QuickMagIC: Tutorial by example

converting files to MagIC and upload data to database

MagIC Workshop May 2014

Introduction

QuickMagIC.py is a Graphical User Interface (GUI) that provides a quick path to the main **PmagPy** programs. The work flow is illustrated schematically in Figure 1:

- (Step 0): getting started.
- Step 1: convert measurement data to MagIC format.
- Step 2 (optional): calculate geographic/tilt-corrected directions.
- Step 3: Fill Earth-Ref data (coordinates, class, type, lithology, etc.).
- Step 4 (optional): interpret data.
- Step 5: upload data and/or interpretations to MagIC database.

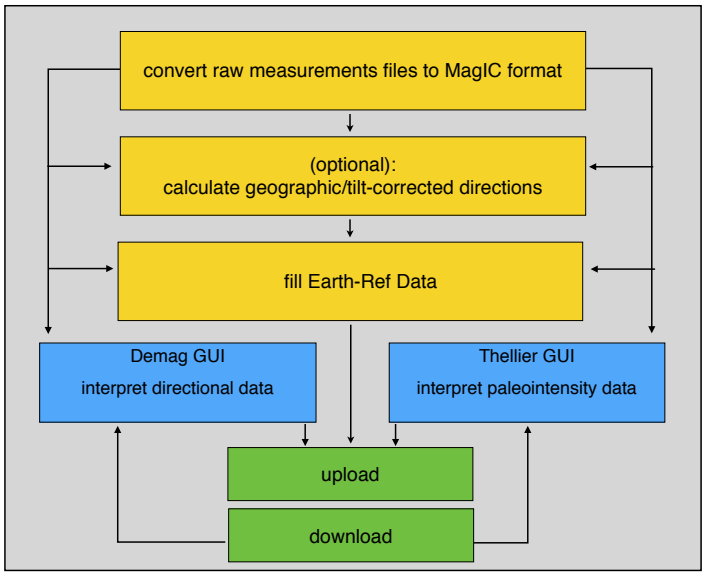


Figure 1: QuickMagIC workflow.

Getting started

- **install PmagPy:** If you havent done it yet: follow the first four bullets in Chapter 1 (MagIC Quick Start), PmagPy Cookbook: `http://earthref.org/PmagPy/cookbook/`
- **create a MagIC Project Directory:** Create a directory with a name that relates to that study.(e.g., ThisProject). The project directory name should have NO SPACES and be placed on the hard drive in a place that has NO spaces in the path.
  Inside ThisProject directory, create two additional directories: MyFiles and MagIC.
- **copy example files:** Copy the four files that are located in Datafiles_2.0 (`https://github.com/ltauxe/PmagPy-Cookbook/blob/master/Datafiles_2.0.zip`) in a folder named QuickMagIC.
- **run the program:** Open up a terminal window (mac) or command prompt (pc) and type QuickMagIC.py on the command line. Select the MagIC directory in ThisProject when prompted.

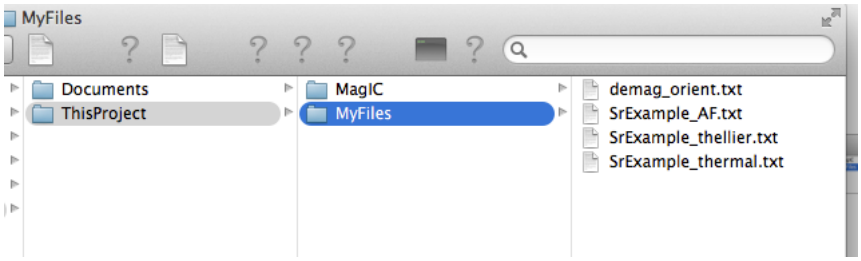


Figure 2: ThisProject directory with MyFiles and 'MagIC Project Directory' folders

Step 1: Converting magnetometer files to MagIC format

- In the *MyFiles* folder there are files containing AF, Thermal, and Thellier measurement data of samples from location Snake River (lava flow site). All samples are from site sr01. The measurement data are arranged in a generic format. An example for a generic file format is shown in Figure 3:

  To learn what all the column headers mean look at the documentation for generic_magic.py (see below).

- Press the [Convert magnetometer files to MagIC format] button. A dialog window will appear with different file formats (Figure 4).

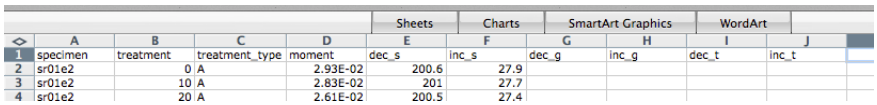
- Choose generic format and press [import file] button. A new dialog box will appear. Here, you can see details about the generic file format by clicking on the [help] button, and scrolling down to 'INPUT'. In this dialog box fill all the required information as shown in Figure 5:

  1. Click on the [Add] button and choose one of the measurements files.
  2. (optional): Insert your earthref user name.
  3. Choose experiment from the dropdown list.
  4. Paleintensity data only: insert the lab field in micro tesla and orientation relative to sample's X direction: 40 0 90.
  5. Choose specimen-sample naming convention (in this example it is: no. of terminal characters = 1).
  6. Choose sample-site naming convention (in this example it is: no. of terminal characters = 1).
  7. Fill in the EarthRef Location Name for this project . For this project, it is "Snake River".
  8. Press OK to create a new MagIC measurement file, which is saved in MagIC Project Directory.

- Repeat the previous step for all the three files in your MyFiles.

- After converting all three files to MagIC, press the [Next Step] Button. Press the [add all files with .magic suffix] . You should see a list of the three magic files:

- Click the OK button. The three files will be combined to a single file, named *magic_measurements.txt* and also stored in the MagIC Project Directory.



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	A	B	C	D	E	F	G	H	I	J
1	specimen	treatment	treatment_type	moment	dec_s	inc_s	dec_g	inc_g	dec_t	inc_t
2	sr01e2	0	A	2.93E-02	200.6	27.9				
3	sr01e2	10	A	2.83E-02	201	27.7				
4	sr01e2	20	A	2.61E-02	200.5	27.4				

Figure 3: generic file format

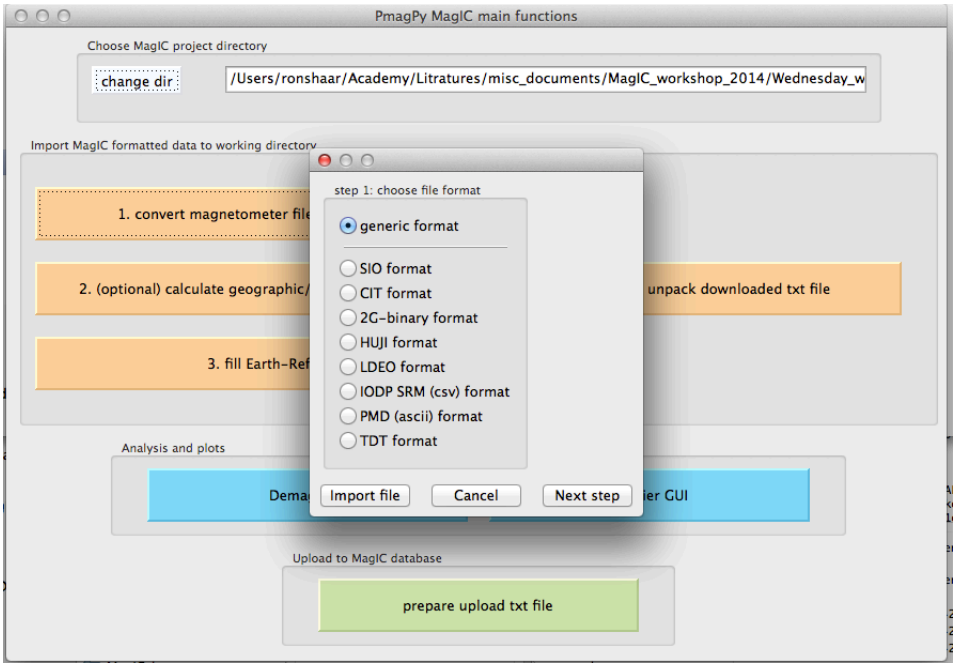
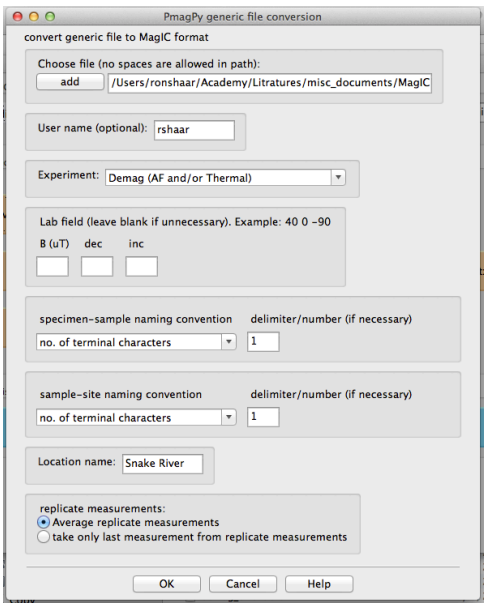


Figure 4: choose file dialog box

a) SrExample_AF.txt (AF) or SrExample_thermal.txt (Thermal)



b) SrExample_thellier.txt (Thellier IZZI)

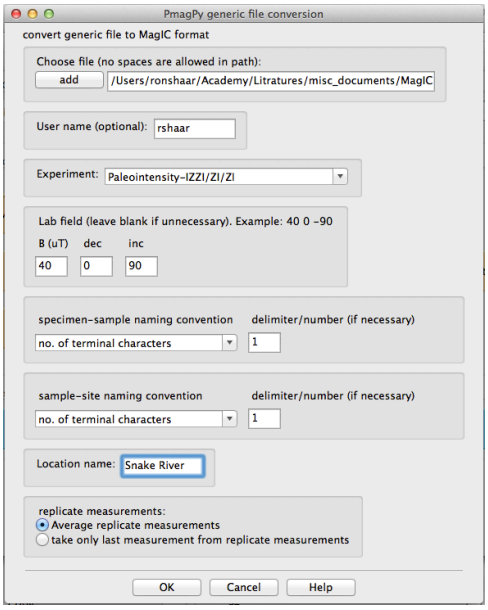


Figure 5: Generic file conversion dialog box.

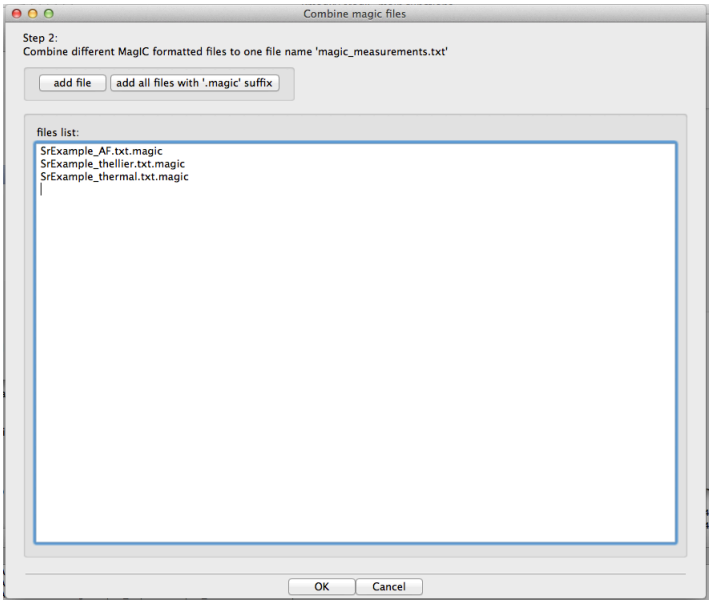


Figure 6: Combine MagIC measurement files dialog box.

Step 2 (optional) calculate geographic / tilt-corrected direction

- **QuickMagIC.py** provides an optional tool for calculating geographic and tilt-corrected directions. To use this tool click on the button labeled 'calculate geographic/tilt-corrected directions'.
- An empty template of a file named demag_orient.txt was created in the MagIC Project Directory. This file is displayed in a Python window. You can fill in this file manually using the Python window or with Excel (recommended). The empty template has now only the sample names derived from your measurement files, using the naming rules that you chose when you converted files to MagIc (Step 1).
- To see an example of a filled demag_orient.txt pull down the menu bar [file] → [open orientation file] and choose the file SrExample_orient.txt from *MyFiles* folder. The orientation data should be as in Figure 7.
- Choose from the menu bar [file] → [Save orientation file].
- Choose from the menu bar [file] → [Calculate sample orientation].
- Fill in the dialog box like in Figure 7:
  - Orientation convention :Pomeroy.
  - Declination correction: Use the IGRF.
  - Orientation priority: #1.
  - Put in the number of hours to SUBTRACT from the local time to get to Greenwich Mean Time: -6. [Local time was 6 hours behind GMT for this example.]
  - press the OK button.
- In the next dialog window add the additional information as in Figure 8 and press OK.
- Click OK in the message box.

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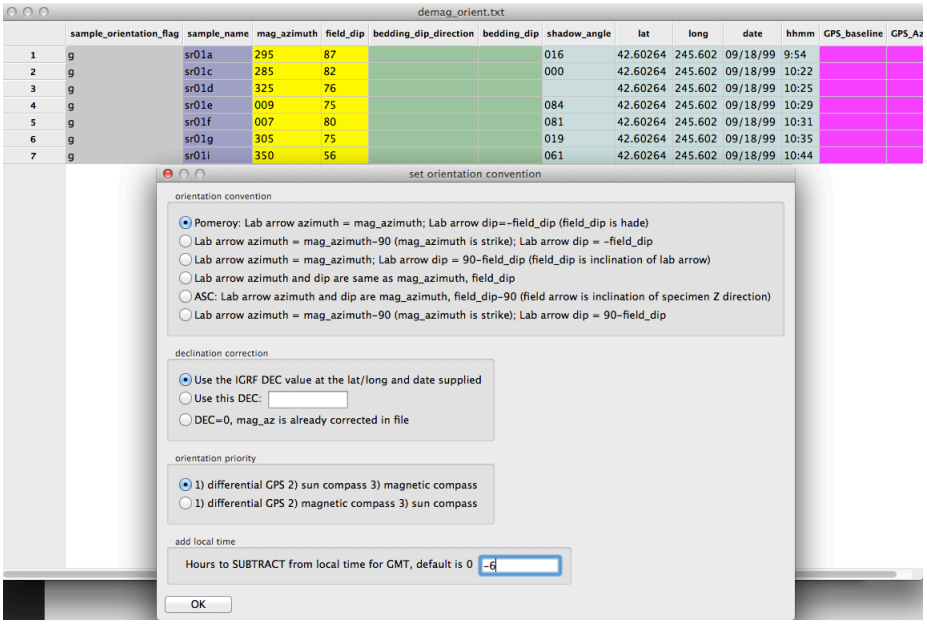

Figure 7: Orientation data file.

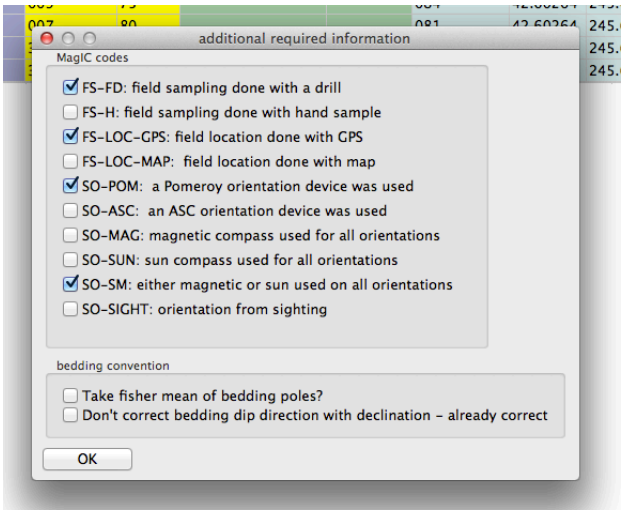

Figure 8: Orientation data MagIC code dialog box.

Step 3: Filling EarthRef data

Filling in the Earth Ref data is a critical part of building a MagIC Project Directory. The Earth-Ref data relevant to this example are arranged in five er_* tables: er_specimens, er_samples, er_sites, er_locations, er_ages. To complete the ER data, click the button, and follow the directions in the help window in order (Figure 9). Use the following Earth-Ref information:

er_samples/er_sites class: igneous
er_samples/er_sites lithology: basalt
er_samples/er_sites type: lava flow
er_sites site_lon: 245.602
er_sites site_lat: 42.60264
er_locations location_type: outcrop
er_ages age: 3.4
er_ages age_sigma: 0.03
er_ages age_unit: Ma
er_ages magic_method_codes: GM-ARAR-AP

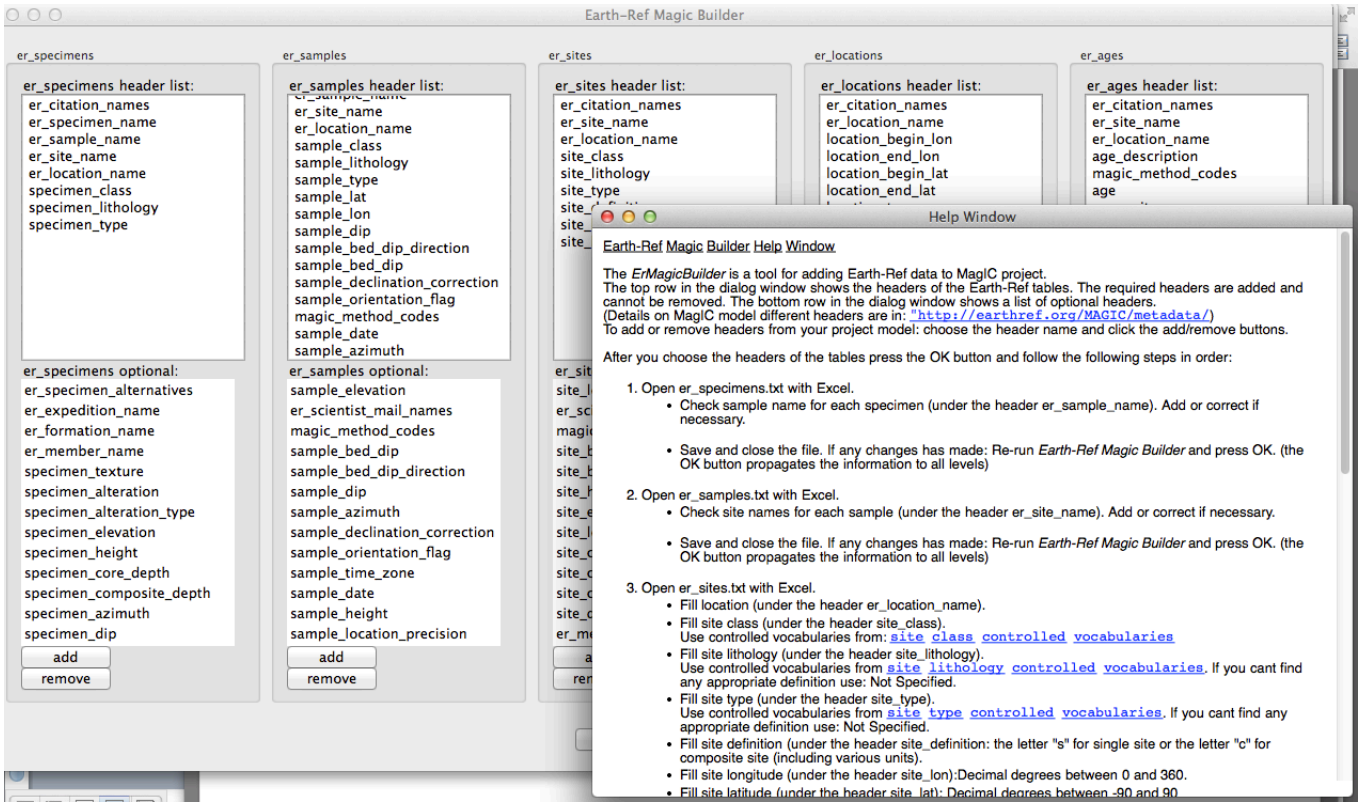

Figure 9: Earth Ref builder tool.

Step 4a: Demag GUI tool

Figure 10 shows the main panel of Demag GUI. To analyze the data in the example follow these steps for each specimen:

- From the 'coordinate system' dropdown menu choose 'geographic'.
- Choose the temperature/AF bounds by double clicking on the required measurement line, or by choosing from the 'bounds' dropdown menu.
- Click 'save' so the program remembers the interpretations (the interpretation is not saved to a file yet!).
- Click the 'next' button to analyze the next specimen.
- To see the Fisher mean for the site: choose from the 'higher level mean' dropdown menus: show=specimens; mean=Fisher.
- After all specimens interpretations are saved in memory, choose from the menubar [File] → [Save MagIC pmag tables]. This save all the interpretations in MagIC formatted pmag_* files in you MagIC Project Directory.
- Click OK on the message dialog box.
- Click OK on the MagIC results table dialog box.
- Click OK on the message dialog box.
- Close the Demag GUI.

Now, all directional interpretations are saved in MagIc Project Directory.

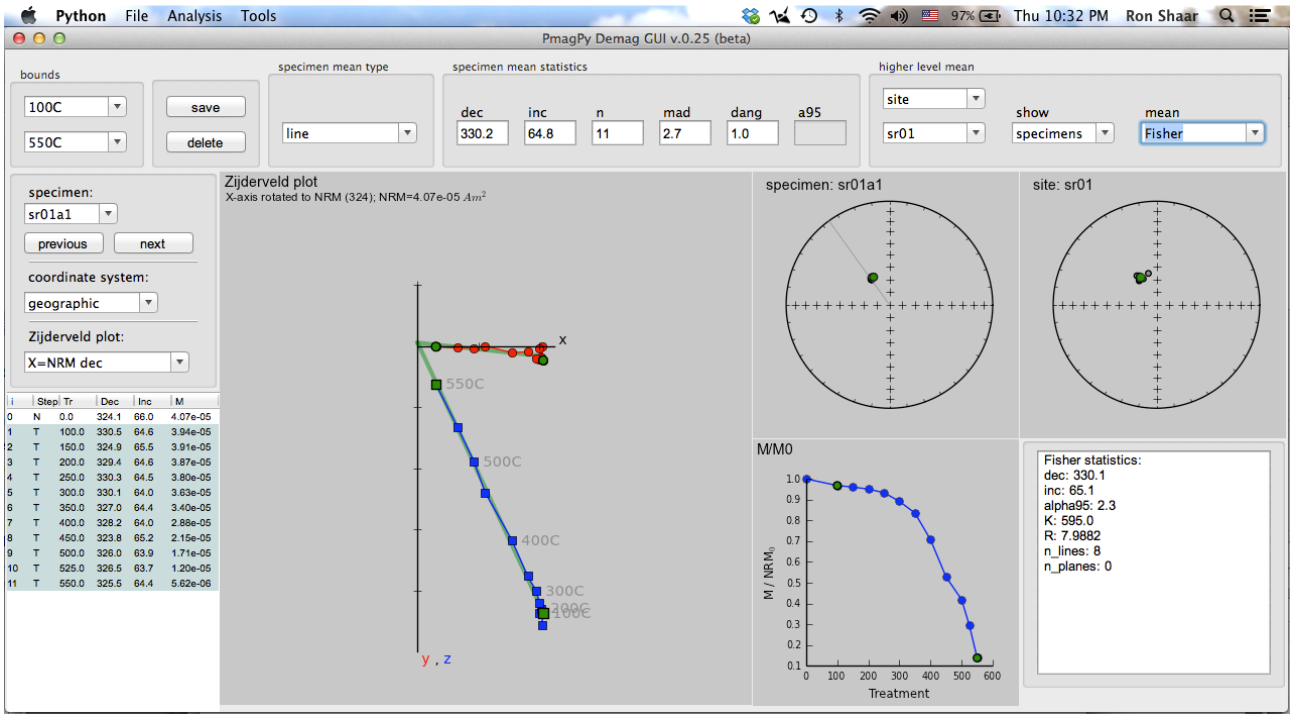

Figure 10: Demag GUI main frame.

Step 4b: Thellier GUI tool

Figure 11 shows the main panel of Thellier GUI. To analyze the data in the example follow these steps for each specimen:

- Choose temperature bounds from the temperatures dropdown menus.
- Click 'save' so the program remembers the interpretations (the interpretation is not saved to a file yet!).
- Click the 'next' button to analyze the next specimen.
- The default of the program is to calculate sample means. To change it to site level mean, choose from the menubar: [Analysis → [Acceptance criteria] → [Change acceptance criteria]. Find the 'average by sample/site' dropdown menu in the third row and change it to [site]. Click OK. The site mean will appear in the sample/site results box (top right).
- After all specimen interpretations are saved in memory, choose from the menubar [File] → [Save MagIC pmag tables]. This saves all the interpretations in MagIC formatted pmag_* files in the MagIC Project Directory.
- Close the Thellier GUI.

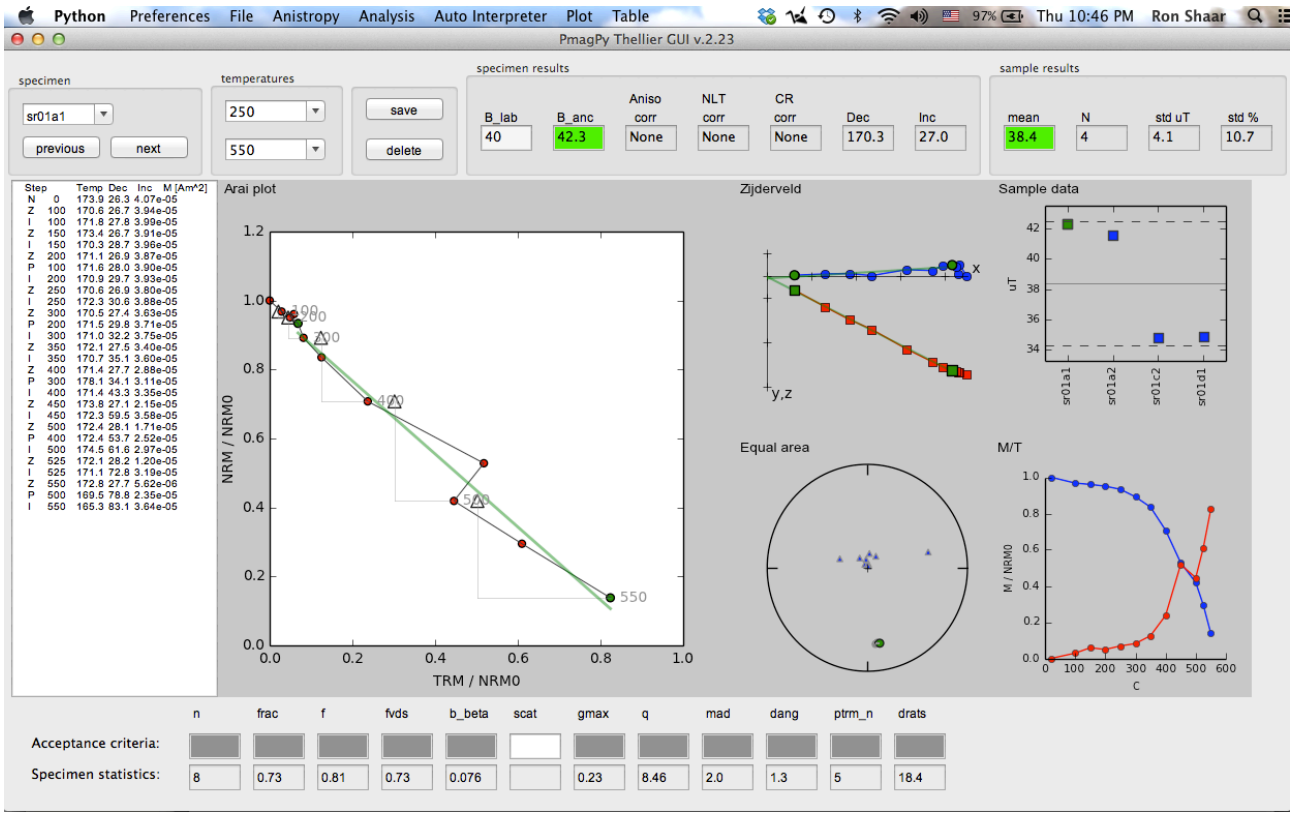

Figure 11: Thellier GUI main frame.

Step 5: Upload to the database

For this, you just click the green *prepare upload txt file* button on the main page of the GUI. A file name 'upload_dos.txt' will be created in MagIC Project Directory. Drag and drop this file in the MagIC search interface. Congratulations. Your data are now in the database.