FOSS4GIS

(r.patch rast=world,universe)

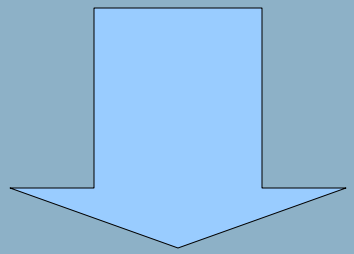
Breve sguardo al software free e open source per applicazioni GIS

27 ottobre
LinuxDay 2007
Bari

Francesco P.Lovergine <frankie@lugbari.org>

Free/Open Source Software

“Free software” è una questione di libertà, non di prezzo.



“Free as in freedom, not free as beer”

Le quattro libertà fondamentali (The Free Software Foundation)

- The freedom to run the program, for any purpose.
- The freedom to study how the program works, and adapt it to your needs. Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor.
- The freedom to improve the program, and release your improvements to the public, so that the whole community benefits. Access to the source code is a precondition for this.

Benefici/Limitati del FOSS

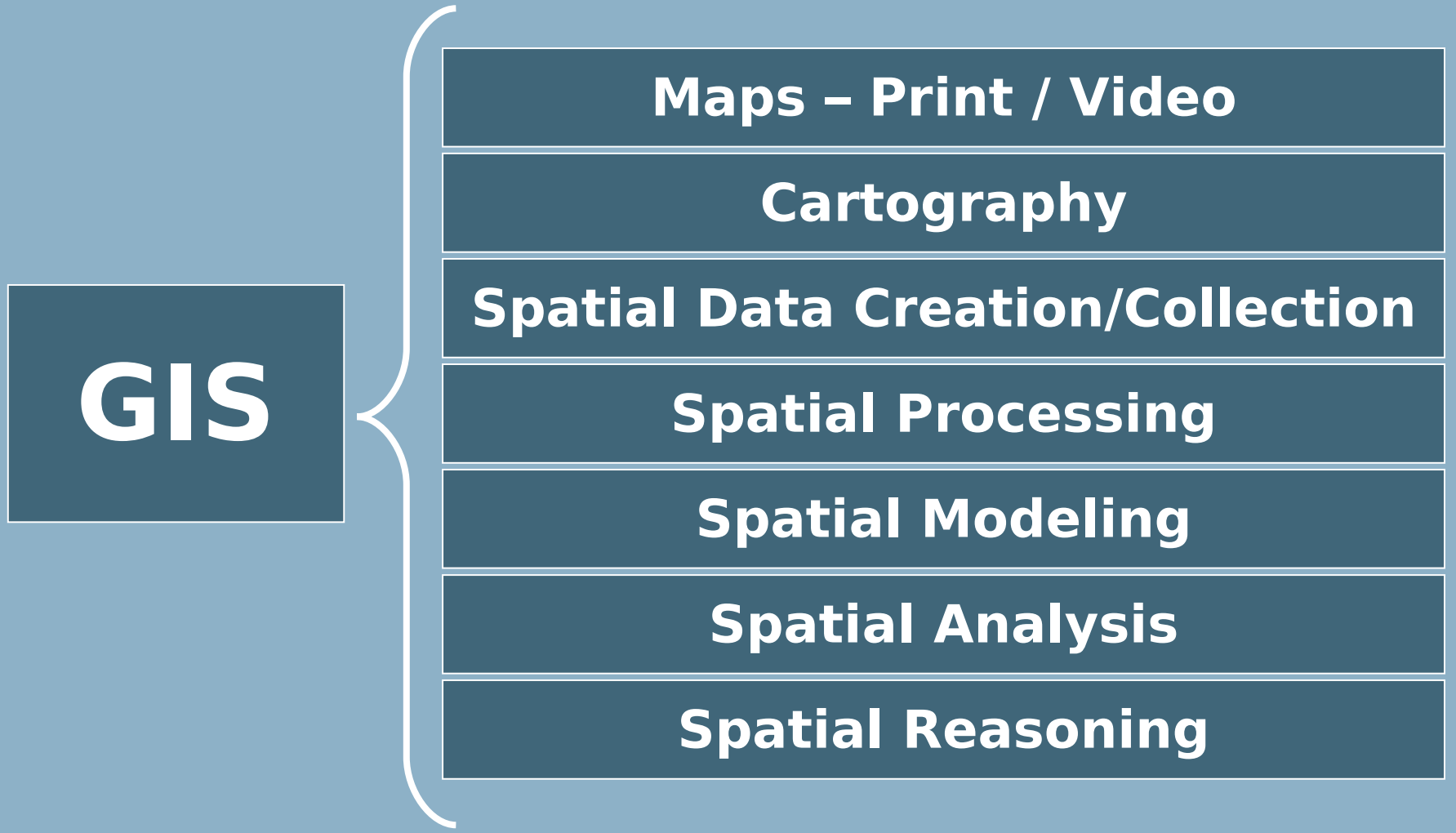
Benefici

- Costo del software = $0
- Rispetto degli standard (per es. OGC) e nessun lock-in
- Codice sorgente disponibile, modificabile, ridistribuibile
- Community di sviluppatori e utenti MOLTO attive
- Cicli di sviluppo MOLTO veloci

Limiti

- Il costo totale != $0
- Molte applicazioni sono più grezze delle controparti proprietarie
- Può essere un problema la compatibilità con i software e formati proprietari e chiusi (es. DWG).

GIS – Geographic Information Systems



Desktop Software Stack

Generic Stack	FOSS4G Stack	Grouping
Application	QGis, Grass, OSSIM, JUMP, UDig	User Interface
Application Dev. Environment	Eclipse, QT, OpenGL, Tkl/Tk	
High Level Utilities	GeoTools, Postgresql, PostGIS	Data Serving
High Level Scripting Languages	PHP, PERL, Python	
Low Level Utilities	Shplib, GEOS, OGR/GDAL, R-Statistics, GMT	Data Processing
Low Level Languages	C, C++, Java, Fortran	System Software
Operating System	Linux, Darwin, Cygwin	
Hardware Drivers	32-64 bit processor drivers	

OSGIS – Desktop Applications

Quantum GIS
The New Direction of Open Source



GRASS GIS



uDig

The Jump Project
WWW.JUMP-PROJECT.ORG



OSGIS Software Stacks... Server

Web-based Software Stack

Generic Stack	FOSS4G Stack	Grouping
Client Side Browser	Firefox, Safari, Netscape	User Interface
Client Side Scripting	Javascript, Java Applets	
~~WEB~~~~~~~~~~~~		
Server Side Application	Chameleon, Cartoweb3, MapGuide, Mapbender, Mapbuilder, Custom	Data Serving
High Level Utilities	Mapserver, MapGuide,	
High Level Scripting Languages	PHP, PERL, Python	Data Processing
Low Level Utilities	Shplib, GEOS, OGR/GDAL, PostGIS, R-Statistics, GMT	
Low Level Languages	C, C++, Java, Fortran	System Software
Operating System/Drivers	Linux, Darwin, Cygwin	
Hardware Drivers	32-64 bit processor drivers	

OSGIS - Server Tools



GDAL/OGR









GRASS GIS



R-Statistics

Desktop Raster/Vector Processing

GRASS/GDAL/OGR - Data Crunching

- Supporto dati raster e vettoriali
- Esteso tool set (simile a ArcINFO/ArcGRID)
- Tradizionalmente poco amichevole la GUI, ma in evoluzione
- Molto veloce
- Cross platform

QGIS/GDAL/OGR – Data Viewing/Editing

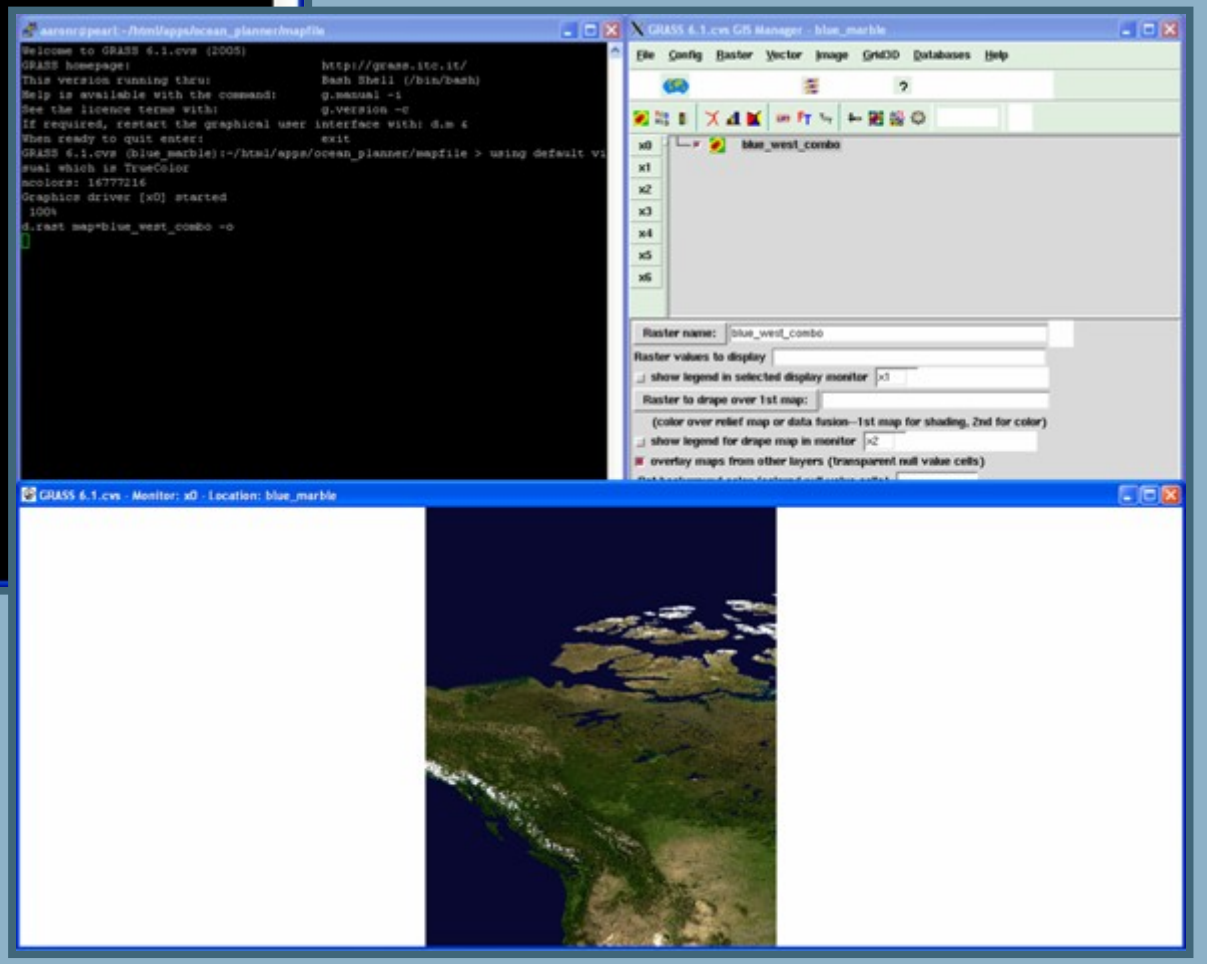
- Supporto dati raster e vettoriali
- GUI evoluta
- Cross platform
- QGIS è integrabile con GRASS

GRASS-Raster

```
aaronr@pearl:~/html/apps/ocean_planner/mapfile
GRASS 6.1.cvs (blue_marble):~/html/apps/ocean_planner > gdalinfo data/base_data/
state/oregon/terrain/drg/www.gis.state.or.us/data/DRG/41117/h/drg41117h7/DRGs/42
117/41117h7.tif
Driver: GTiff/GeoTIFF
Size is 4546, 5914
Coordinate System is ``
Origin = (2025390.516070,103953.511767)
Pixel Size = (8.00000000,-8.00000000)
Metadata:
  TIFFTAG_SOFTWARE=Arc/Info
  TIFFTAG_XRESOLUTION=0.125
  TIFFTAG_YRESOLUTION=0.125
  TIFFTAG_RESOLUTIONUNIT=1 (unitless)
Corner Coordinates:
Upper Left  ( 2025390.516,  103953.512)
Lower Left  ( 2025390.516,   56641.512)
Upper Right ( 2061758.516,  103953.512)
Lower Right ( 2061758.516,   56641.512)
Center      ( 2043574.516,   80297.512)
Band 1 Block=4546x2 Type=Byte, ColorInterp=Palette
  Color Table (RGB with 256 entries)
    0: 0,0,0,255
    1: 255,255,255,255
    2: 0,151,164,255
    3: 203,0,23,255
    4: 131,66,37,255
    5: 201,234,157,255
    6: 137,51,128,255
    7: 255,234,0,255
    8: 167,226,226,255
    9: 255,184,184,255
   10: 218,179,214,255
   11: 209,209,209,255
   12: 207,164,142,255
```

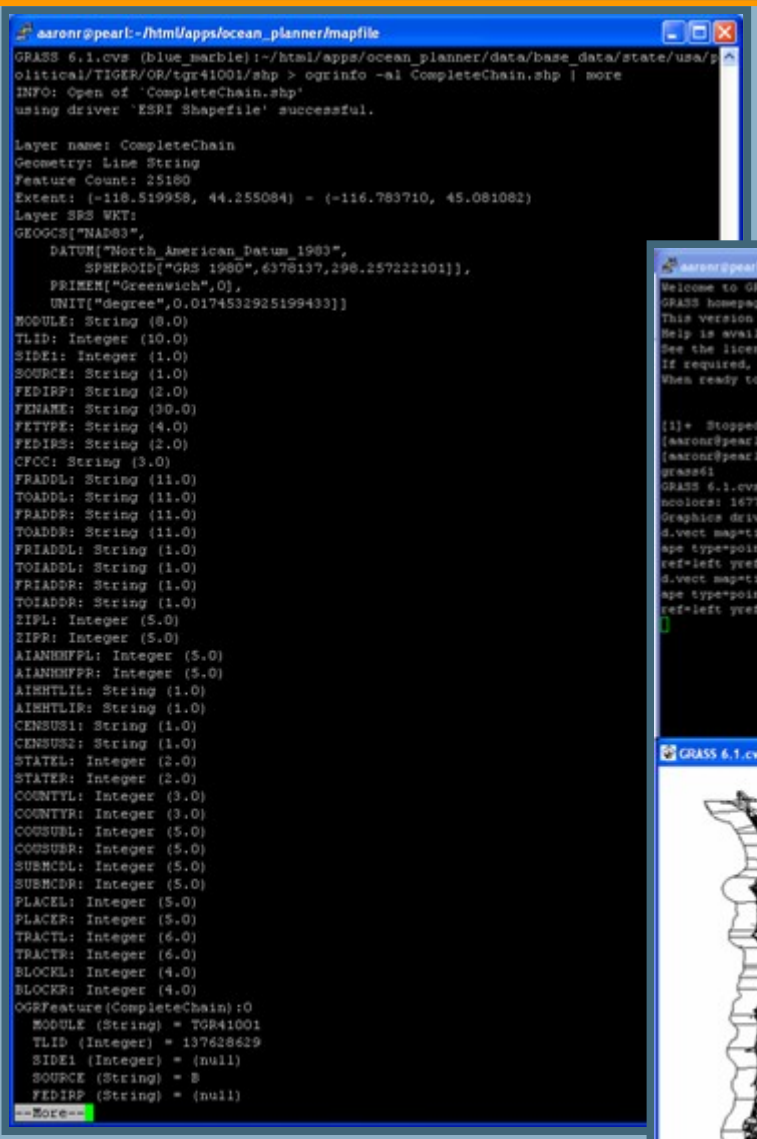
GDAL

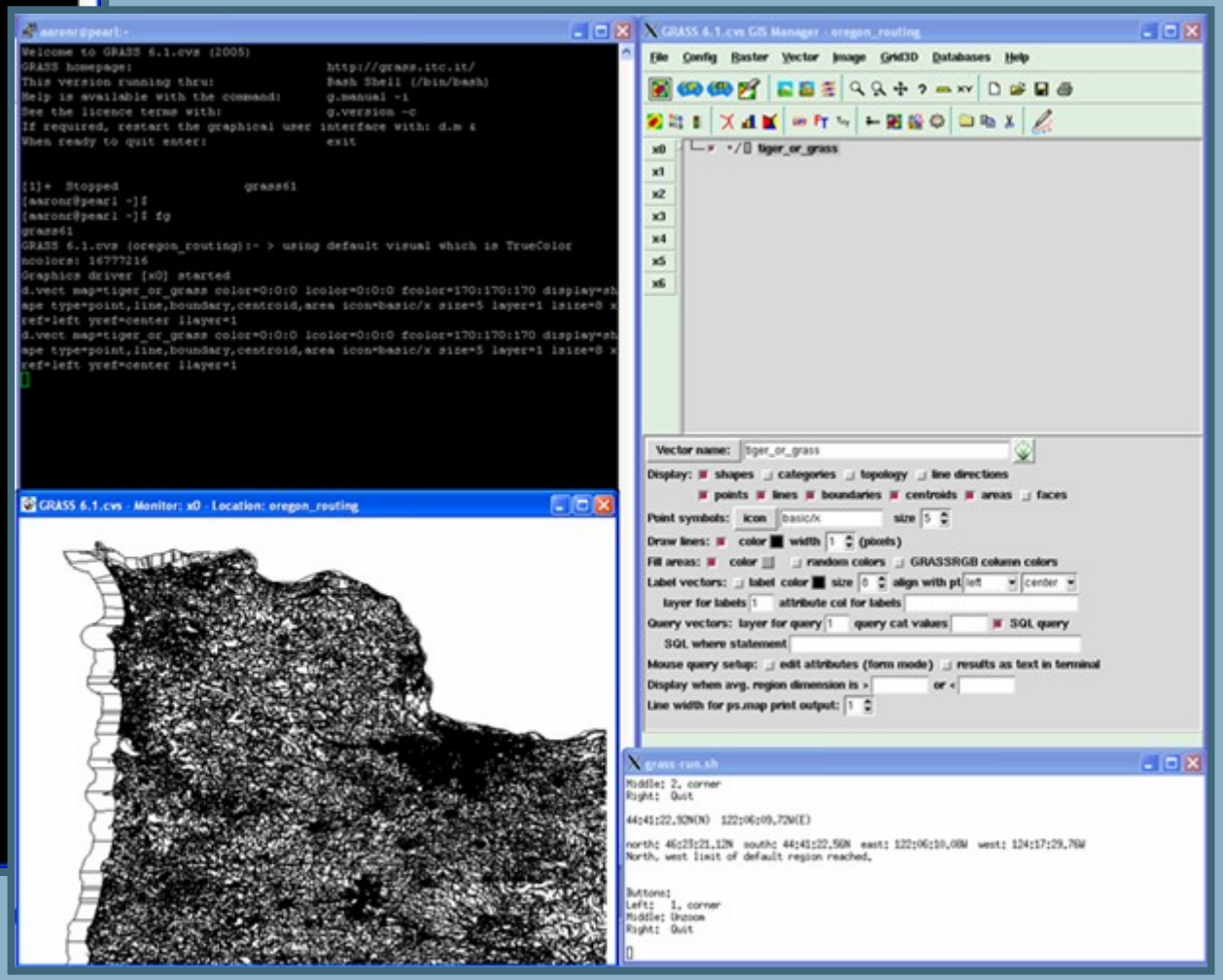
Grass Raster Processing



GRASS-Vector

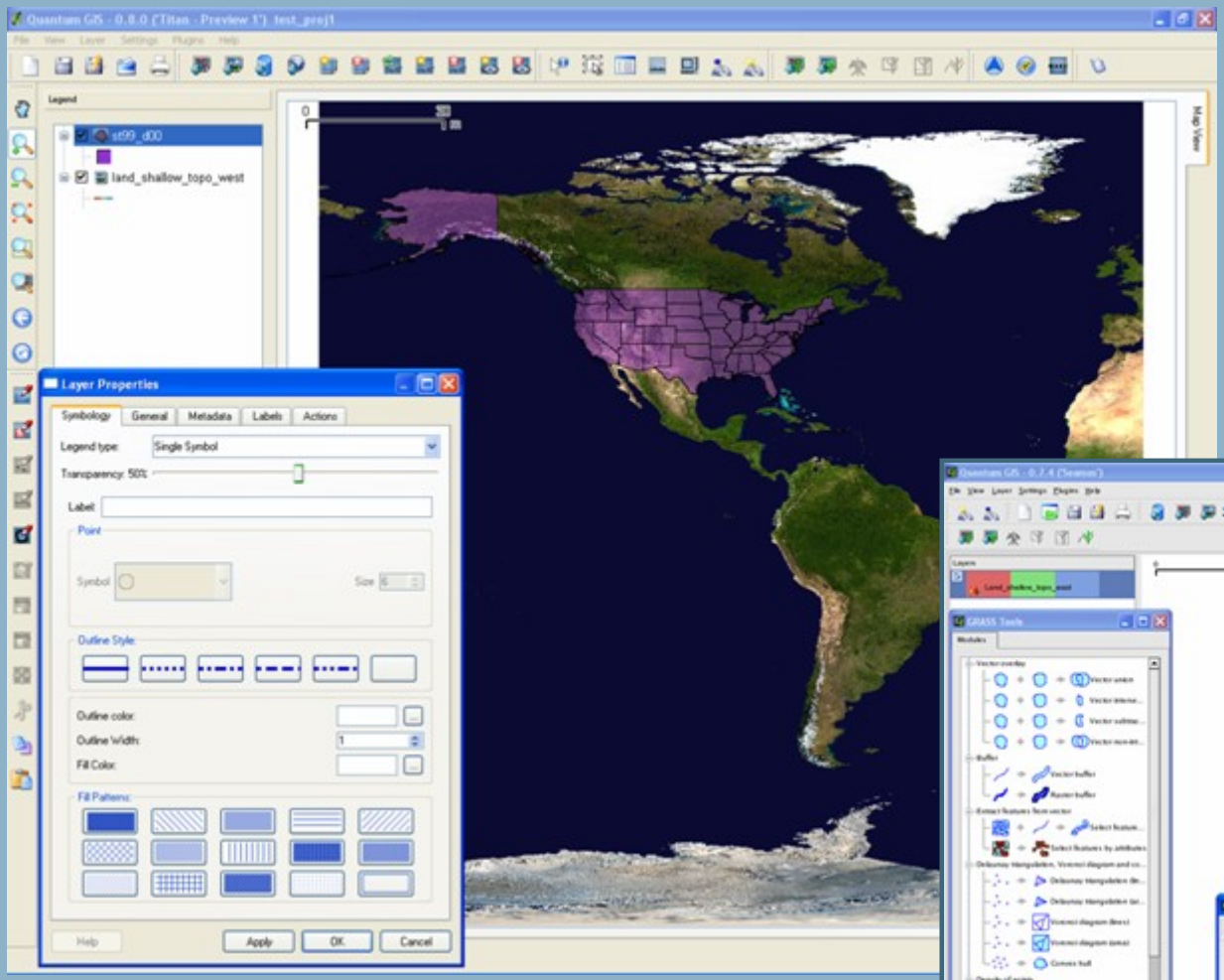
Grass Vector Processing



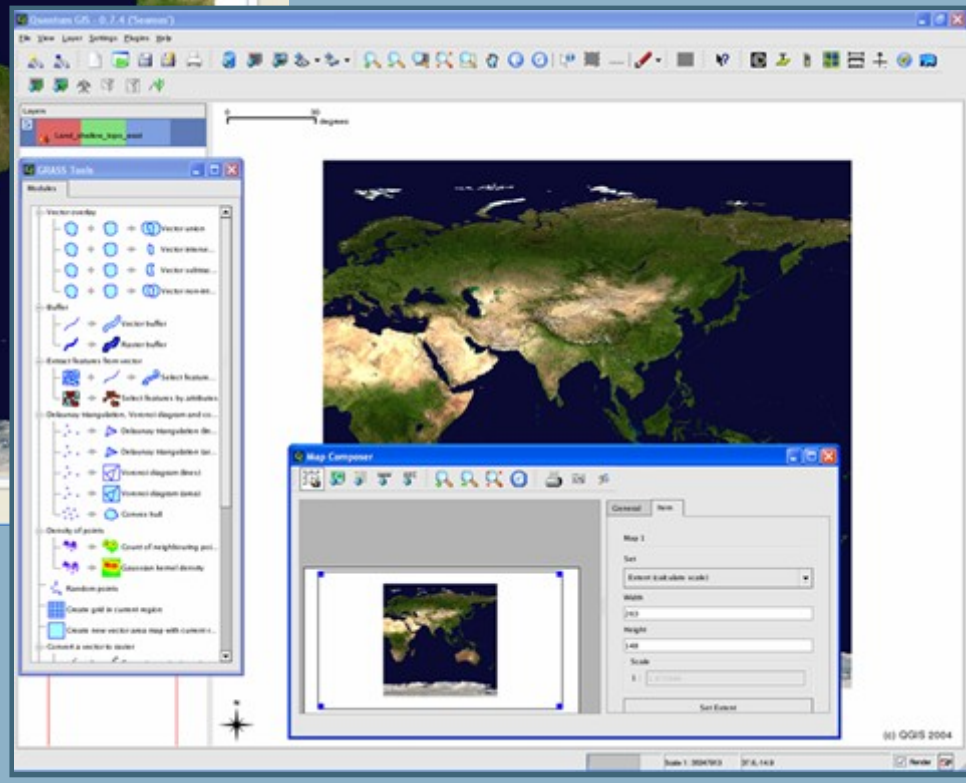


OGR

QGIS

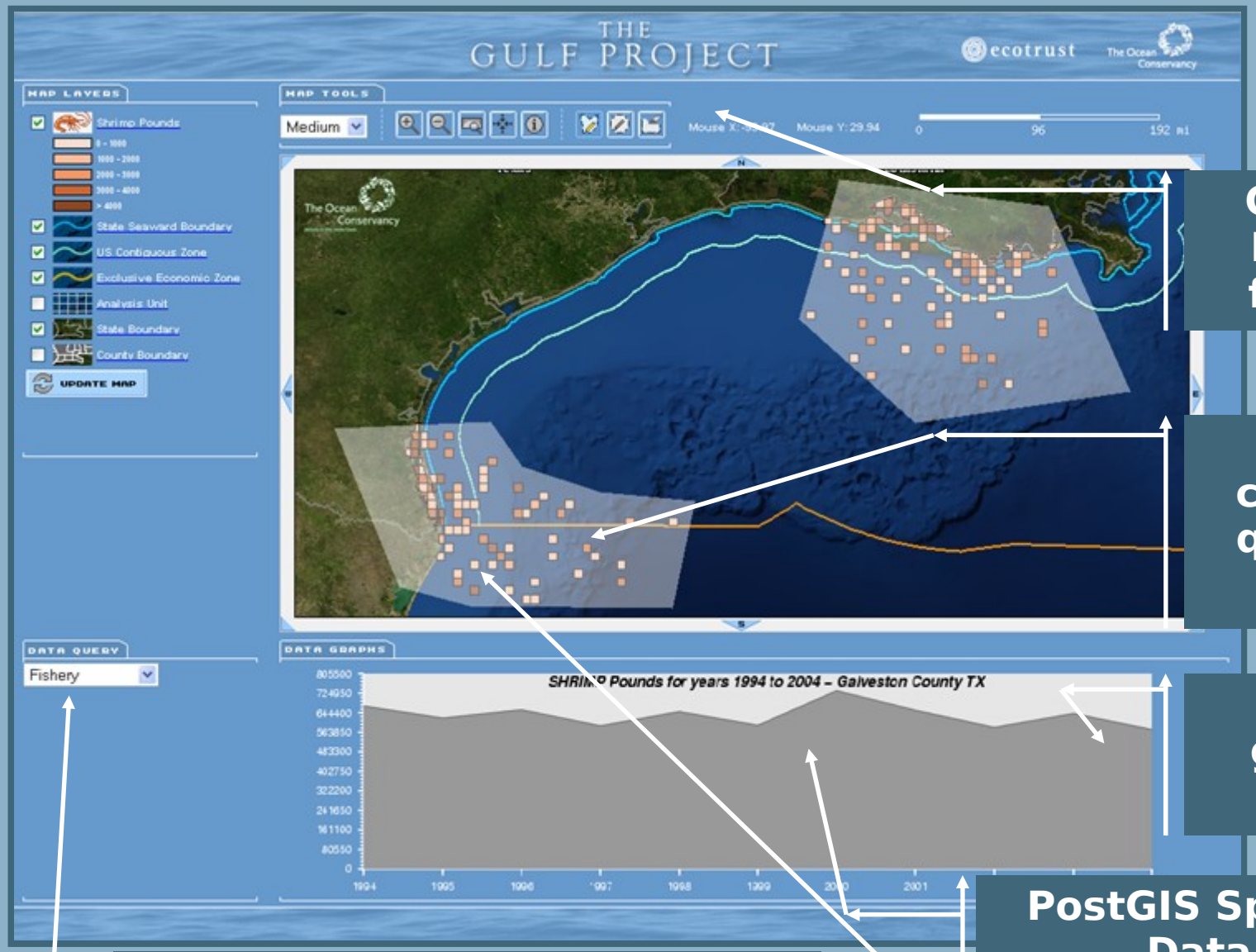


QGis 0.9



QGis 0.7.4

Mapserver Web-Based Interface



Chameleon Mapserver framework

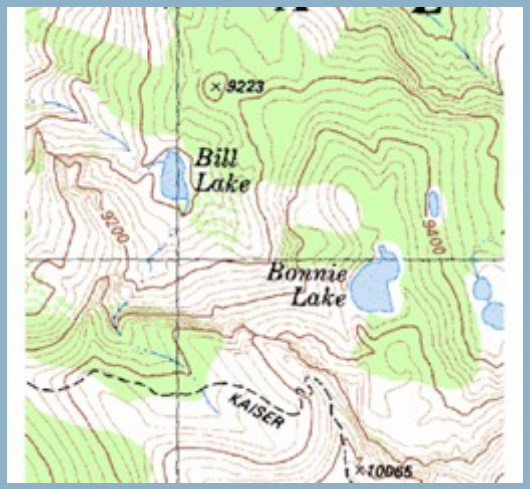
Spatially constrained queries and scenarios

GMT generated graphics

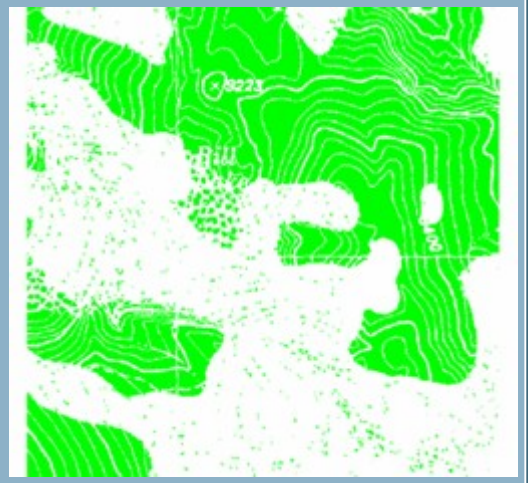
PostGIS Spatial Data

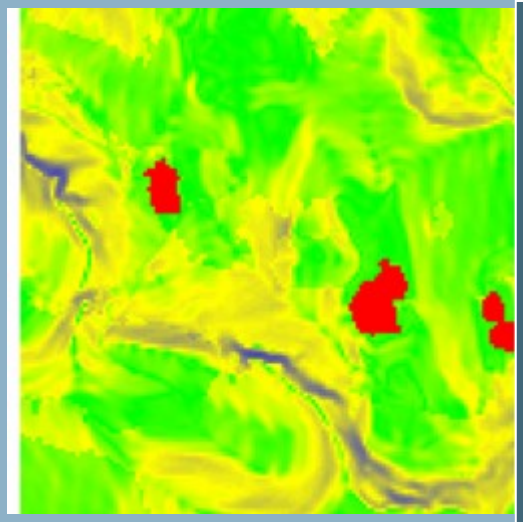
AJAX-User Based Data Filter

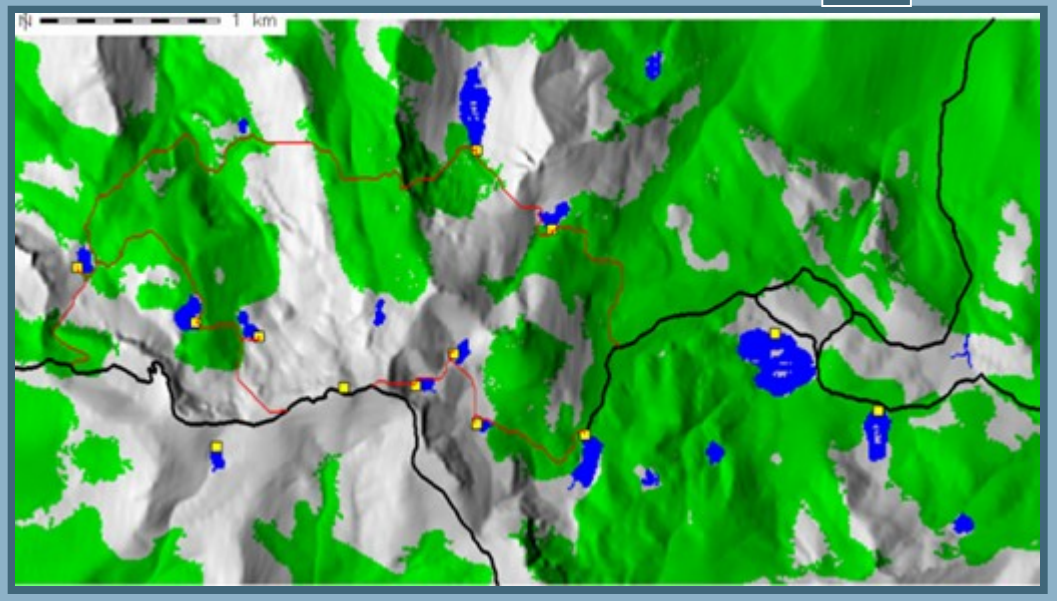
Navigazione delle wilder-ness con GRASS







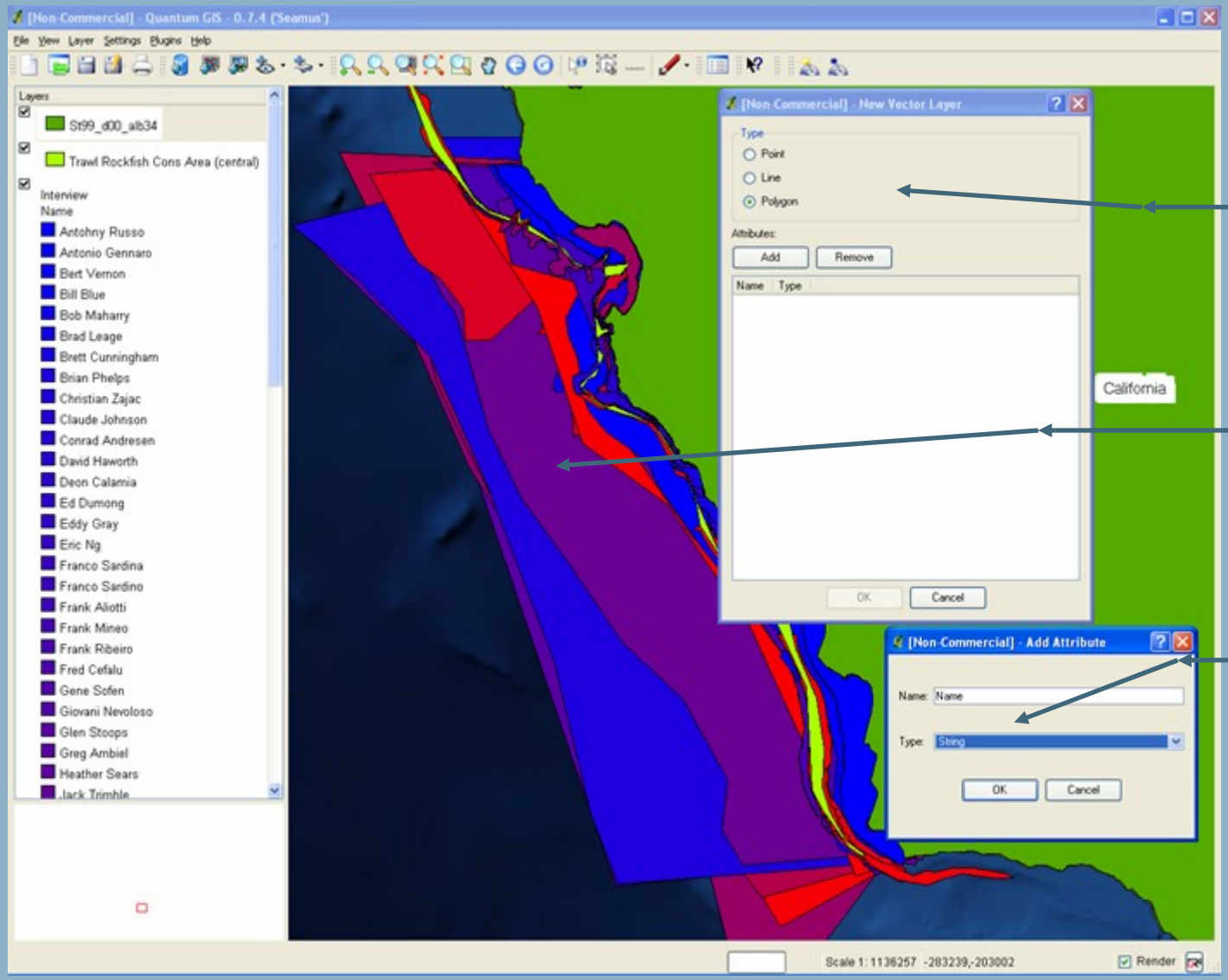




Thanks to Dylan Beaudette :
http://casoilresource.lawr.ucdavis.edu/drupal/node/244

Creazione dei dati….

Digitalizzazione, modifica, estrazione…



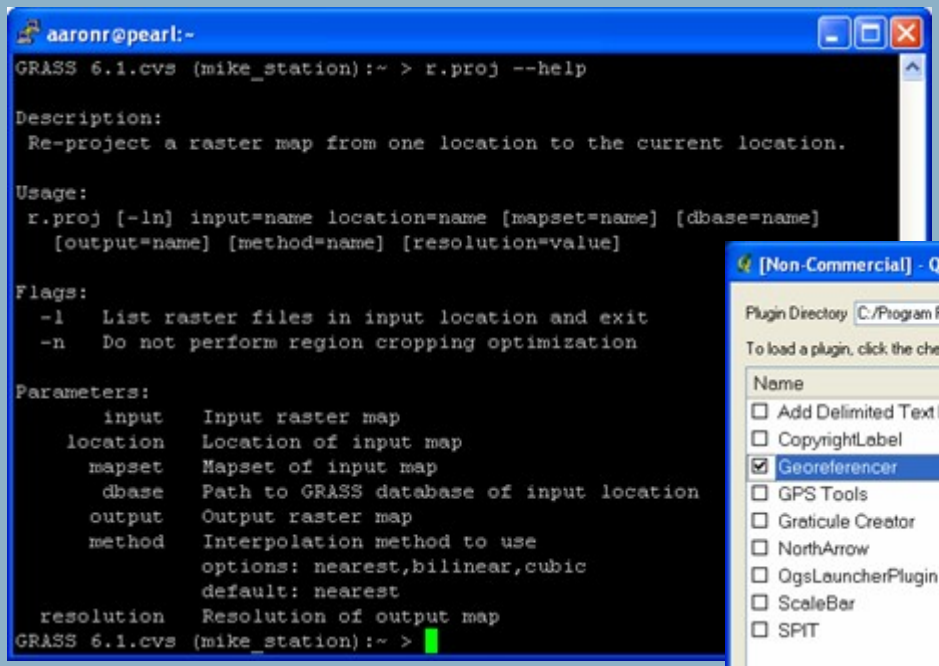
Creazione nuovi shape

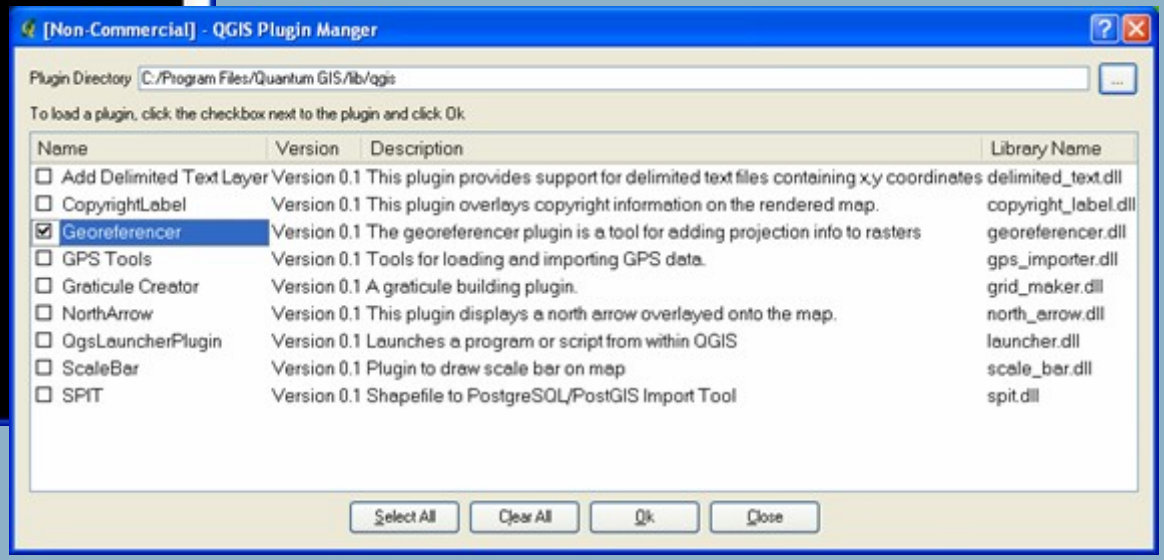
Vista layer contestuali

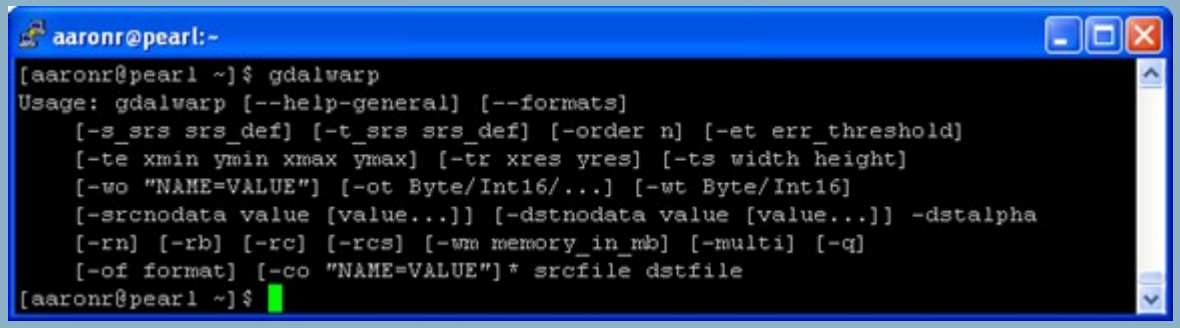
Creazione nuovi attributi

Trasformazione dei dati….

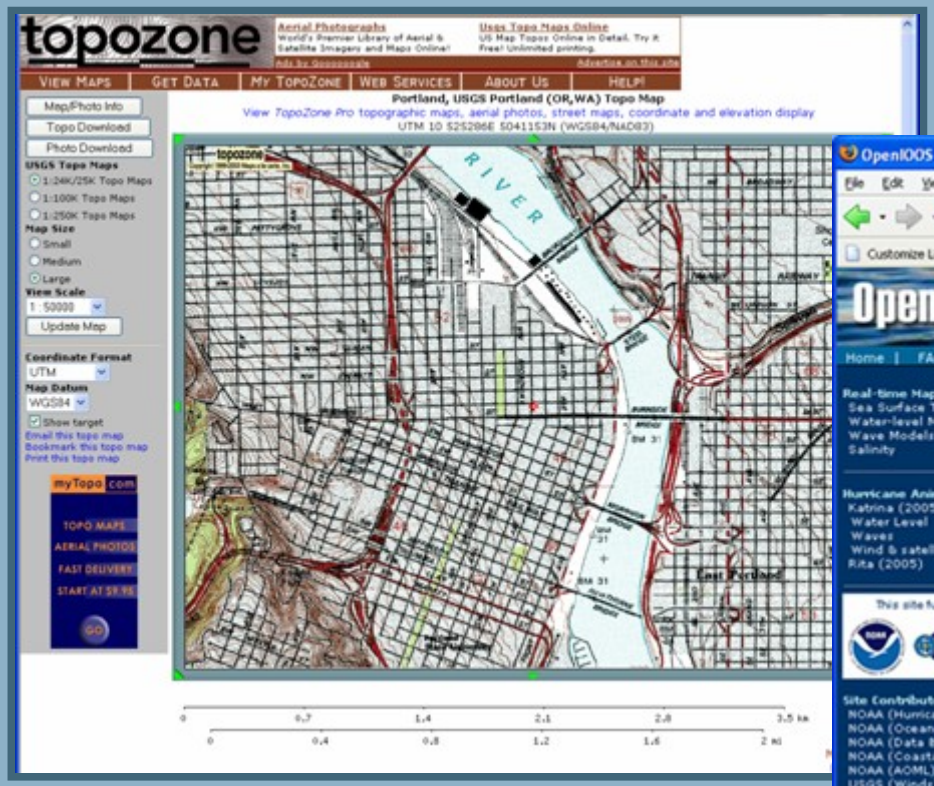
Come passare da UTM a Geo-NAD83?

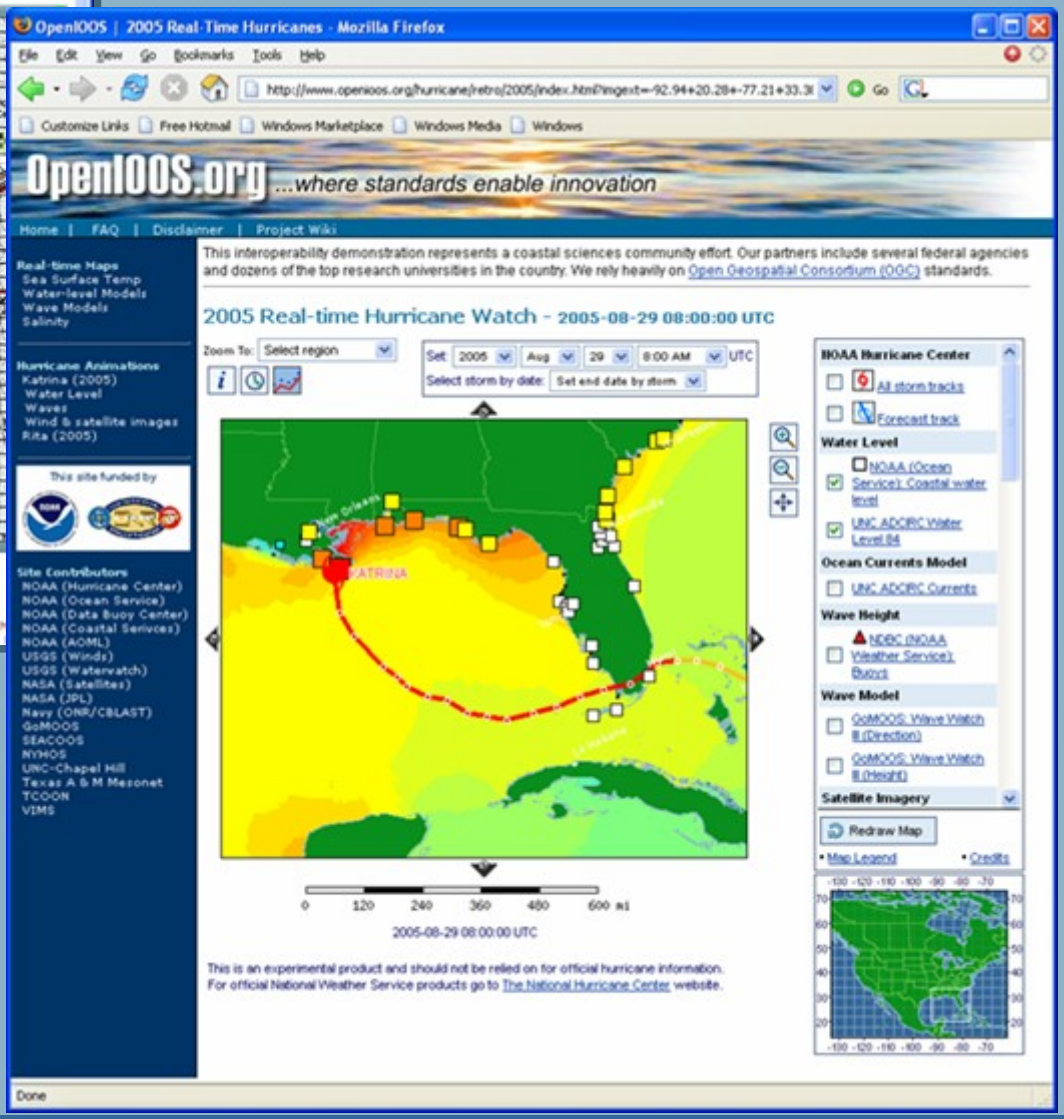






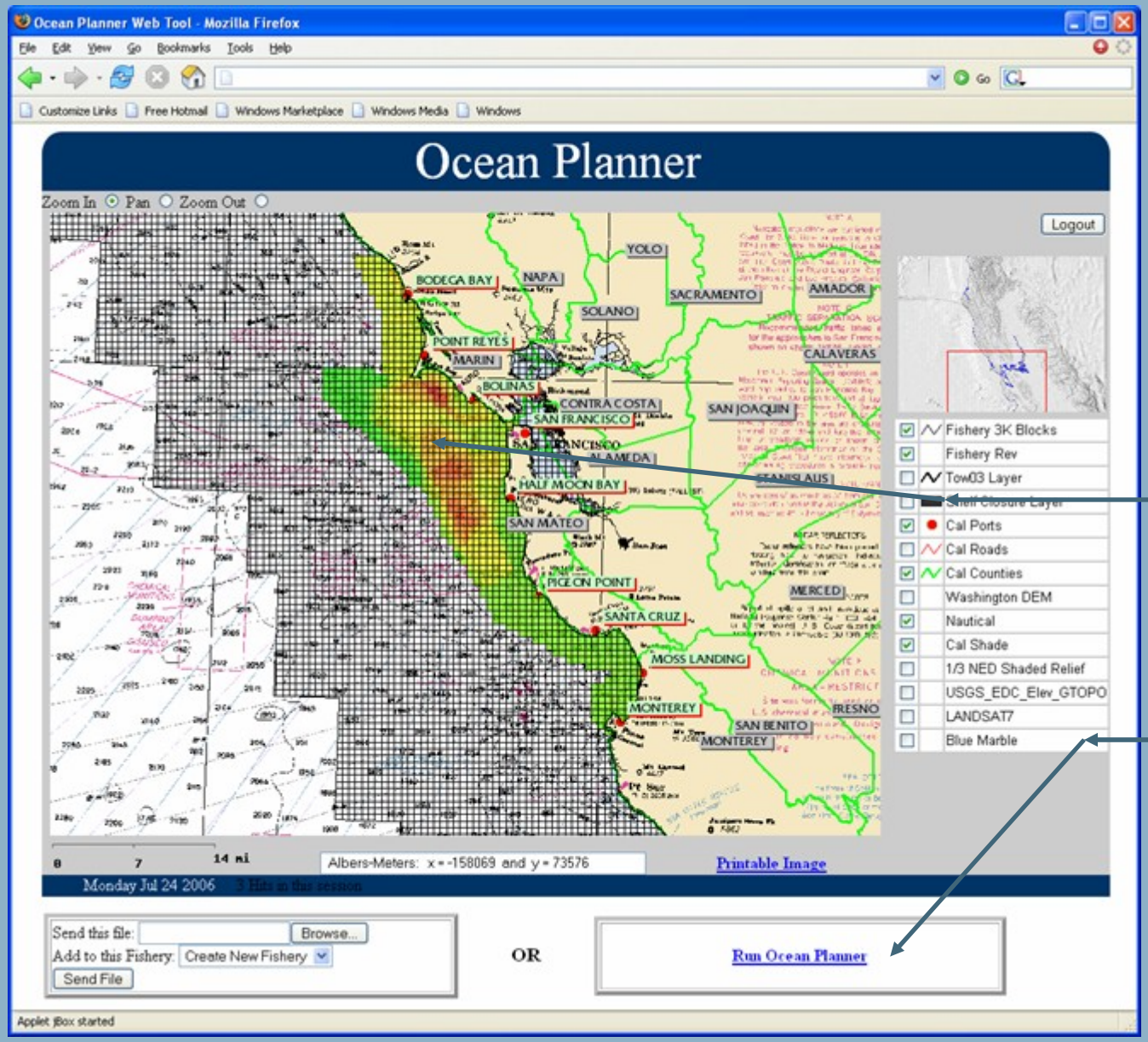
Web enable standard geo-data….





MAPSERVER

Portare su web geo-dati non standard….



Come visualizzare e interagire con data model?

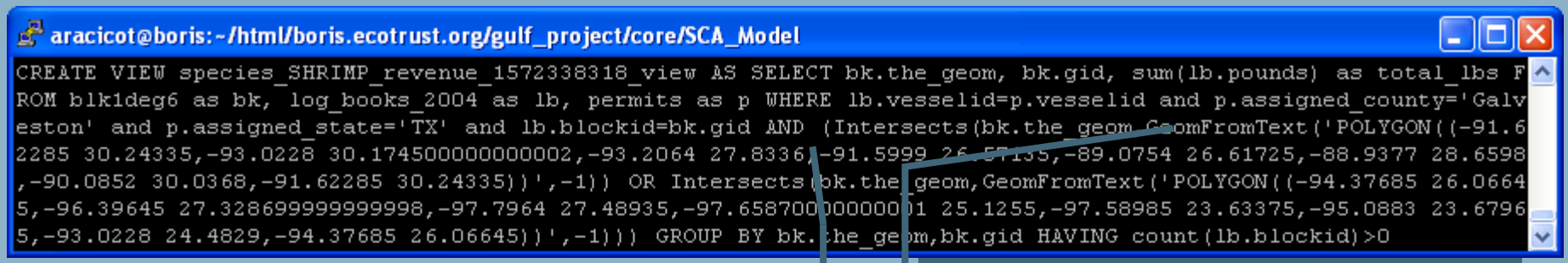
GIS Model Results

Web Based Real-Time GIS Model

MAPSERVER

Geo-database relazionali….

How to select data within a polygon area?



Intersects

Distance(geometry, geometry)
Equals(geometry, geometry)
Disjoint(geometry, geometry)
Intersects(geometry, geometry)
Touches(geometry, geometry)
Crosses(geometry, geometry)
Within(geometry A, geometry B)
Overlaps(geometry, geometry)
Contains(geometry A, geometry B)
Intersects(geometry, geometry)
Relate(geometry, geometry, intersectionPatternMatrix)
Relate(geometry, geometry)

PostGIS

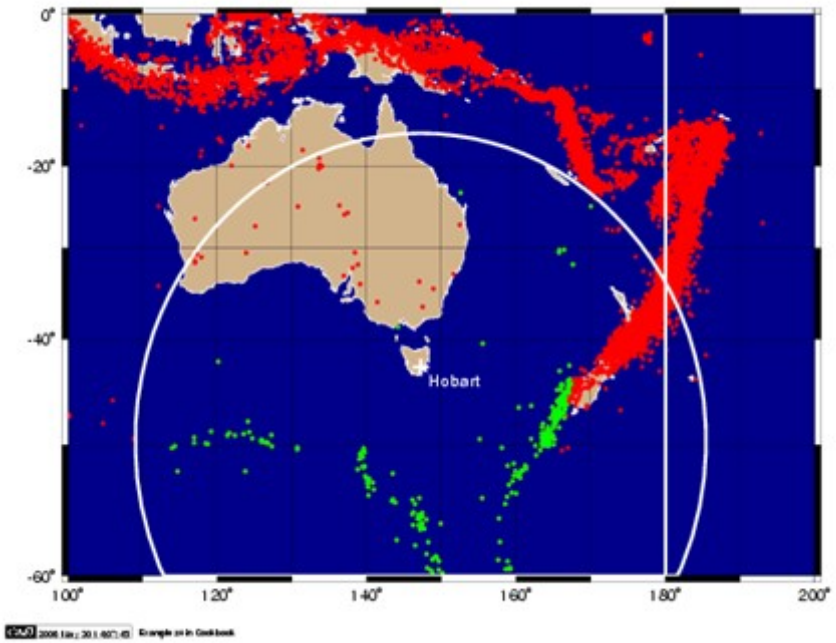
Geometry Definition

Centroid(geometry)
Area(geometry)
Length(geometry)
PointOnSurface(geometry)
Boundary(geometry)
Buffer(geometry, double, [integer])
ConvexHull(geometry)
Intersection(geometry, geometry)
SymDifference(geometry A, geometry B)
Difference(geometry A, geometry B)
GeomUnion(geometry, geometry)
GeomUnion(geometry set)
MemGeomUnion(geometry set)

Visualizzare dati unici...

Come plottare geospatial e model data?

```
#!/bin/csh
#
#               GMT Example 24  $Id: job24.csh,v 1.5 2006/05/08 01
#
# Purpose:   Extract subsets of data based on geospatial criteria
# GMT progs:                gmtselect, pscoast, psxy, minmax
# Unix progs:               echo, cat, awk
#
# Highlight oceanic earthquakes within 3000 km of Hobart and >
echo "147:13 -42:48 3000 Hobart" >! point.d
cat << EOF >! dateline.d
> Our proxy for the dateline
180             0
180             -90
EOF
set R = `minmax -I10 oz_quakes.d`
pscoast $R -JM9i -K -Gtan -Sdarkblue -Wthin,white -Dl -A500 -Ba2
                -U"Example 24 in Cookbook" >! example_24.ps
psxy -R -J -O -K oz_quakes.d -Sc0.05i -Gred >> example_24.ps
gmtselect oz_quakes.d -L1000/dateline.d -Nk/s -C3000/point.d -fg
                | psxy -R -JM -O -K -Sc0.05i -Ggreen >> example_24.ps
awk '{print $1, $2, 0, $3, $3}' point.d | psxy -R -J -O -K -SE -Wfat,white >> example_24.ps
awk '{print $1, $2, 14, 0, 1, "LT", $4}' point.d \
                | pstext -R -J -O -K -Gwhite -D0.1i/-0.1i >> example_24.ps
psxy -R -J -O -K point.d -Wfat,white -Sx0.2i >> example_24.ps
psxy -R -J -O -M dateline.d -Wfat,white -A >> example_24.ps
\rm -f point.d dateline.d .gmt*
```



The Generic Mapping Tools
http://gmt.soest.hawaii.edu/

Informazioni

OSGeo
- http://www.osgeo.org

OSGIS
- Maptools - http://www.maptools.org
- FreeGIS - http://freegis.org/
- Open Source GIS - http://opensourcegis.org/
- GFOSS Italia - http://www.gfoss.it/

Standards
- OGC - http://www.opengeospatial.org/

Desktop
- GRASS - http://grass.itc.it/
- QGIS - http://qgis.org/
- UDIG - http://udig.refractions.net/confluence/display/UDIG/Home
- OpenJUMP – http://jump-project.org/
- OSSIM - http://www.ossim.org/Welcome.html
- OpenEV - http://openev.sourceforge.net/

Server/Web
- Mapserver - http://mapserver.gis.umn.edu/
- MapBender - http://www.mapbender.org
- MapBuilder - http://docs.codehaus.org/display/MAP/Home
- MapGuide OS - https://mapguide.osgeo.org/

Tools
- PostGIS - http://postgis.refractions.net/
- Remote Sensing - http://remotesensing.org/tiki-index.php
- GDAL/OGR - http://gdal.maptools.org/index.html
- PROJ.4 - http://proj.maptools.org/
- R-Statistics - http://www.r-project.org/
- GMT - http://gmt.soest.hawaii.edu/

Web Mapping

* **Mapbender**
* **MapBuilder**
* **MapGuide Open Source**
* **MapServer**
* **OpenLayers**

Desktop Applications

* **GRASS**
* **OSSIM**
* **Quantum GIS**
* **gvSIG**

Geospatial Libraries

* **FDO**
* **GDAL/OGR**
* **GeoTools**

Progetti blessed by
OSGEO Foundation

http://www.osgeo.org



OpenStreetMap

Un problema fondamentale è la proprietà dei dati geografici.

Openstreemap rappresenta la risposta free al problema della mancanza di dati liberamente distribuibili, almeno relativamente alla cartografia stradale.

Rimane il problema dei dati satellitari (soprattutto in UE ma non esclusivamente) solo parzialmente mitigati dal fenomeno Google. Pochissimi paesi mettono a disposizione archivi completi e spesso solo dati a bassa risoluzione sono disponibili.

Queste slide sono in parte basate su una presentazione di Aaron Racicot di Ecotrust e rilasciate in pubblico dominio.