIS</a>	1930-1939 : <a href="#">IPSL IDRIS</a>
		1940-1949 : <a href="#">IPSL IDRIS</a>	1940-1949 : <a href="#">IPSL IDRIS</a>
		1950-1959 : <a href="#">IPSL IDRIS</a>	1950-1959 : <a href="#">IPSL IDRIS</a>
GRID_U	<a href="#">grid_U.dump</a>	FTP Access :	DODS Access :
		1840-1849 : <a href="#">IPSL IDRIS</a>	1840-1849 : <a href="#">IPSL IDRIS</a>
		1850-1859 : <a href="#">IPSL IDRIS</a>	1850-1859 : <a href="#">IPSL IDRIS</a>
		1860-1869 : <a href="#">IPSL IDRIS</a>	1860-1869 : <a href="#">IPSL IDRIS</a>
		1870-1879 : <a href="#">IPSL IDRIS</a>	1870-1879 : <a href="#">IPSL IDRIS</a>
		1880-1889 : <a href="#">IPSL IDRIS</a>	1880-1889 : <a href="#">IPSL IDRIS</a>
		1890-1899 : <a href="#">IPSL IDRIS</a>	1890-1899 : <a href="#">IPSL IDRIS</a>
		1900-1909 : <a href="#">IPSL IDRIS</a>	1900-1909 : <a href="#">IPSL IDRIS</a>
		1910-1919 : <a href="#">IPSL IDRIS</a>	1910-1919 : <a href="#">IPSL IDRIS</a>
		1920-1929 : <a href="#">IPSL IDRIS</a>	1920-1929 : <a href="#">IPSL IDRIS</a>
		1930-1939 : <a href="#">IPSL IDRIS</a>	1930-1939 : <a href="#">IPSL IDRIS</a>
		1940-1949 : <a href="#">IPSL IDRIS</a>	1940-1949 : <a href="#">IPSL IDRIS</a>
		1950-1959 : <a href="#">IPSL IDRIS</a>	1950-1959 : <a href="#">IPSL IDRIS</a>



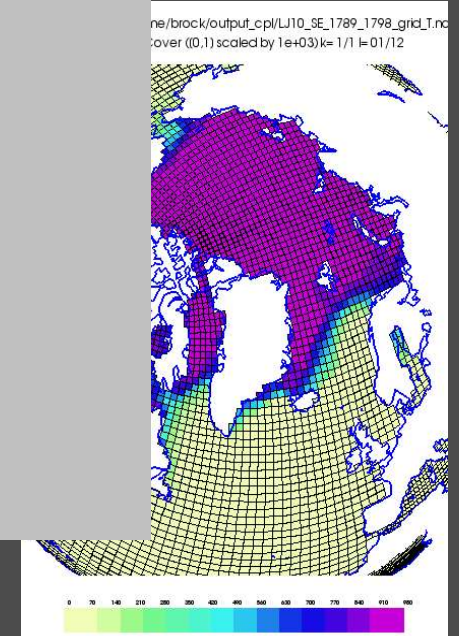
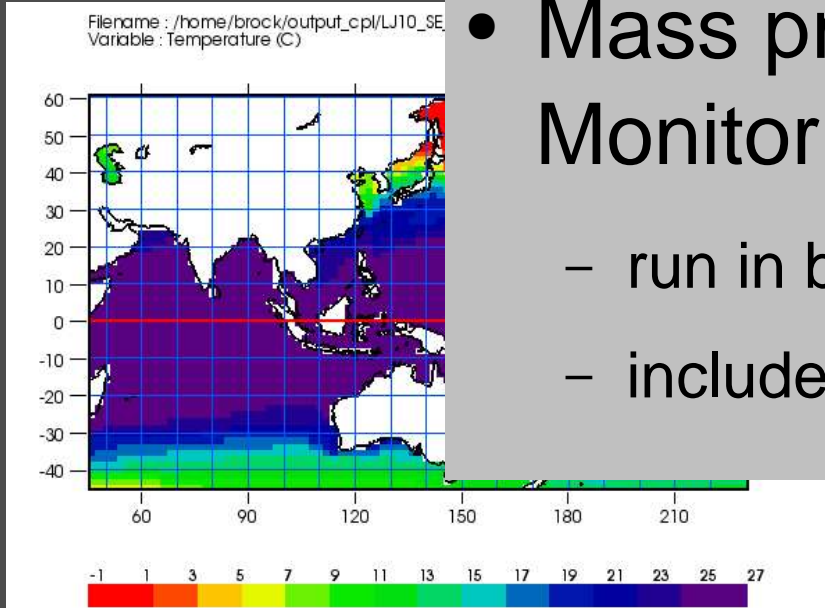


- Explore, Discover, Recover

- explore interactively results
- switch and discover options
- recover the command with exacts arguments and options

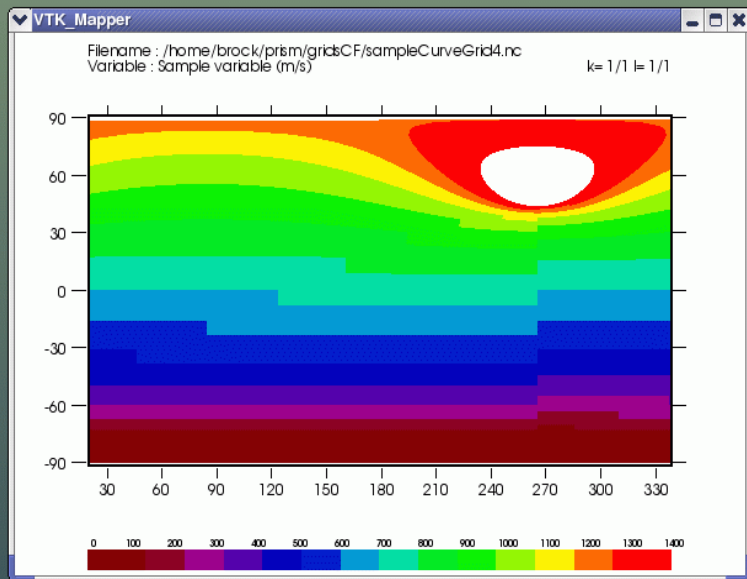
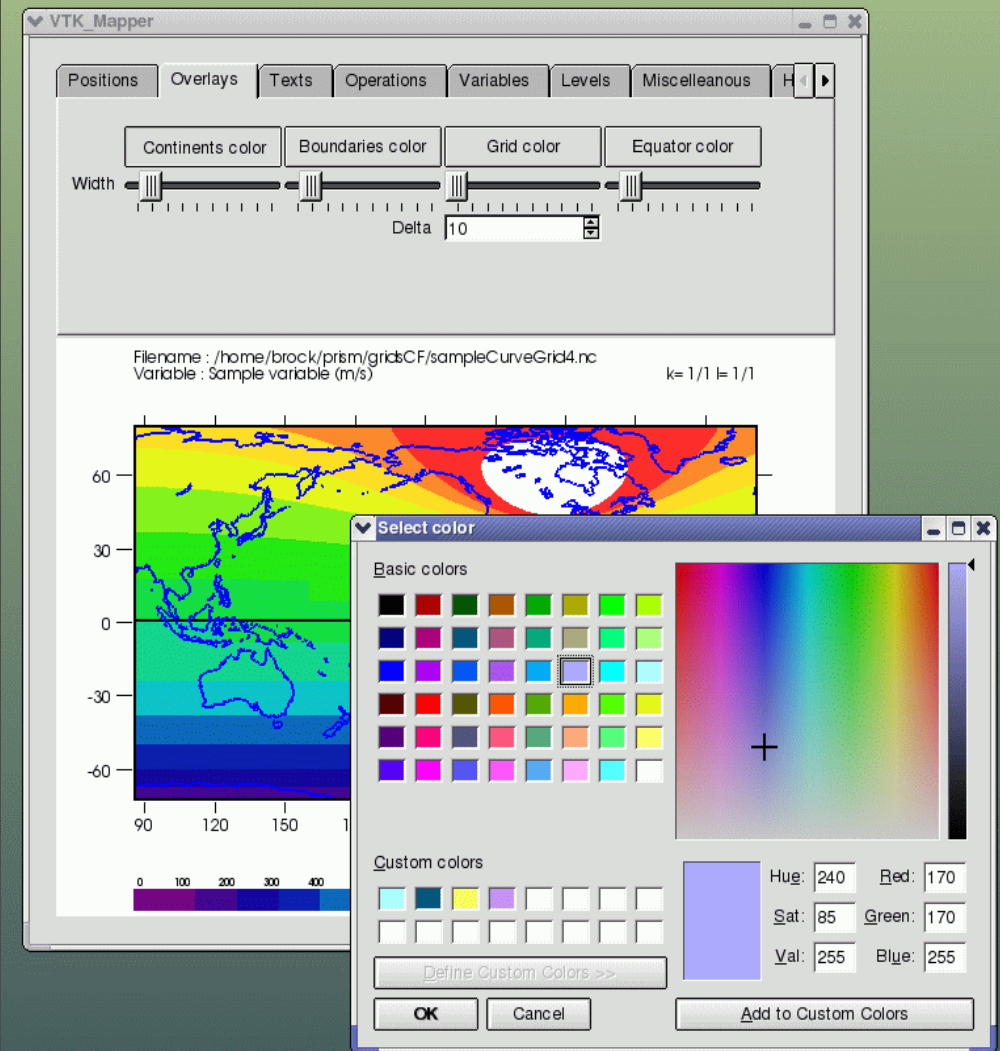
- Mass production documents, Monitoring simulations

- run in batch mode
- include in scripts



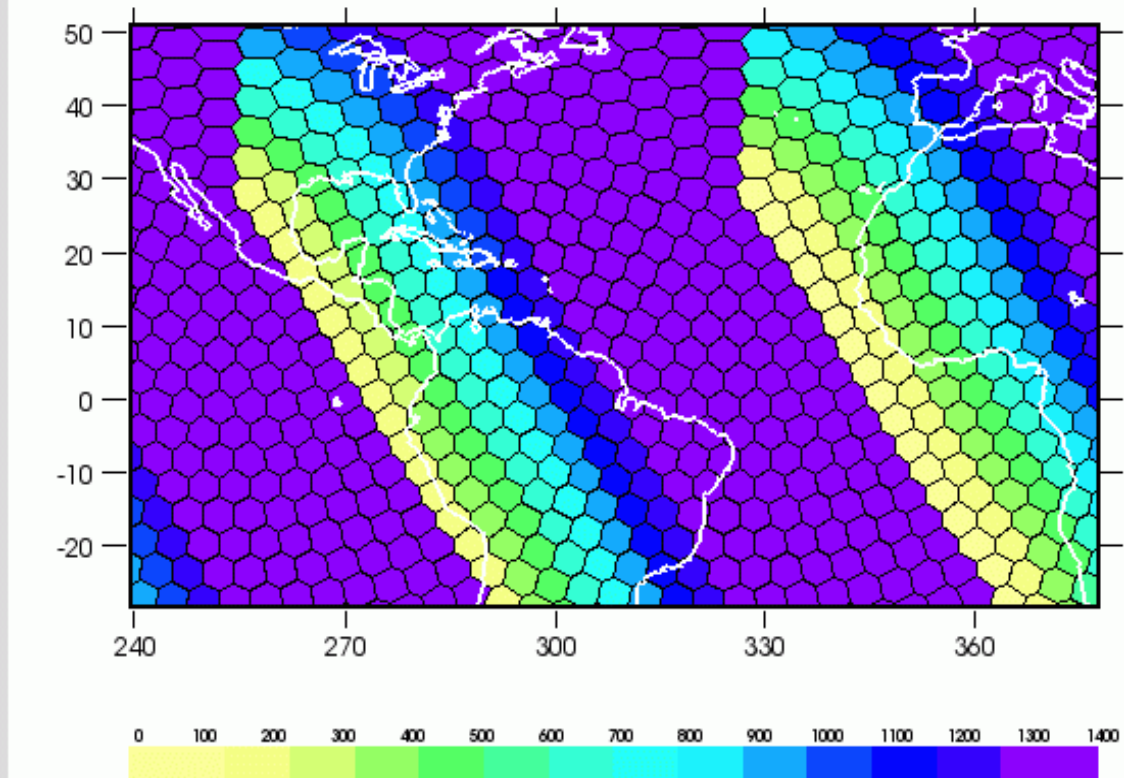
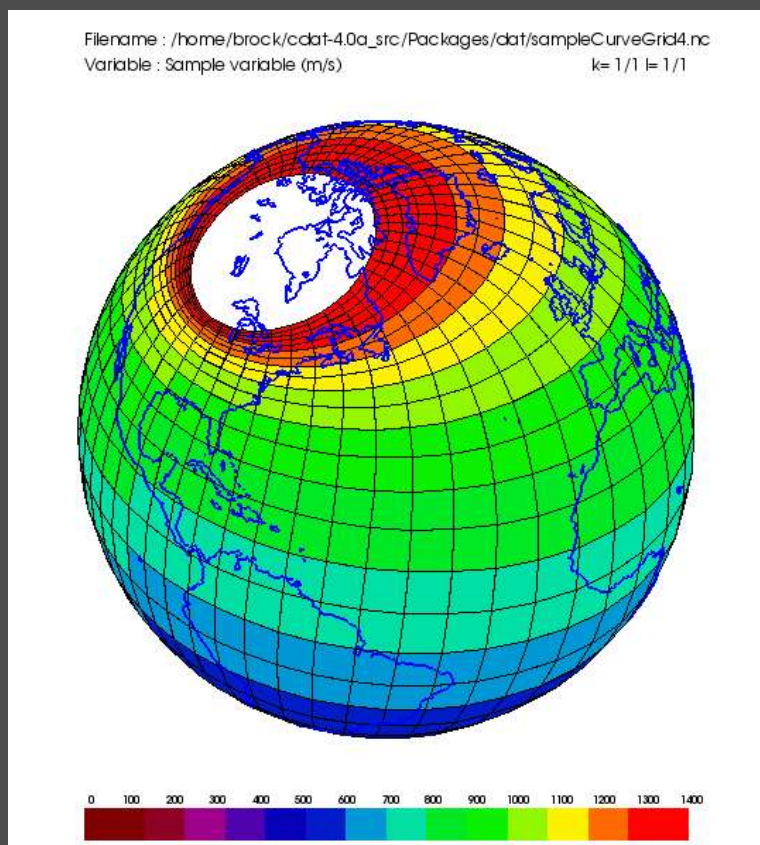
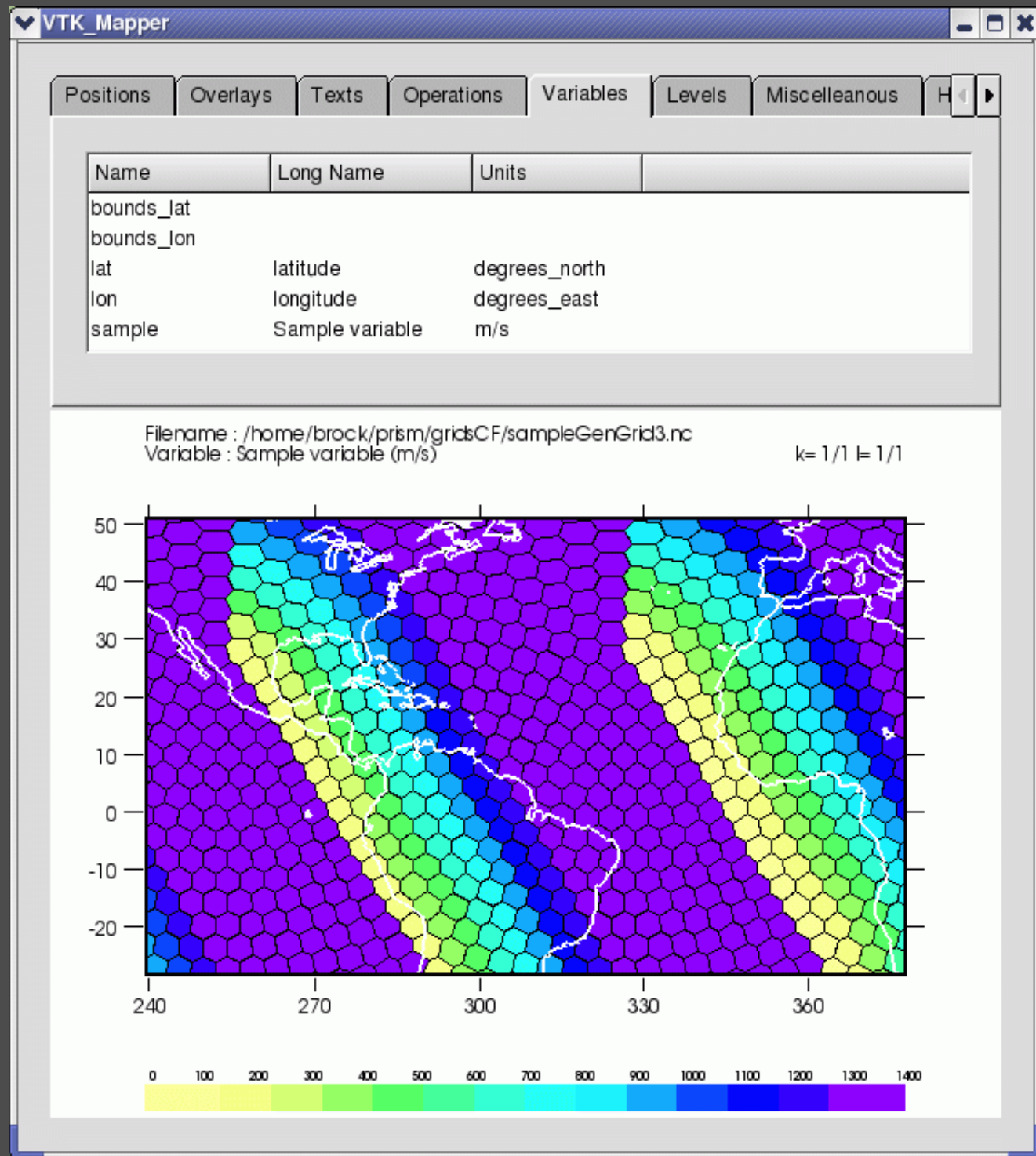
### 3 modes of use :

- Interactive with a GUI interface
- Interactive
- Offscreen



```
>> mapper.py --offscreen /home/brock/prism/gridsCF/sampleCurveGrid4.nc sample
```

- Rectilinear, Curvilinear and Generic grids
- Isocontours, Isolines, Mesh plots





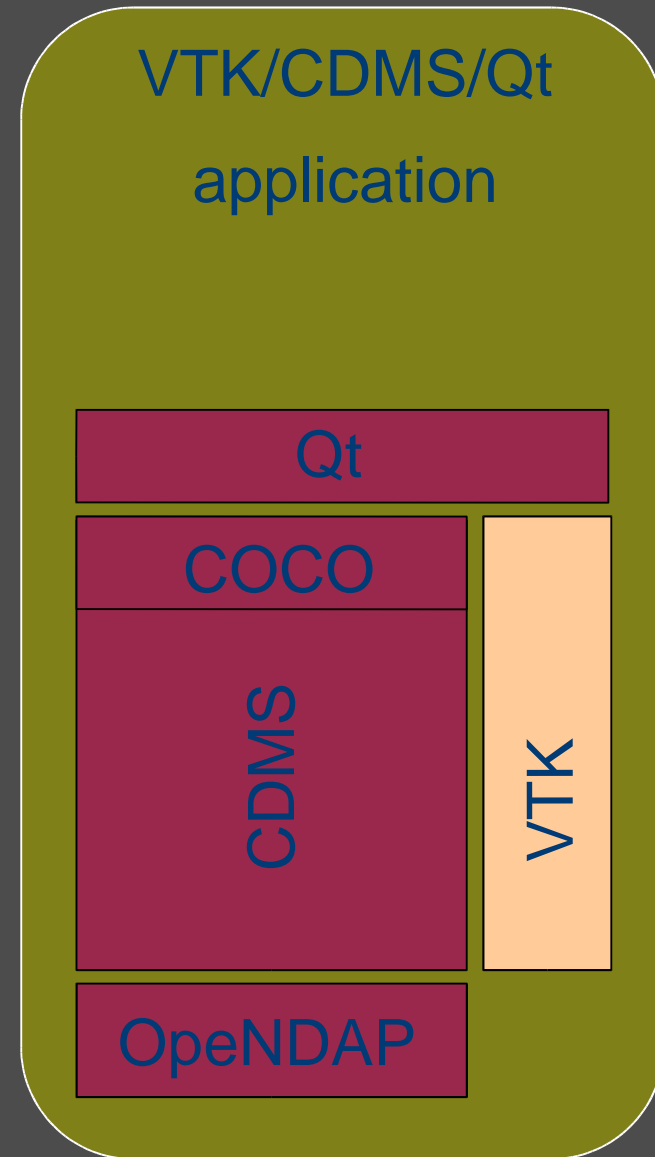
## Visualisation Toolkit

- Advanced library for: computer graphics, visualization and image processing
- Object-oriented software framework
- Open source and binaries available for all common platforms
- Software interfaces for: C++, Python, Java and Tcl



## Paraview

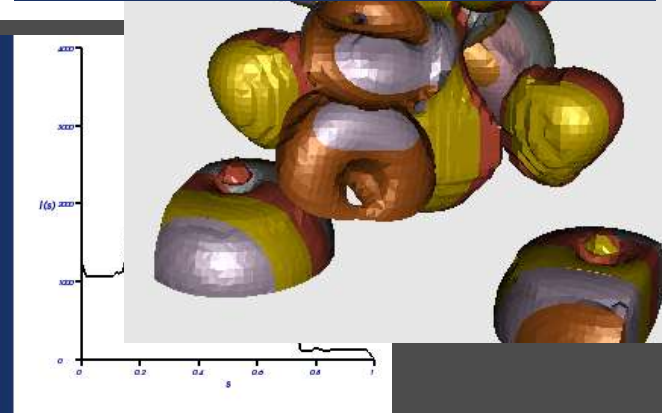
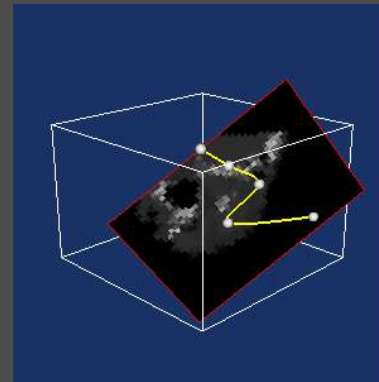
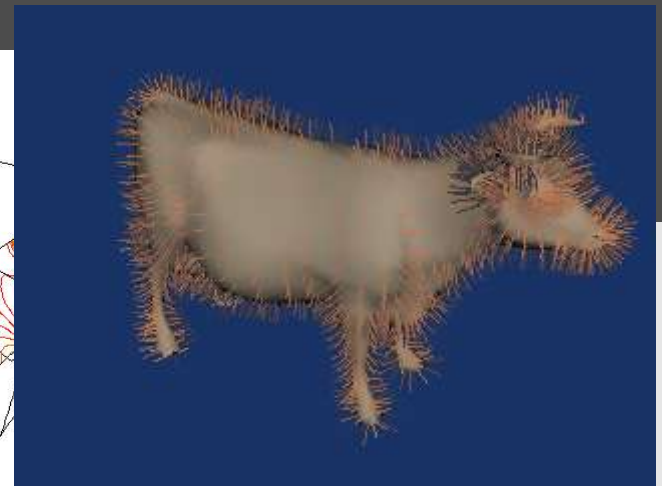
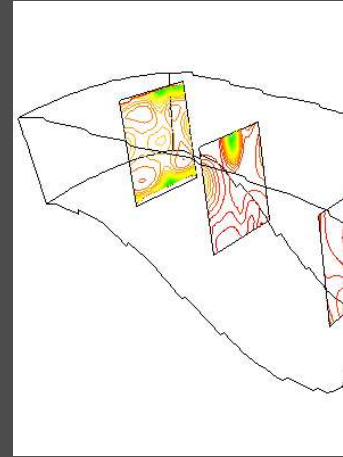
- Open Source application using VTK





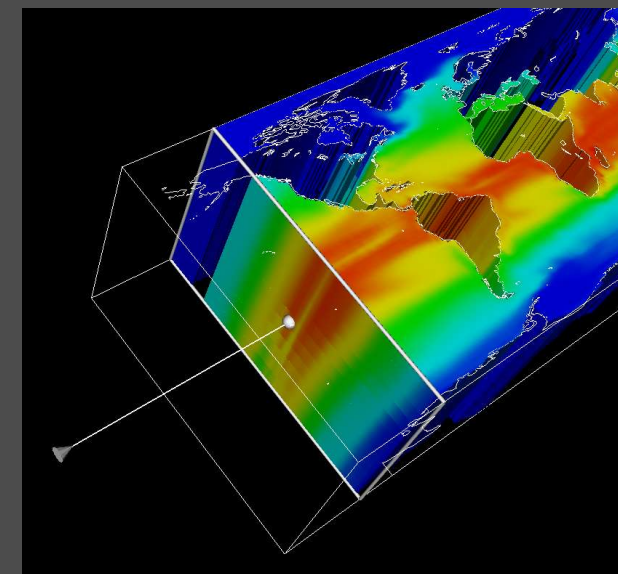
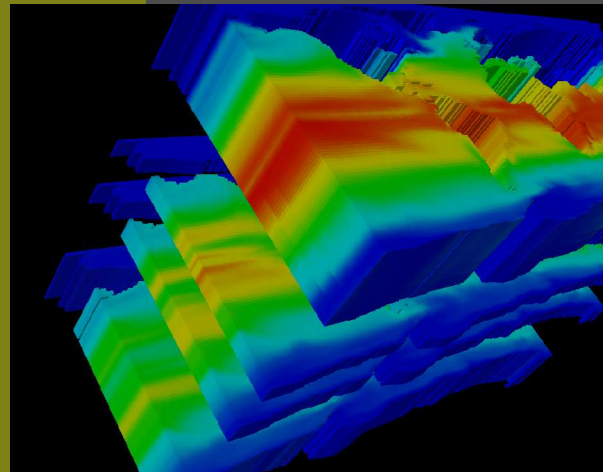
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## Paraview

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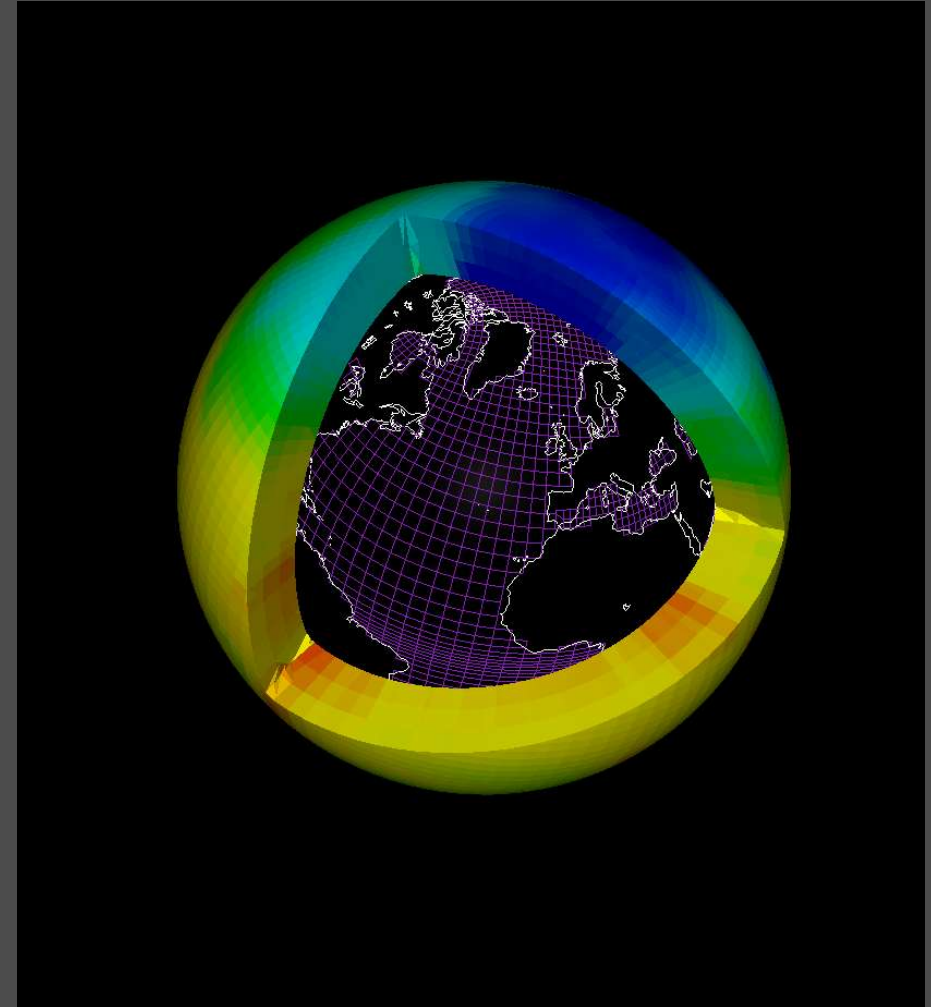
## Visualisation Toolkit

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## Paraview

- Open Source application using VTK



- Qt Designer, Qt's visual design tool

## VTK/CDMS/Qt application

Use PyQt user interface compiler:  
 > pyuic -x file.ui > file.py

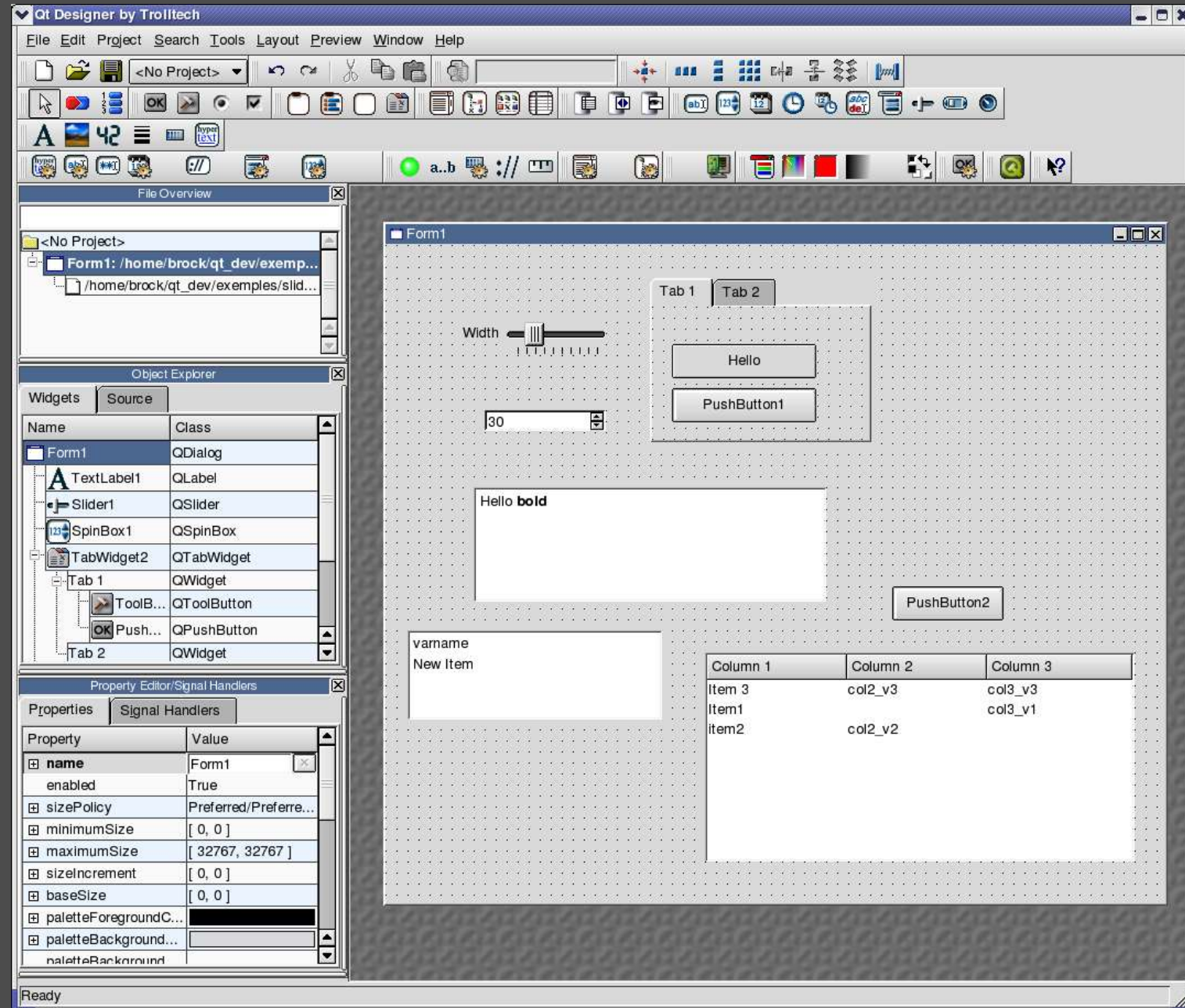
Qt

COCO

CDMS

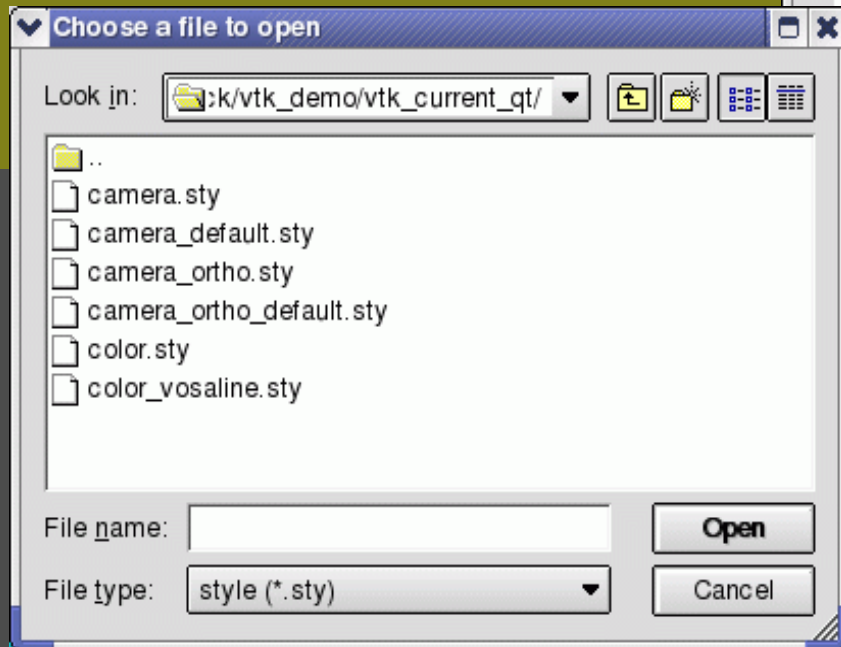
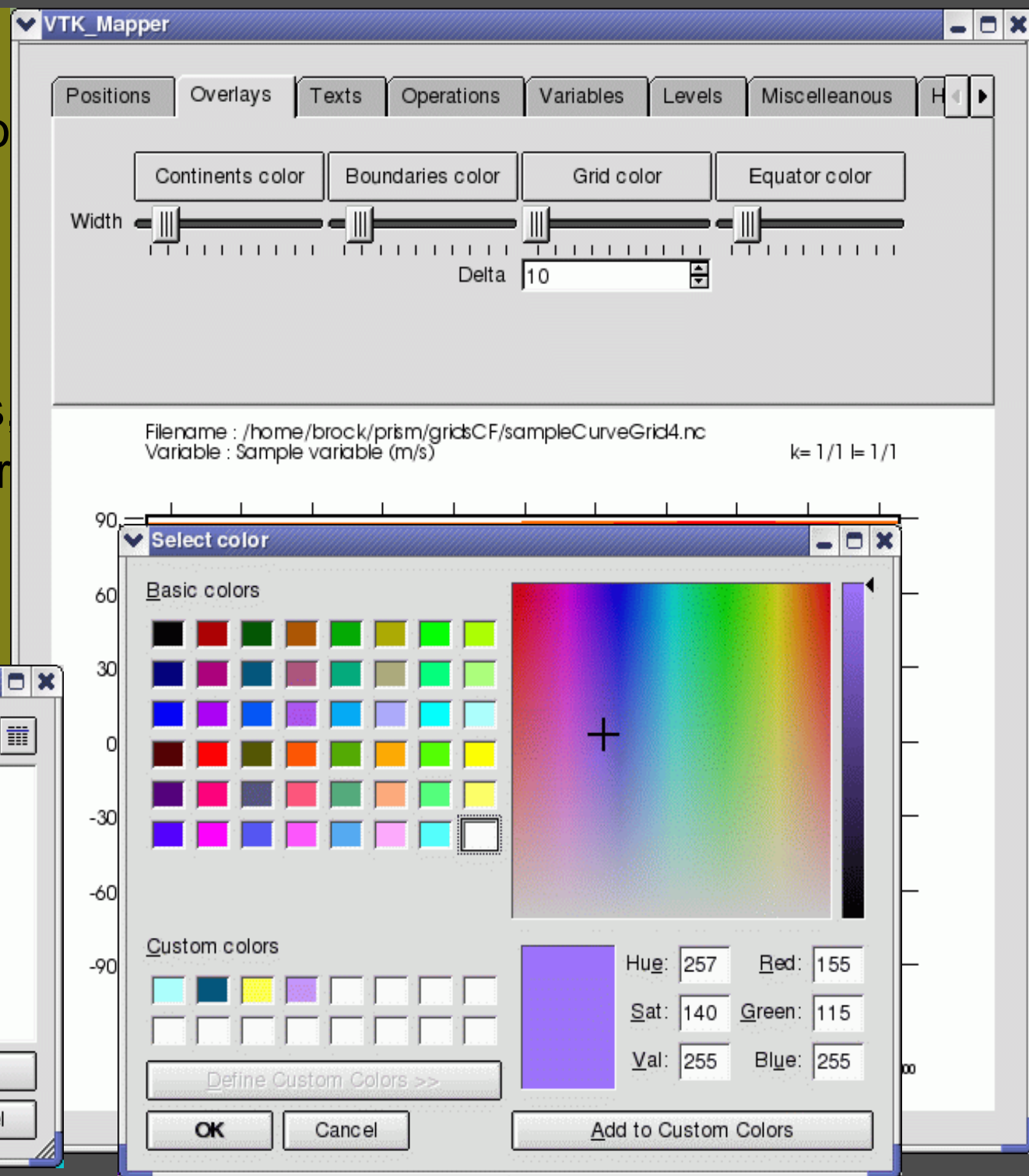
VTK

OpeNDAP



# Qt C++ Toolkit

- Development of multiplatform GUI applications with its «*write once, compile anywhere*» concept
- Rich set of widgets (buttons, scroll bars, etc) that cater for most situations
- Python bindings with PyQt



- CDAT 4.0 beta3

- CDMS

- Read/Save CF netCDF files(rectilinear, cirvilinear, generic grids)
    - Access DODS server
    - Make calculations

- Mesa 6.0

- Offscreen rendering

- VTK 4.4

- Make polygons plots
  - Make isocontours, isofilled plots
  - Capture image to PNG
  - Convert GL to PDF, EPS

- Qt Tookit

- PyQt
  - Qt Designer

- **Compilation of Mesa 6.0**

```
> make linux-x86
```

- **Compilation of CDAT 4.0 beta3**

```
> express_install /home/user/cdat-4.0b3
```

```
> /home/user/bin/python ./install.py --force
```

- **Compilation of VTK (interim release 4.4)**

```
> cmake
```

```
...
```

```
OPENGL_INCLUDE_DIR           /home/user1/Mesa-6.0/include/GL  
OPENGL_gl_LIBRARY            /home/user1/Mesa-6.0/lib/libGL.so  
OPENGL_glu_LIBRARY           /home/user1/Mesa-6.0/lib/libGLU.so  
OPENGL_xmesa_INCLUDE_DIR     /home/user1/Mesa-6.0/include/GL  
OSMESA_INCLUDE_DIR           /home/user1/Mesa-6.0/include/GL  
OSMESA_LIBRARY                /home/user1/Mesa-6.0/lib/libOSMesa.so
```

```
...
```

```
VTK_OPENGL_HAS_OSMESA        ON
```

```
...
```

```
VTK_USE_MANGLED_MESA         OFF
```

```
...
```

```
VTK_USE_GL2PS                 ON
```

```
...
```

# • CDMS

- Grid types
- Grid and mesh information methods
  - *getGrid()*, *getMesh()*
- Conversion methods
  - Rectilinear --> Curvilinear with *toCurveGrid()*
  - Curvilinear --> Generic with *toGenericGrid()*
- See documentation of CDMS 4.0

CDMS defines a rich set of grid types to represent the variety of coordinate systems used in climate model applications. Grids can be categorized as *rectangular* or *nonrectangular*.

- A *rectangular* grid has latitude and longitude axes that are one-dimensional, with strictly monotonic values. The grid is essentially the Cartesian product of the axes. If either criterion is not met, the grid is *nonrectangular*.

CDMS supports two types of nonrectangular grid:

- A *curvilinear* grid consists of a latitude and longitude axis, each of which is a two-dimensional coordinate axis. Curvilinear grids are often used in ocean model applications.
- A *generic* grid consists of a latitude and longitude axis, each of which is an *auxiliary* one-dimensional coordinate axis. An auxiliary axis has values that are not necessarily monotonic. As the name suggests, generic grids can represent virtually any type of grid. However, it is more difficult to determine adjacency relationships between grid points.

```
>>> import cdms
>>> f = cdms.open('clt.nc')
>>> clt = f('clt')
>>> rectgrid = clt.getGrid()
>>> rectgrid.shape
(46, 72)
>>> curvegrid = rectgrid.toCurveGrid()
>>> curvegrid
<TransientCurveGrid, id: grid_1, shape: (46, 72)>
>>> genericgrid = curvegrid.toGenericGrid()
>>> genericgrid
<TransientGenericGrid, id: grid_1, shape: (3312,)>
>>>
```