READ ME: MATLAB ANALYSIS CODES

There are 3 different codes present for the analysis of the FERN code calculations. There are 2 analysis codes that should generally be used (Analysis and XError).

To be able to run the analysis, make sure the data files taken from the output of FERN only contain numbers. The header and column titles should be deleted.

In both codes, make sure that the data point entry number is equal to the lines in the file, or that the plot output number in FERN matches the data points variable in both matlab codes. Additionally, be sure the data files being used are in the same directory as the matlab codes, if not you may have to specify the path for matlab or just move the files to the same directory.

ANALYSIS.M :

The analysis code reads in the data files to calculate the residuals and the root mean square (RMS) of the error. Both these calculations require a reference (or exact) file to compare the FERN calculation to. Presently the code is set up to read in 3 files: Reference, Fast, and Accurate. Though the fast and accurate can be substituted for intermediates (variable names are based off of the original 3 files). A step by step direction to run the code is below

1. Be sure the lines in the file = the variable for the dataPoints in the code
2. Set the number of isotopes to the network size
3. Choose files to use (Need a reference file) Fast and Acc are generally the more important, but Intermediate may need to be run too.
4. Run
5. Output should show 2 things: 1 is the maximum error each isotope reached in the calculation and 2 is the isotopic contribution to the error at time when Max Error is reached. The error and true mass fraction should be shown. This is shown for the 2 calculations being run (Fast + Acc or some other combo)

XERROR.M :

The XERROR code reads in the data files to calculate the Mean of 3 calculations (reference generally requires + 2 others), The uncertainty btwn those 3, and writes a file containing all the data.

The reference files is generally required as that is the “exact” calculation. The additional 2 files can be any calculations done with FERN. Currently, this files reads in 3 files.

Step by step:

1. Be sure the lines in the file = the variable for the dataPoints in the code
2. Set the number of isotopes to the network size
3. Make sure r is equal to number of files being read (calculations used)
4. Choose files to use (Need a reference file) Fast and Acc are generally the more important, but Intermediate may need to be run too.
5. Change the name of the output file the code generates to the desired name.
6. Run
7. Output should show a mess of numbers. The code writes the final matrix containing the time, mean and uncertainty of each isotope.

GNUPLOT SCRIPTS :

The XERROR.M code outputs a file containing the data: Time, Mean X, Uncertainty in X. This file is used in GNUPLOT to plot the uncertainty as a function of time and to plot the mean of each mass fraction vs time (with error bars)

The gnu scripts are “PlotUncert” and “PlotMeanX”

* 1. If using “PlotUncert” be sure to double check the column numbers being ploted. The Time is column 1, column 2-(iso+1) will be mean value of each isotope. Uncertainties begin at column number iso+2
  2. May need to use a log axis since the uncertainties are small and some vary over many orders of magnitude. Another option is just to plot a few uncertainties that have more significance than the others.

The PlotMeanX uses the uncertainties as error bars while plotting the mean of each mass fraction.

* 1. May need to restrict the x and y-axes to small ranges to show meaningful error bars as the value of the uncertainties are generally very small.