MGDS Data Exploration Tools – Hands-on exercises and usability feedback

Please try the following short exercises. Remember, there are multimedia tutorials and help pages at this web page: http://www.geomapapp.org/
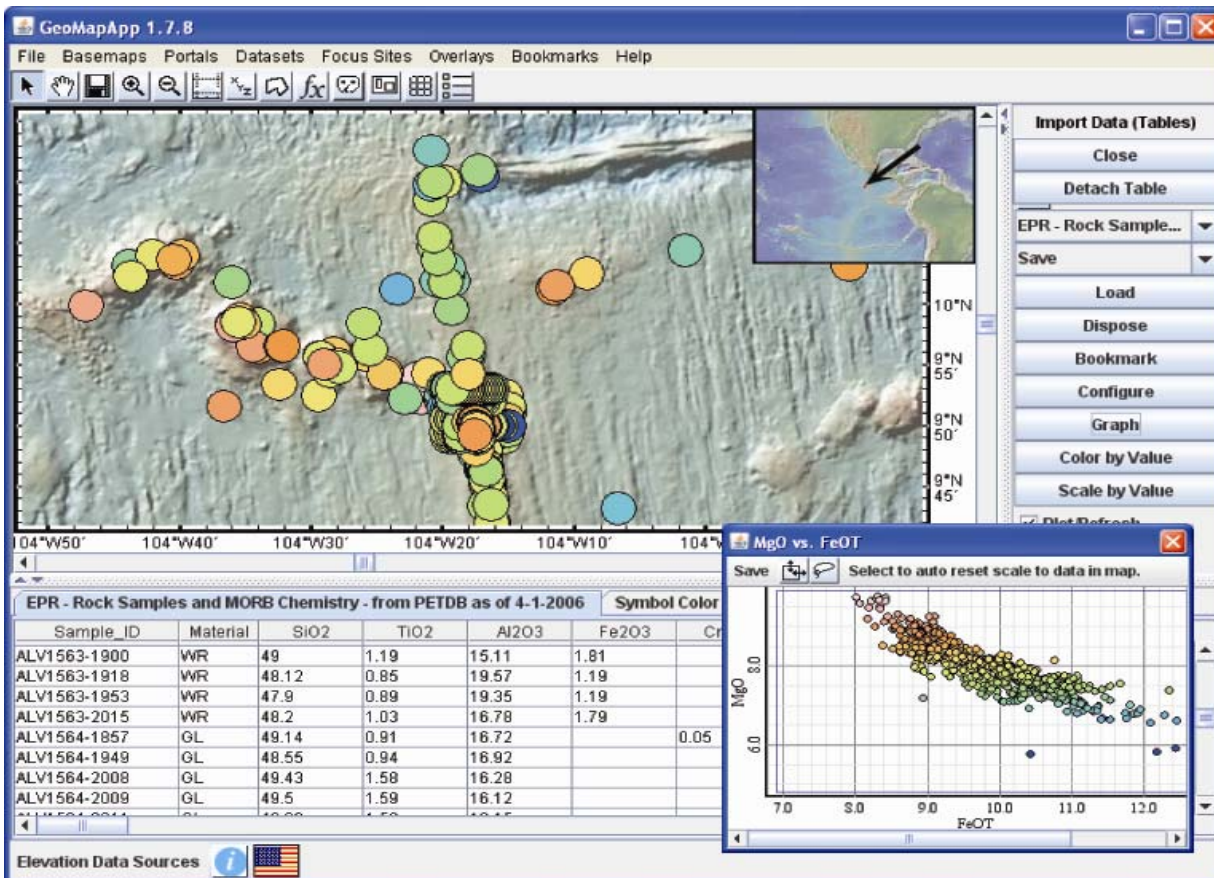
GeoMapApp: Search for geochemical signatures using PetDB petrology

Zoom to the EPR 9N Integrated Study Site. Most of this seafloor is mapped with high-resolution multibeam; fuzzy areas around the edges are the background satellite altimetry-derived bathymetry.

Load the PetDB samples chemistry (*Focus Sites -> Select From Searchable List,* type *"MORB"* into search box*,* click once on *EPR Rock samples and MORB chemistry from PetDB,* then hit *OK*). When the table is loaded, use the *Colour By Value* button to colour the symbols on, say, MgO. In the colour palette window, slide the grey lines sideways to change the colour scale. Use the *Graph* button to plot FeOT against MgO. In the graph plot window, click on the *Lasso* tool and use the mouse to encircle the high-MgO outliers. This lights up the symbols both on the graph and in the map window.

Bonus: On the right, use the Save drop-down menu to copy the selected points into an Excel spreadsheet and open the spreadsheet.

Note: you can also pull up these samples using the real-time PetDB Web Feature Service, as follows. *File -> Import Dataset from WFS*. From the drop-down menu, select *PetDB*, hit *Connect*. Hit *Load Feature* (may take a few minutes depending upon the internet connection).

GeoMapApp: Central America geochemical signatures using EarthChem petrology

Zoom to the Central America area. Land elevations are from the Space Shuttle SRTM90 mission. Seafloor depths are from high-resolution multibeam and background satellite altimetry-derived bathymetry.

Load the EarthChem samples chemistry (*Focus Site -> Select From Searchable List,* type *"earthchem"* into search box*,* click once on *EarthChem Rock Samples Central America,* hit *OK*). Use the *Colour Symbols* button to colour the symbols on, say, CaO. In the colour palette window, slide the grey lines sideways to change the colour scale. Use the *Graph* button to plot TiO_2 against SiO_2. Click on map points or table records to highlight particular samples.

In the graph plot window, click on the *Lasso* tool and use the mouse to draw a line on the graph around the high-TiO_2 samples. This lights up the symbols both on the graph and in the map window. Bonus: On the right, use the *Save* drop-down menu to copy the selected points into an Excel spreadsheet and open the spreadsheet.

Note: you can also pull up the ocean floor samples using the real-time PetDB Web Feature Service: *File -> Import Dataset from WFS.* From the drop-down menu, select *PetDB*, hit *Connect.* Hit *Load Feature* (may take a few minutes depending upon the internet connection).
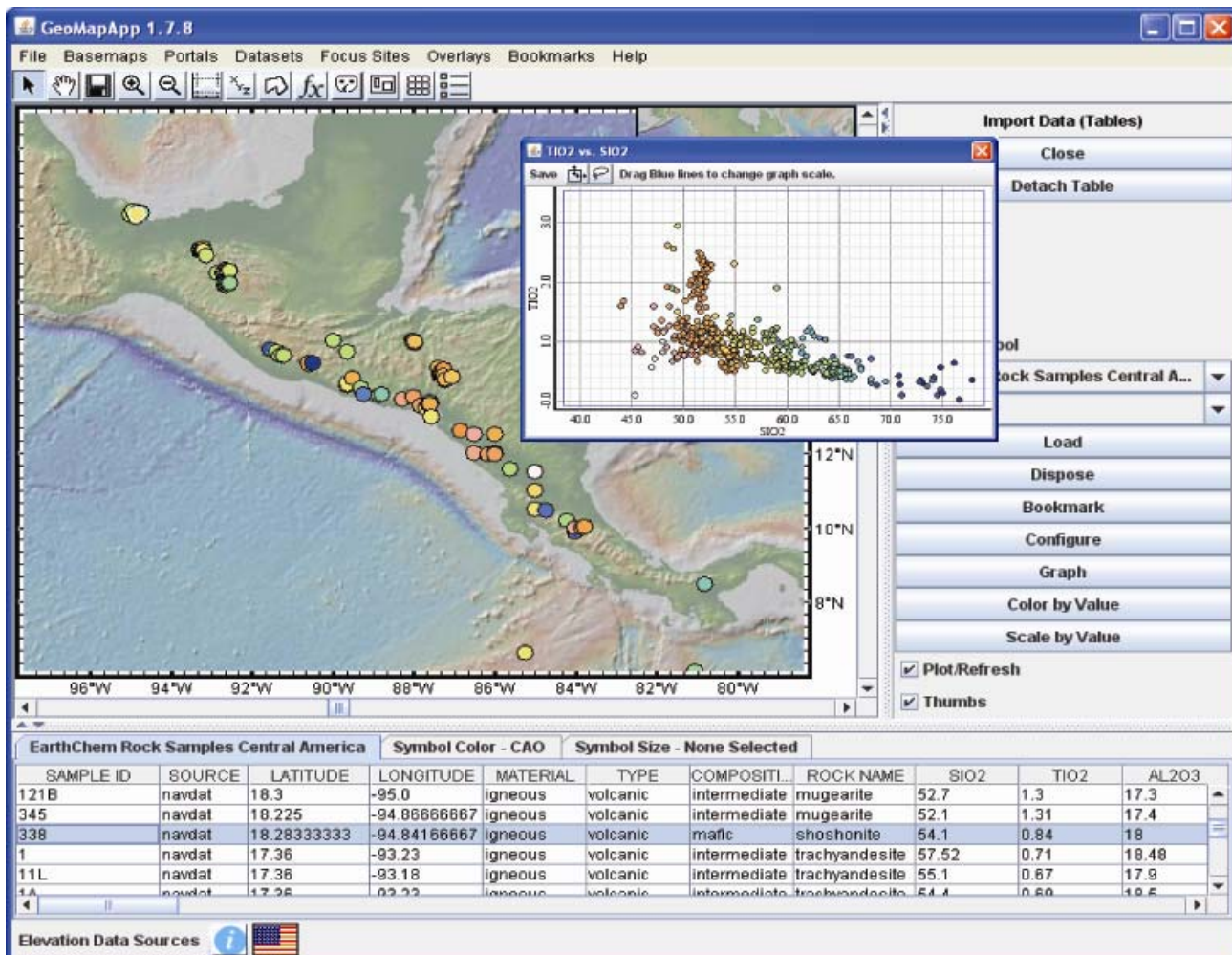
GeoMapApp: Biological diversity and high-resolution bathymetry at hydrothermal vents

First, load the high-resolution ABE Imagenex 5m bathymetry grid for the EPR:9N ISS (Places -> Hi_Res_Grids -> EPR_9N -> 9 50). Use the zoom button to zoom in on the bathymetry. In the Grid Options window, click on the Profile Tool and use the mouse to select a profile line.
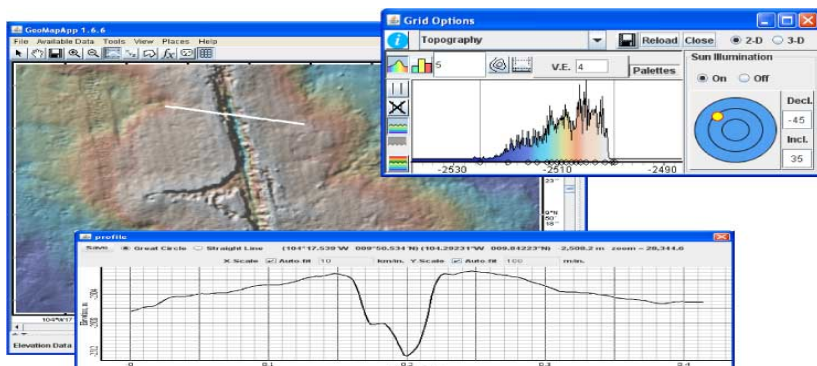

Load Alvin dive photos as follows: *Available Data -> Open Searchable List*. Type "*dive photo*" in the text box at the top, click once on *EPR:9_50N NDSF Dive Photos* so that only this item remains highlighted. Hit *OK*. In the Layers window, click once on the *EPR_9_50N* item in the left pane and then click the Layers window + zoom-in button to zoom to the EPR 9N area. The squiggly lines are all dive tracks in this area. In the right Layers window pane, scroll down and select Alvin dive number *3973*. Click the yellow light bulb button to produce a list of FrameGrabber photos for this dive. This also plots the locatiojn of each photo as a circle on the dive track. Click the yellow light bulb button twice more to bring up two photo windows. In one of these photo windows, select *Camera 2* from the drop-down menu. Use the Left and Right arrows to scroll through the photos. Jump down to photos with time stamp *20040216_194753* and scroll forwards to see Riftia (tube worms), crabs and anemones at Tica vent.
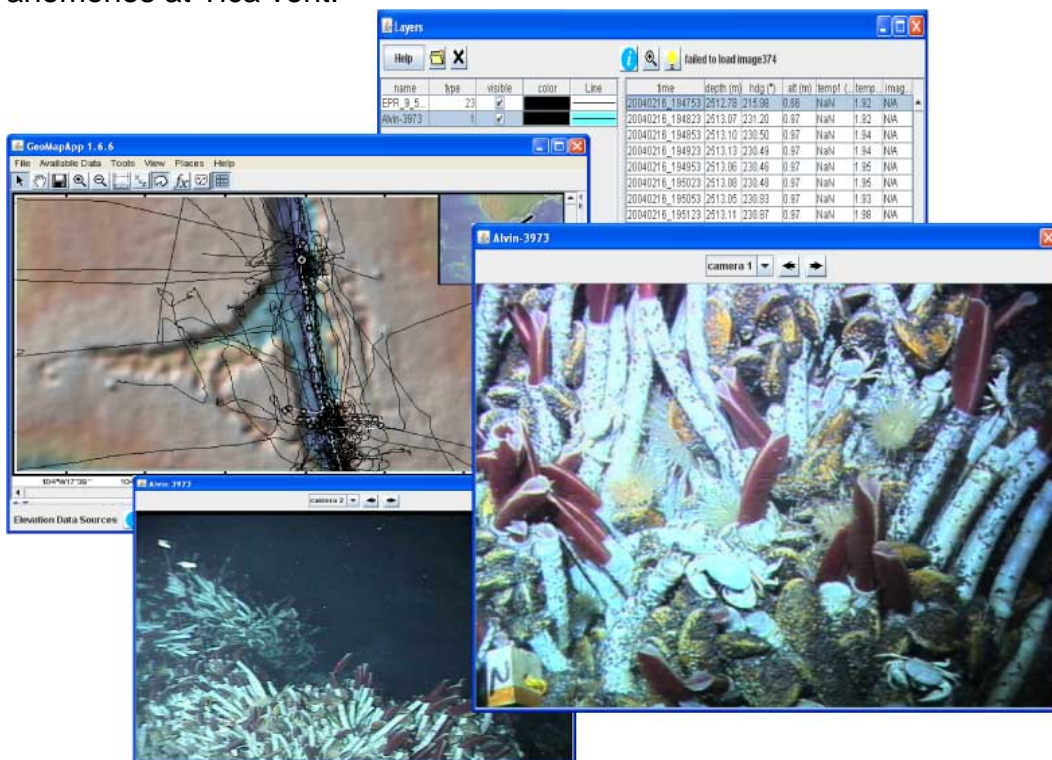
GeoMapApp: Earthquake swarms at the Wilkes fracture zone

Open the NOAA PMEL earthquake catalogue for the EPR area (*Portals -> Location and Timing of Seafloor Earthquakes and Volcanic Eruptions*. Select *EPR*, hit OK). The lower pane shows a histogram of number of earthquakes against time (year, day, date).

Zoom to the Wilkes fracture zone at 109ºW/9ºS. The spikes in the earthquake histogram at the bottom show two swarms in the six-year. Reduce the movie speed to, say, 4 frames/sec (lower left corner). *Play*.
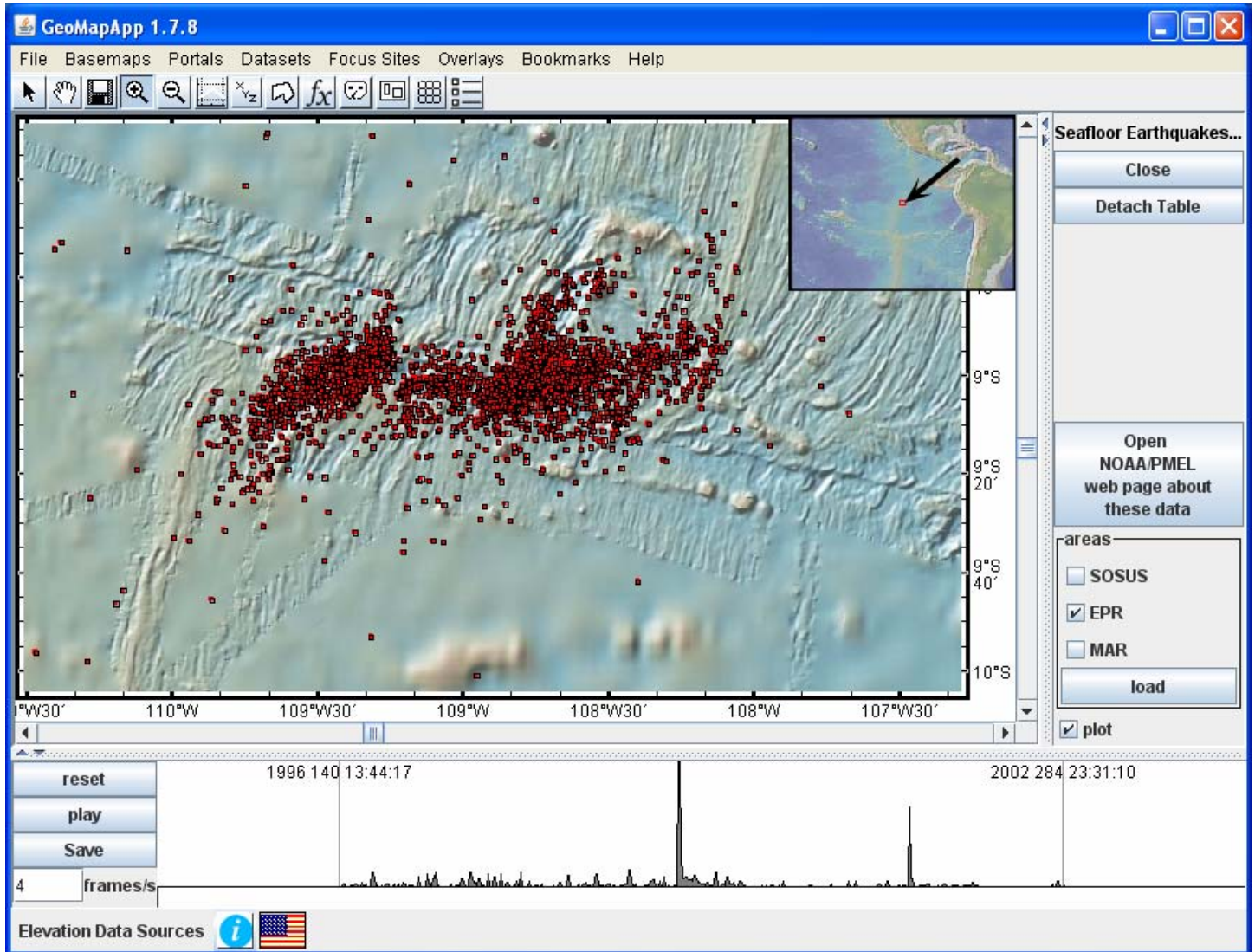
The spectacular abyssal fabric which curves into the FZ can be best seen by unticking the *plot* box (lower right). To save the movie, select *Save* and add ".mov" to the filename. It can then be played on your iPod!

MGDS Ridge 2000 data portal: Find samples, stations and deployed instruments

Use the MGDS Ridge 2000 data portal to view maps and current vent information at each Integrated Study Site. On the main MGDS web page (http://www.marine-geo.org/), under *Data Portals* select *Ridge 2000*. Click on the interactive map, select the Samples tab and zoom in. Click on a sample symbol to display the sample and cruise name. Click the Stations tab to view stations. Download or view a list of currently-deployed instruments as follows. In the left pane, under List Data by Site, open the drop-down menu and select the ISS. Scroll down in the left pane and click *Deployed Instruments*.

Samples and stations can be viewed interactively in GeoMapApp (see example 7), and the table of currently-deployed instruments can be imported.

MGDS Ridge 2000 data portal: View a map and list of hydrothermal vents for each ISS

Use the MGDS Ridge 2000 data portal to view maps and current vent information at each Integrated Study Site. On the main MGDS web page (http://www.marine-geo.org/), under *Data Portals* select *Ridge 2000*. Click on the interactive map, select Vents and zoom in. Click on a vent symbol to display the vent name. Download or view a list of vents as follows. In the left pane, under List Data by Site, open the drop-down menu and select the ISS. Scroll down in the left pane and click Vent Locations.

MGDS: Download Temperature probe data for the EPR 9-50N hydrothermal vents

Use the MGDS **Search For Data** interface to search for and download data, as follows. Open **Search For Data** (http://www.marine-geo.org/, under *Tools & Services*). In the *Select Data By* drop-down menu, choose *By Device Type* and in the *Device Type* drop-down menu select Probe:Temperature. Hit *Search*. Click on the two entries *EPR:9N_LoTemp* and *EPR:9N_HiTemp*, and, in each, click the *Temperature* hyperlink to download the temperature data for individual vents.

GeoMapApp: Plot instrument and sample locations in the Lau Basin using WFS

Connect to the Ridge 2000 database using the MGDS Web Feature Service (*File -> Import Dataset from WFS*, select *MGDS*, hit *Connect*). Select *Stations:World*,location *Ridge2000:Lau Basin,* hit *Load Feature.* Zoom to the Lau Basin area. Select a station (either click on map dots, or click on rows in table). To select more than one row, use the shift or control keys.

To view the full database entry for this locality scroll to right side of table and click on the *Details* URL to bring up MGDS web page.


Bonus: Use the *Lasso Tool* to select some stations and save the station information to an Excel spreadsheet (*Save* button on right, *Selection to Excel File*).

GeoMapApp: Examine multi-channel seismic profiles across the Aleutian Trench

Load the multi-channel seismics interface (*Portals -> Multi-Channel Reflection Profiles,* then hit *OK*). Click the box over the Aleutian subduction zone. This zooms in to the area. Click the trench-perpendicular southwestern-most seismic line (line 1232 on cruise EW9409). Push the *view-1* button to load the profile. Scroll down to see the horizons. Use the zoom button on the left of the profile pane to see more detail. The red section of line in the map view depicts the portion of the profile in the display pane.

Now select the trench-parallel profile (line 1234, EW9409) intersecting this line and load in *view-2*. Click the triangular dots icon to digitise discrete points on the horizons (left-click to digitise, right-click or diskette symbol to copy digitised points). Click the T icon to add text labels.

Bonus: view profiles in inverse video (select black/white square icon), side-by-side (select *Horizontal*), and compressed (use compress icon on left).
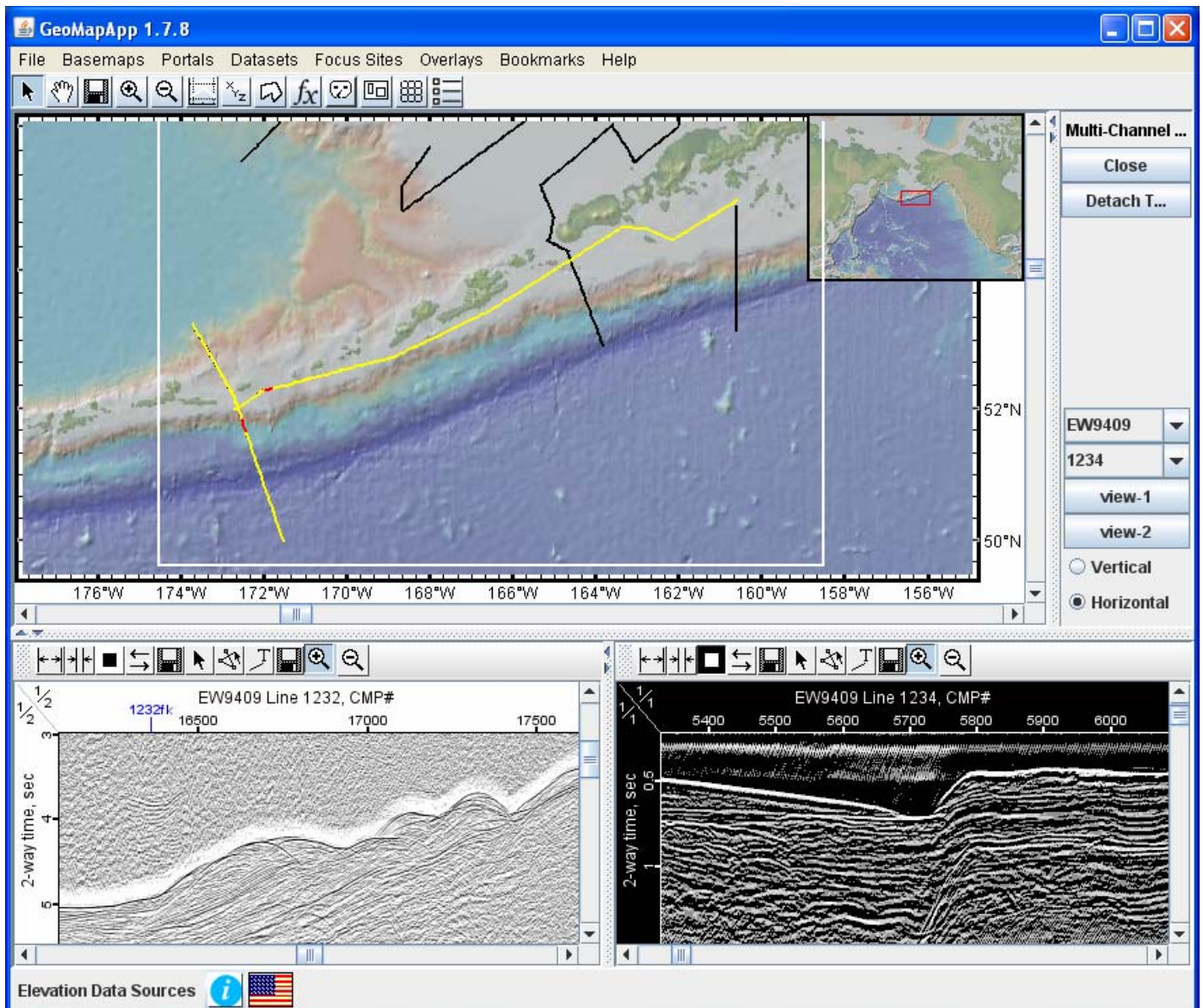
GeoMapApp: A decade of earthquakes in the IBM Focus Site – accessing data with WFS

Zoom in to the IBM area. Connect to IRIS (seismology repository) using the IRIS Web Feature Service (*File -> Import Dataset from WFS*, scroll down and select *IRIS*, hit *Connect*). Select the feature *topp:Events1990to2000* for the *Current View* bounding box, hit *Load Feature*. Colour the symbols according to magnitude, and scale the symbols according to depth. Note that clicking in the table on the URL hyperlinks brings up the IRIS Wilber II information window. Save the image as a KMZ file on the desktop and double-click the file icon to open Google Earth.

MGDS: Download CTD-BLISP data for Papua New Guinea Source-to-Sink initiative

Use the MGDS **Search For Data** interface to find data (http://www.marine-geo.org/, under *Tools & Services*). In the *Select Data By* drop-down menu, choose *By Device Type* and in the *Device Type* drop-down menu select CTD. Refine the search further by limiting results to the PNG area (under *Search Location By* select *Focus/Study Site*, and in the *Focus/Study Site* drop-down menu choose PNG). Hit *Search*. Click on the hyperlink for, say, *VANC19MV*. Scroll through list to find BLISP data and processed (level 2) CTD data. Click on link to download file.

GeoMapApp: Import Weinrebe bathymetry compilation grid of Central America

Use the search capability in **Search For Data** (http://www.marine-geo.org/, under *Tools and Services*) to find the Central America bathymetric compilation grid of Weinrebe. (Hint: search on *Investigator* name and/or *search location by Focus Site*.) Click on link to file name *CR_all_new_0.002_0.002_z.grd* to download the file. Unzip the file.

Import this grid to **GeoMapApp** (*File -> Import a 2-D Grid file*). Once imported, use the zoom buttons to explore this multibeam grid. Use the Grid menus to change the colour palette (slide the grey lines sideways), alter the sun angle, and increase the vertical exaggeration. You can also change the colour histogram using the vertical sliders.

Bonuses: to see how this grid compares to the underlying background bathymetry, turn the imported grid off and on by clicking the "*visible*" box in the Layers window. In the Grid menu, draw contours, change the sun illumination angle, increase the vertical exaggeration, and save image as a JPEG file.
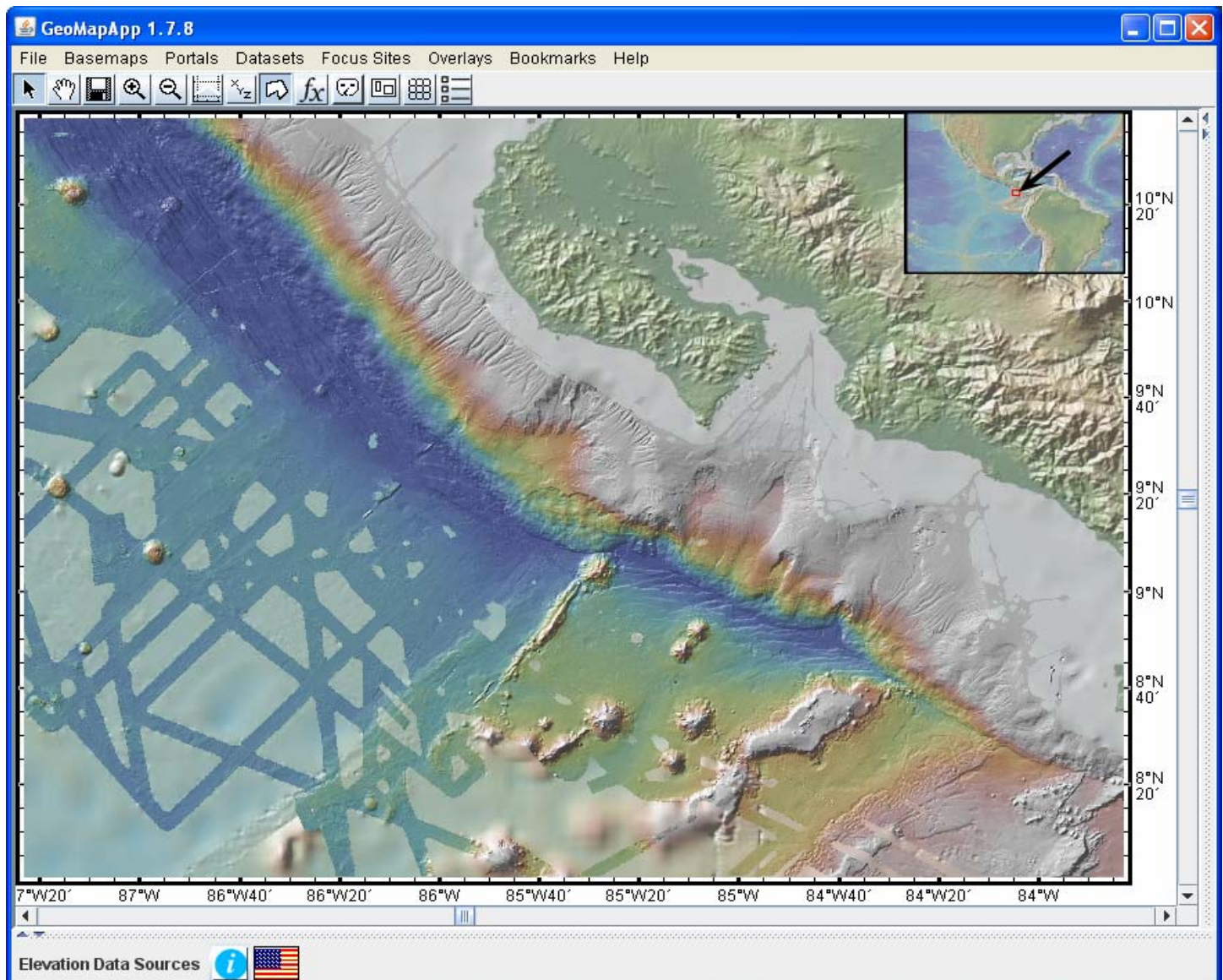
GeoMapApp: Explore contributed bathymetry grids

In the GeoMapApp toolbar, click the *Show Contributed Grids* (rectangles) icon. Zoom to the IBM area and click once on the box marked *Marianas Western Insular Margin (2006-2007)*. That box is now highlighted. Right click in the box. The grid will load automatically, and a *Layers* and *Grid Layer Dialog* window will each open.

Use the zoom buttons to explore this multibeam grid. Use the Grid menus to change the colour palette (slide the grey lines sideways), alter the sun angle, and increase the vertical exaggeration. You can also change the colour histogram using the vertical sliders. Note that the rectangular outlines of the contributed grid bounding boxes can be discarded by clicking again on the *Show Contributed Grids* icon.

Bonuses: to see how this grid compares to the underlying background bathymetry, turn off and on the high-resolution multibeam grid by clicking the "*visible*" box in the GeoMapApp *Layers* window. Change to a black-and-white colour palette (Palettes button in Grid Dialog box), and save this image as a JPEG file.
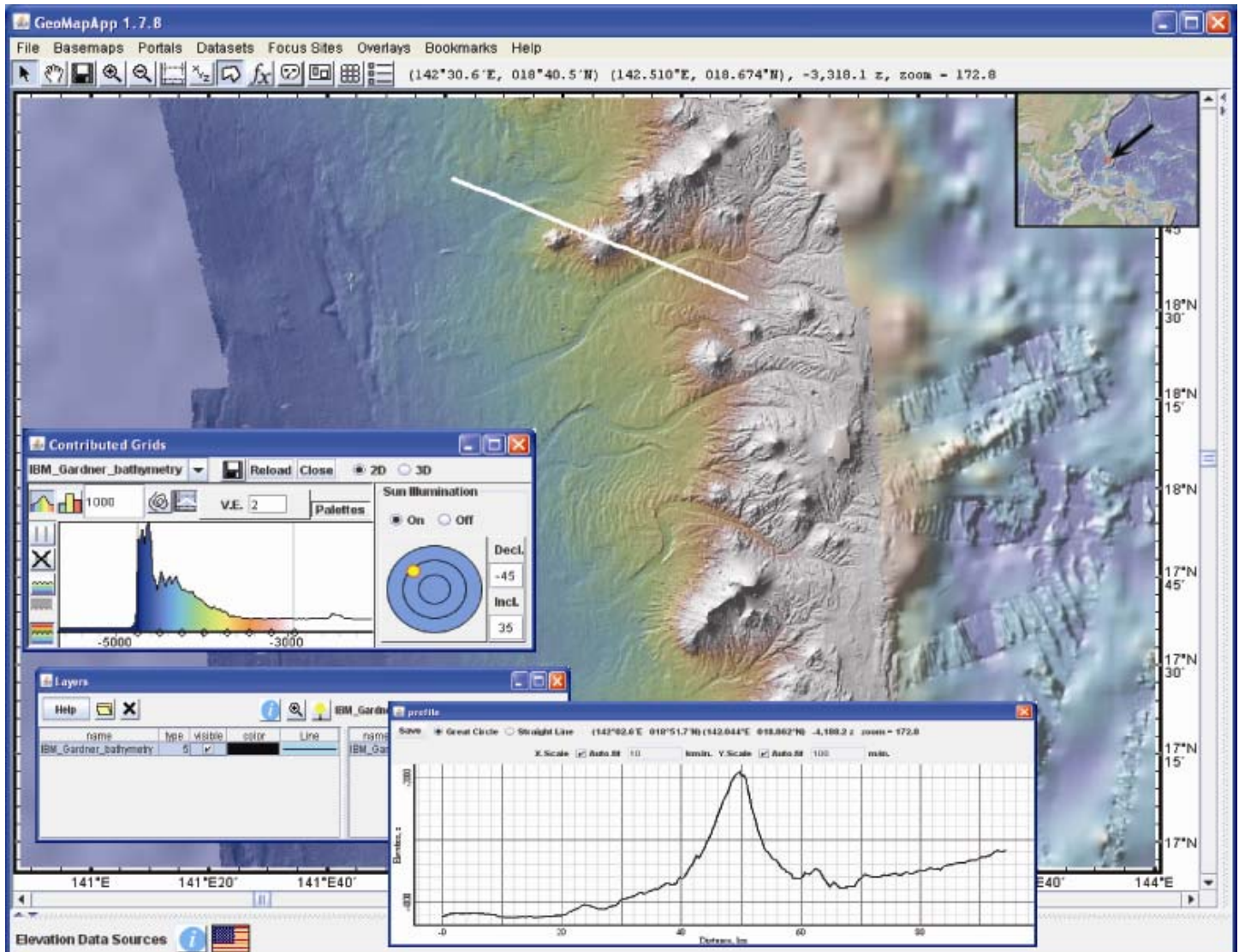
MGDS MARGINS data portal: Find samples and stations for each Focus Site

Use the MGDS MARGINS data portal to view maps and current station/sample information. On the main MGDS web page (http://www.marine-geo.org/), under *Data Portals* select *MARGINS*. Click on the interactive map, select the stations tab and zoom in. Click on a station symbol to display the station and field program name, and, in the information bubble, click those links to view the full MARGINS database entry. Click the samples tab to view samples.

Samples and stations can be viewed interactively in GeoMapApp (see example 7), and the table of currently-deployed instruments can be imported.

**GeoMapApp: Plot the location of Waipaoa sediment cores – the MGDS WFS**

Connect to the MARGINS database using the MGDS Web Feature Service (*File -> Import Dataset from WFS*, select *MGDS*, hit *Connect*). Select *Stations:World*, location *MARGINS:New Zealand,* hit *Load Feature.* Zoom, select a core (click on map dots, or click on rows in table) and view the full database entry for core (scroll to right side of table, click on URL to bring up MGDS web page).

Bonus: Use the *Lasso Tool* to select some cores and save the core station information to an Excel spreadsheet (*Save* button on right, save *Selection to Excel File*).
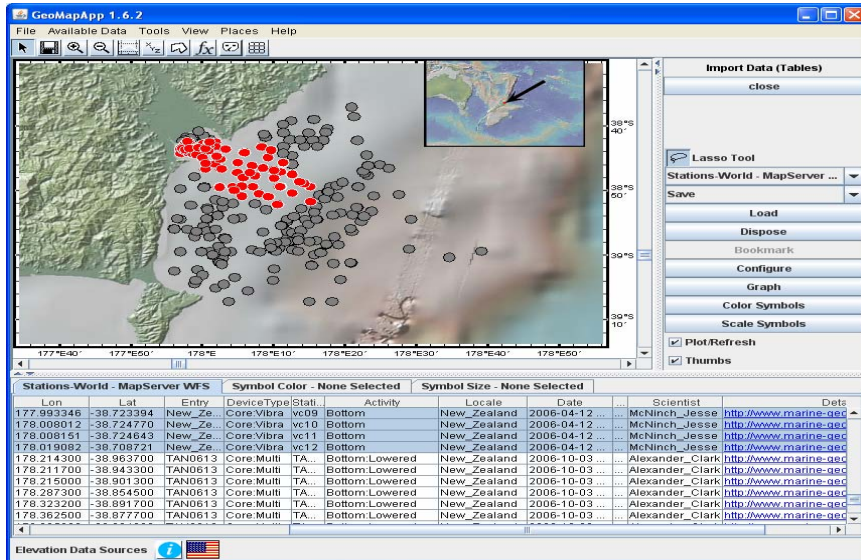

8) MGDS: Download MARGINS-funded multibeam swath files for Gulf of California cruises

Use the MARGINS data portal to find data (http://www.marine-geo.org/, under tab *Data Portals, MARGINS*). In the *List Data by Site* drop-down menu, choose Gulf of California. Under MARGINS Data Sets, choose *by Data Type* and scroll down the resultant list to the bathymetry hyperlinks. Follow links to examine the swath file listings and to download data. Bonus: Download MGD77-formatted ASCII file containing gravity and magnetics data.
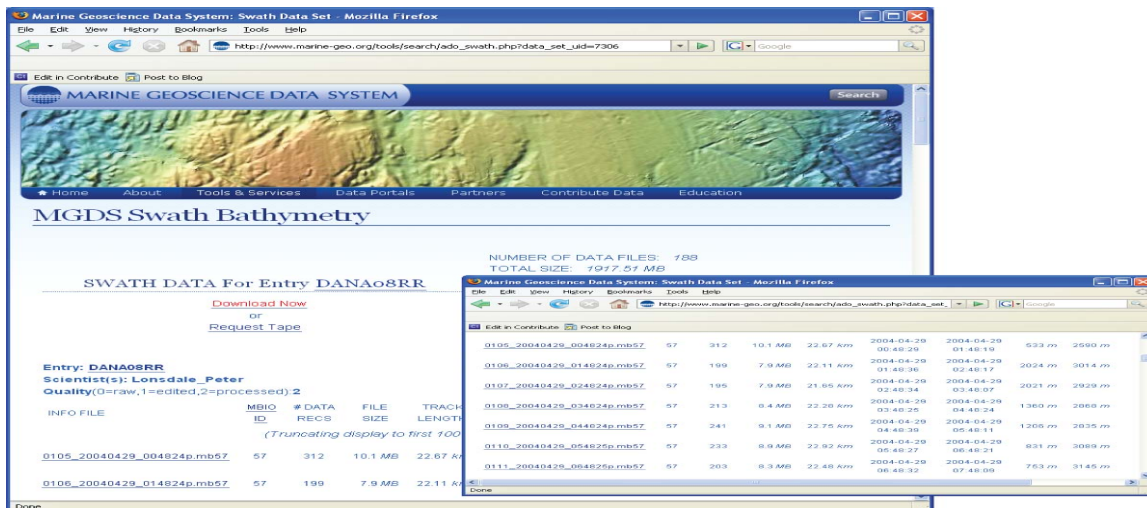
GeoMapApp: Compare gravity-magnetics- topography profiles along ship tracks

Load the underway geophysics interface (*Portals -> Bathymetry, Gravity, and Magnetic Anomaly Profiles*). Zoom in, click on a track or use lower left cruise ID menu to select track (example: select *RC2608*). Hit *View Profile*. Red part of track line shows the extent of the displayed profile. Use scroll bar at bottom to scroll through profile. Click circles to switch between bathymetry, gravity and magnetics. Use lower left *Download Data* to get the MGD77 file.
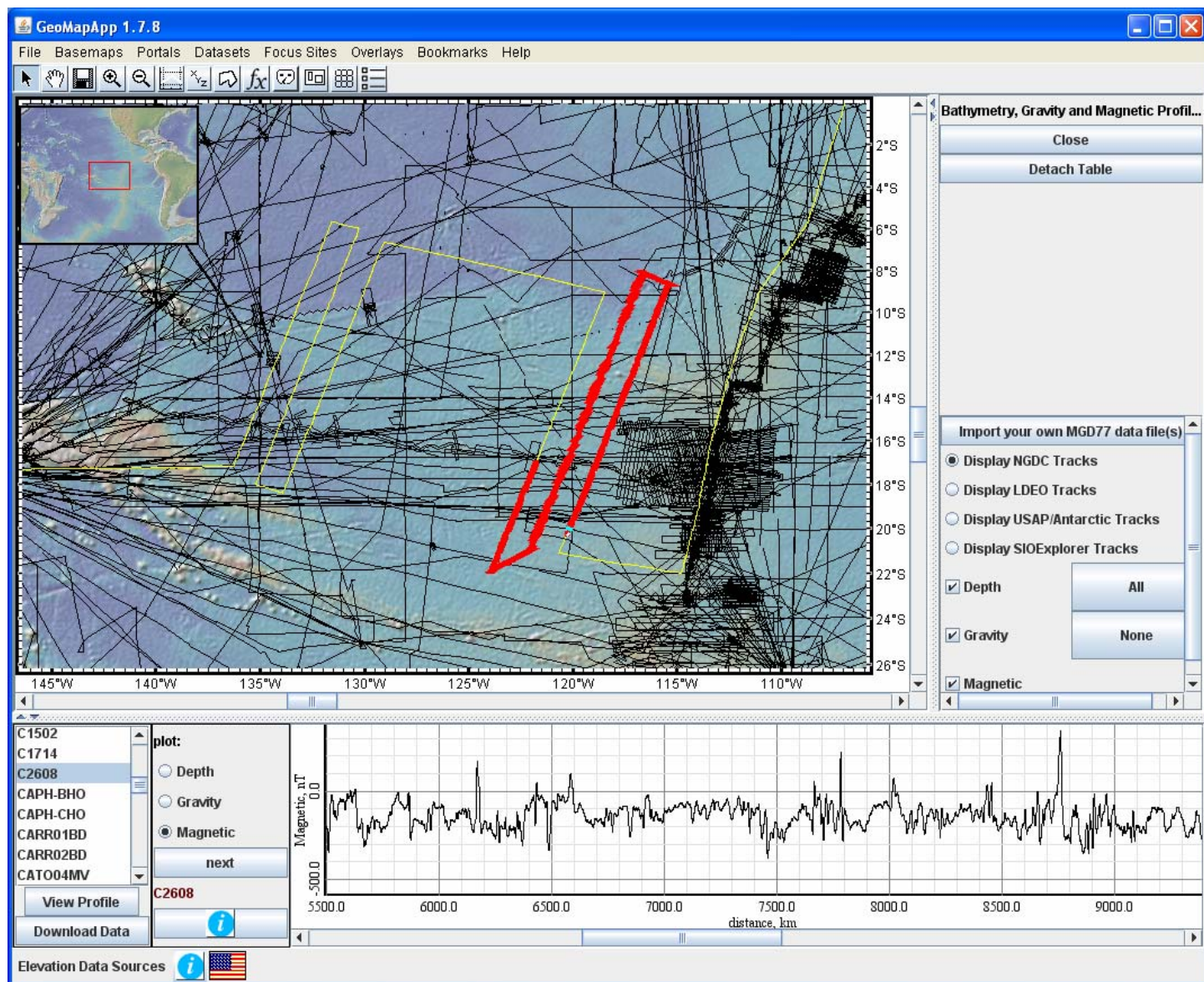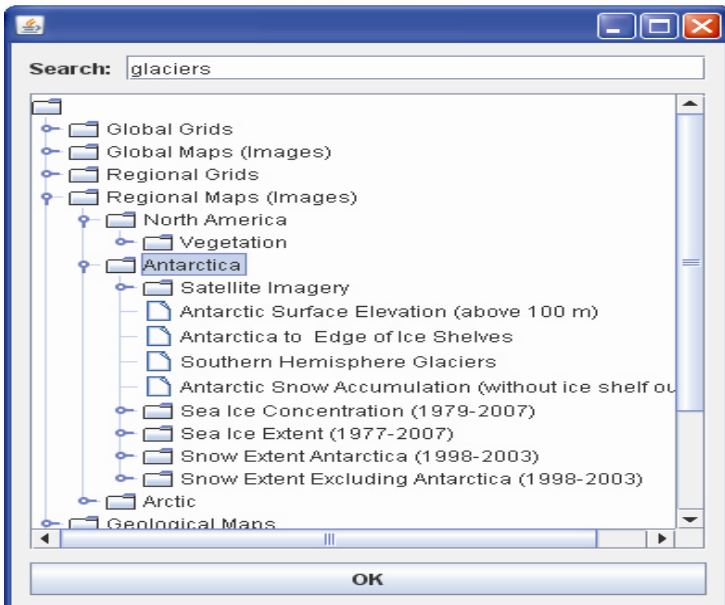
Tear-Off menus

There are two ways to get to the built-in GeoMapApp data sets. The first way allows users to select items from the drop-down menus. These need to be invoked for each data set loaded. Example:
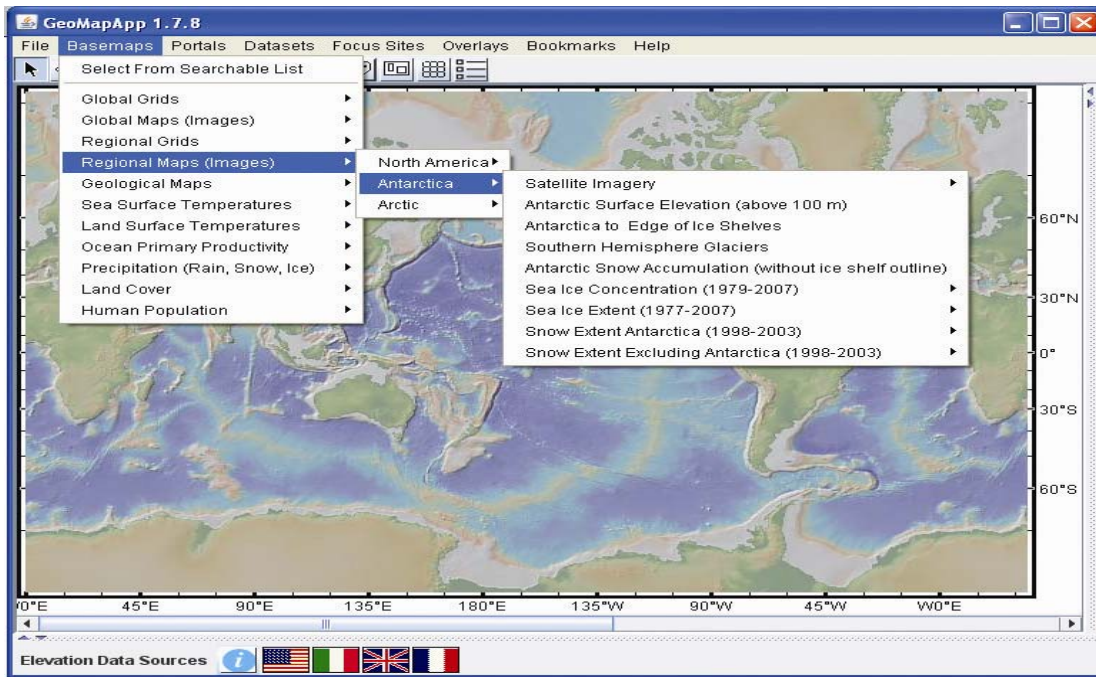

The second way allows any drop-down menu to remain open and active throughout a GeoMapApp session. This means that multiple data sets from one menu can be loaded without having to go back through the drop-down menus. To invoke this, go into the *Basemaps*, *Datasets* or *Focus Sites* tab and hit *Select From Searchable List*. In that window, navigate to any menu. Click either the folder symbol or menu name and drag the mouse out of that window. The menu selected will open in a new window. Any sub-menus are fully active. To select a data set, click on it and hit *OK*.
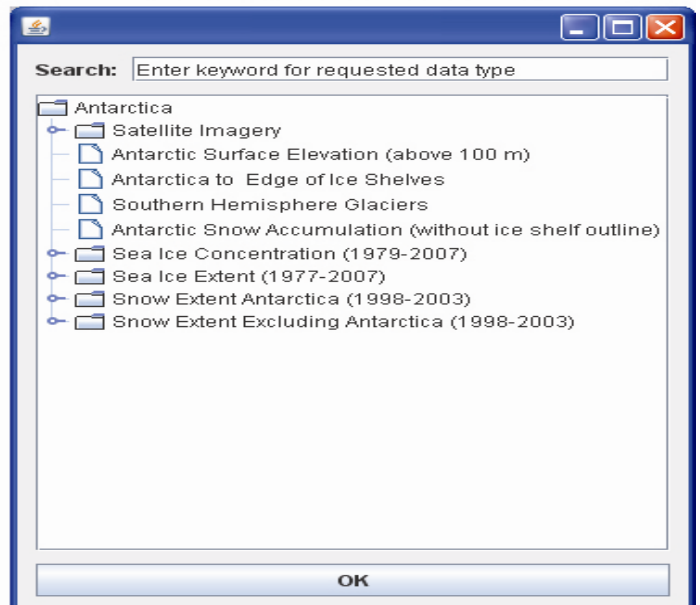
Andrew Goodwillie, MGDS

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