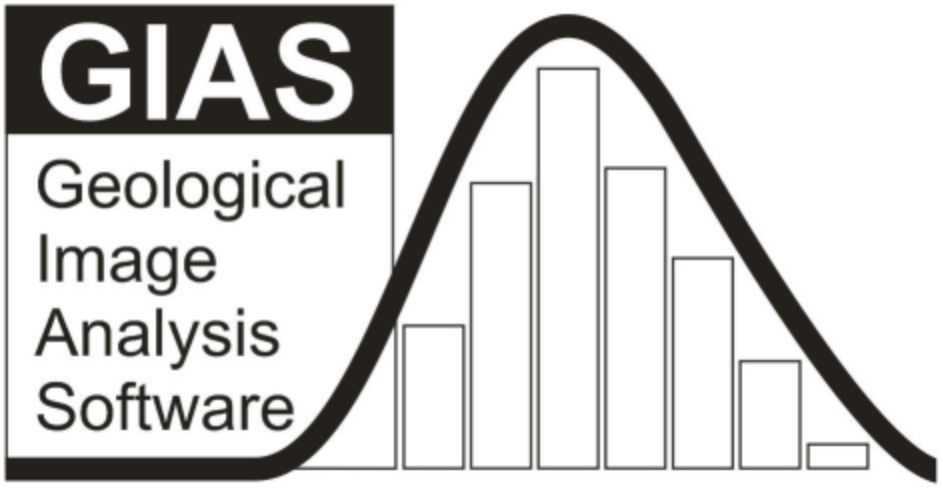


GIAS version 2

Geological Image Analysis Software
How to use it

March 2012
www.geoanalysis.org

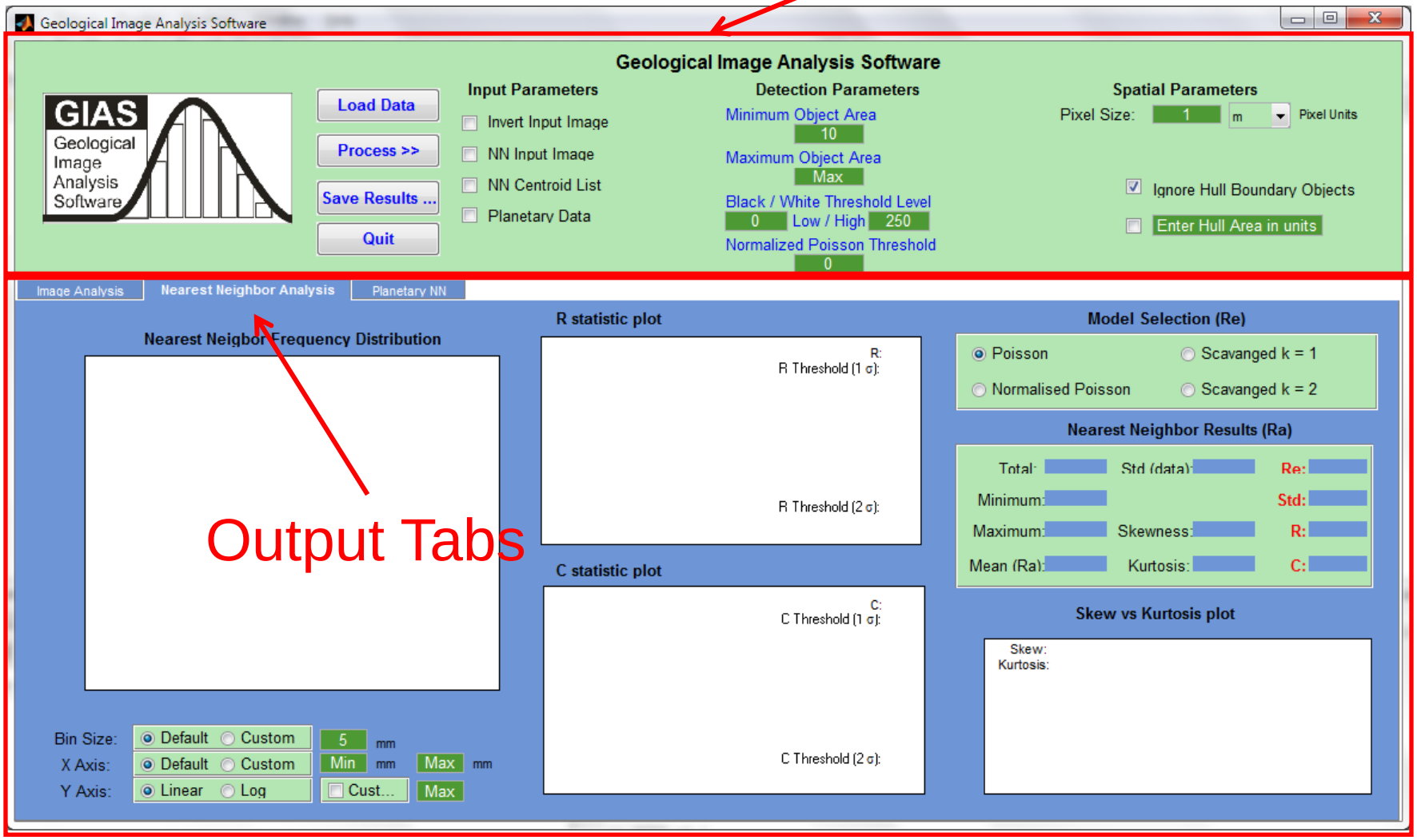
Running the application

- In MATLAB
  - Add the GIAS directory and sub-directories to your path (along with the *Mcode* and *skdata* directories)
  - On the command line type: GIAS_v2
  - You should see the GIAS GUI appear within a few seconds

Panels/Tabs (1)

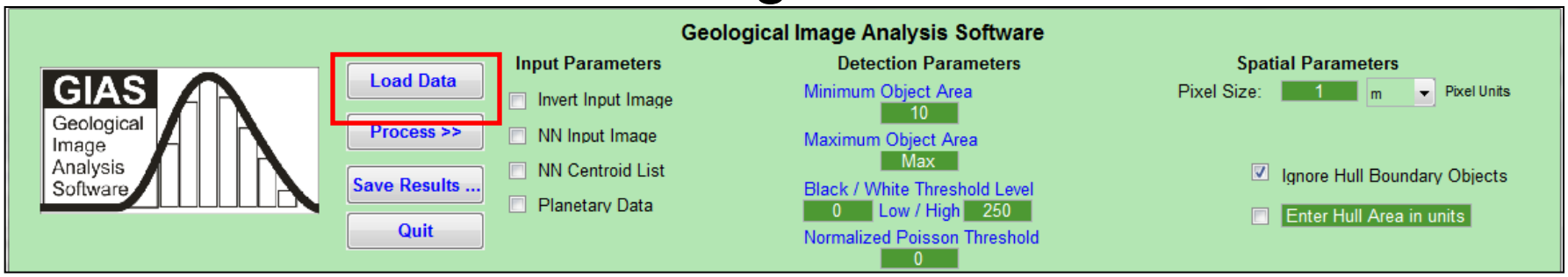
- Input panel:
  - Open files, select processing parameters and options
- Image Analysis Tab:
  - Used for image processing statistics
- Nearest Neighbor Analysis Tab:
  - Used for nearest neighbor statistics
- Planetary NN Tab:
  - Used for analysis of planetary-scale datasets

Panels/Tabs (2)

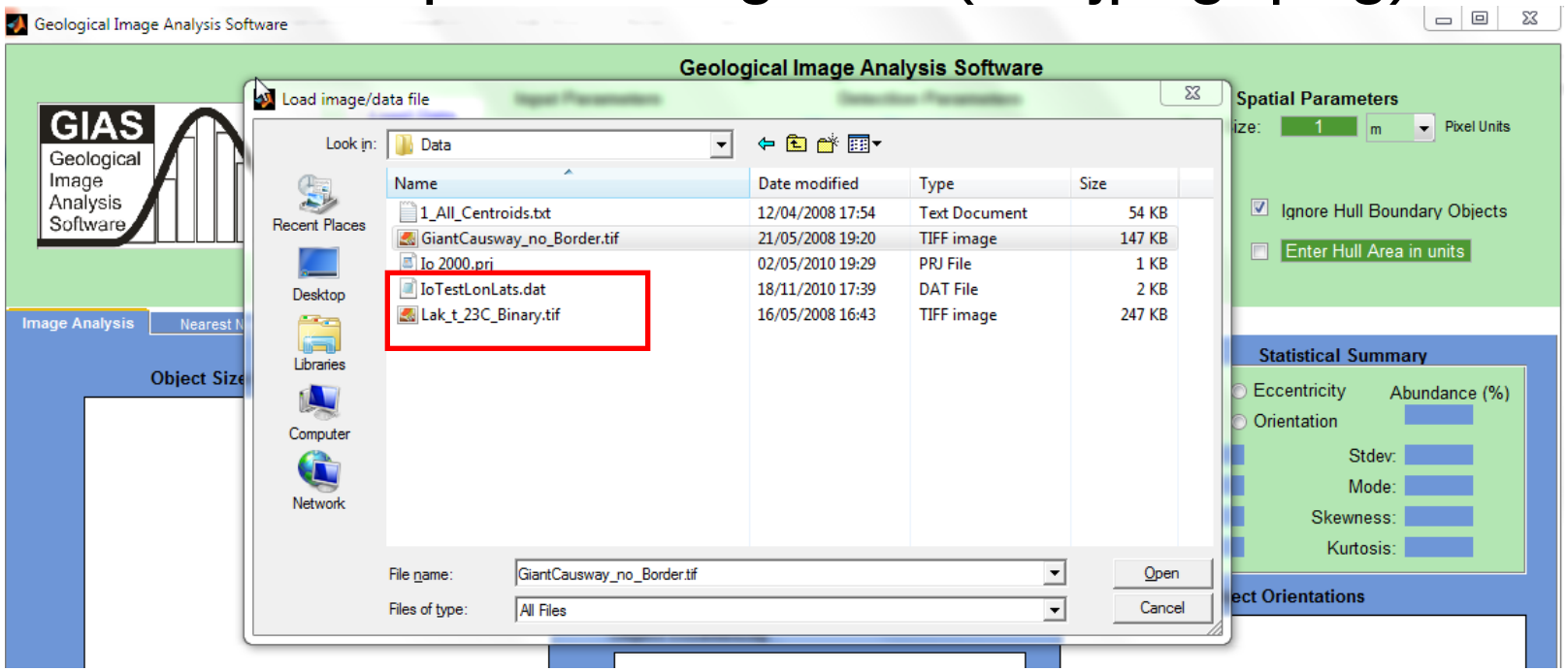


Opening an image

- Click on the ‘Load Image’ button

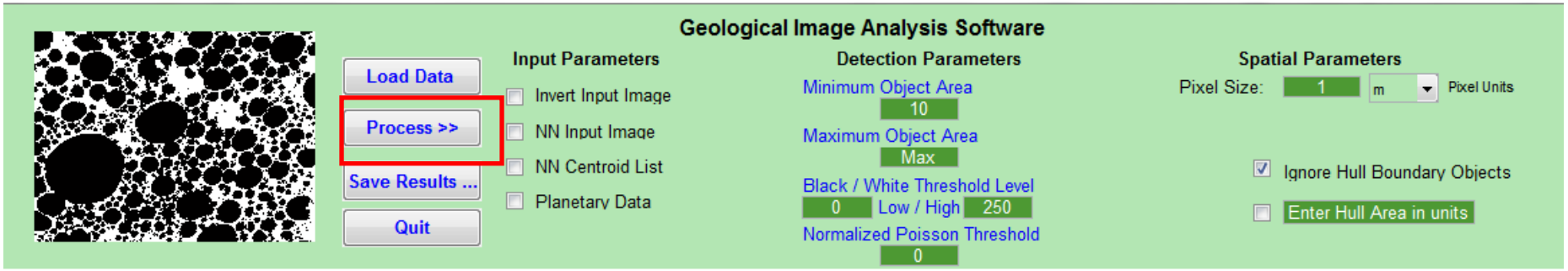


- Select the required image file (tiff, jpeg, png)



Processing the Image

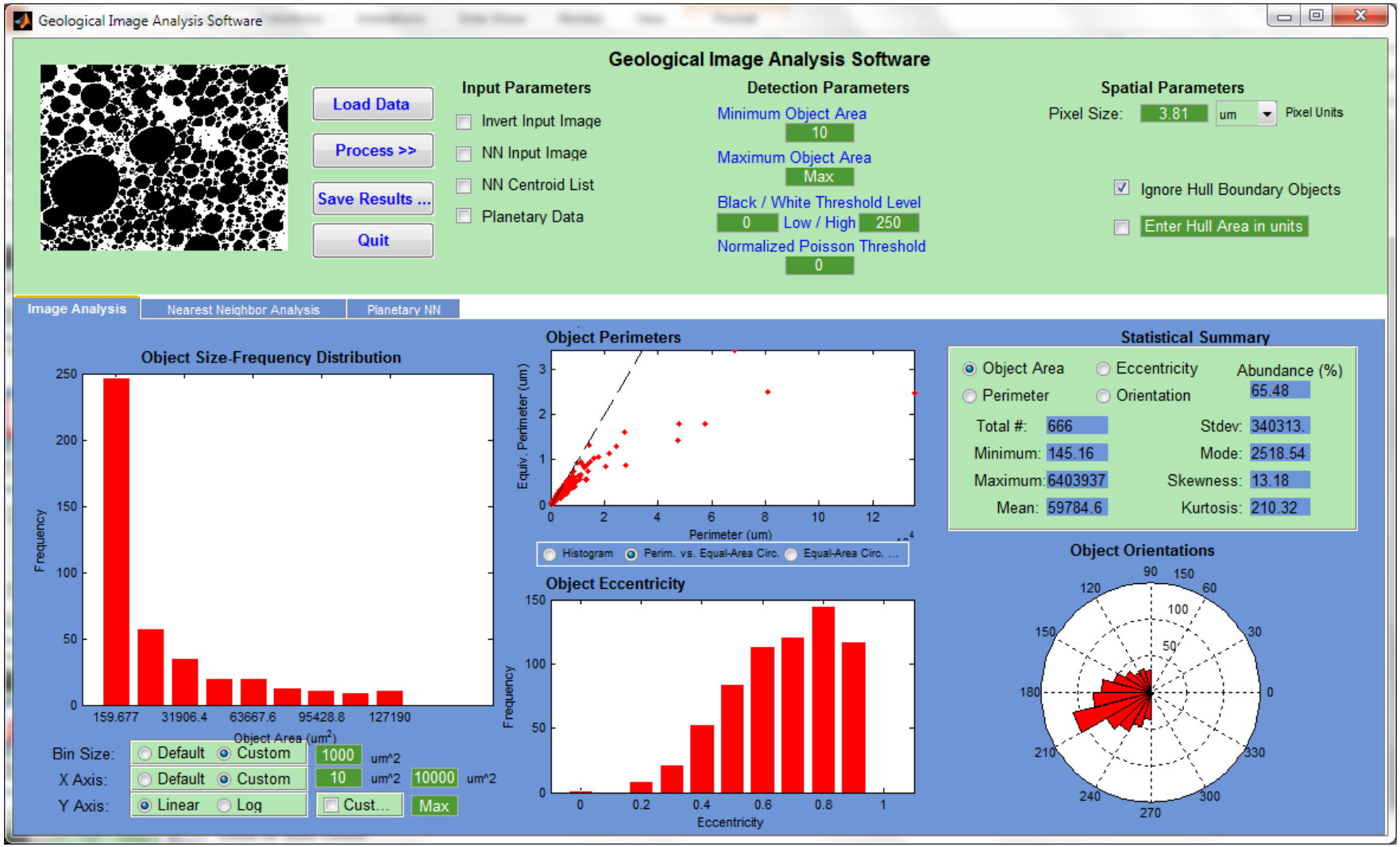
- Select the relevant detection parameters and output parameters (e.g. pixel size)
- See the Help files for information on the options
- Click on the ‘Process’ button



- It takes less than15 seconds to process test image LAK_t_23c on an Intel i5 core

Results: Image Analysis Tab

- These are the results for the Image Analysis

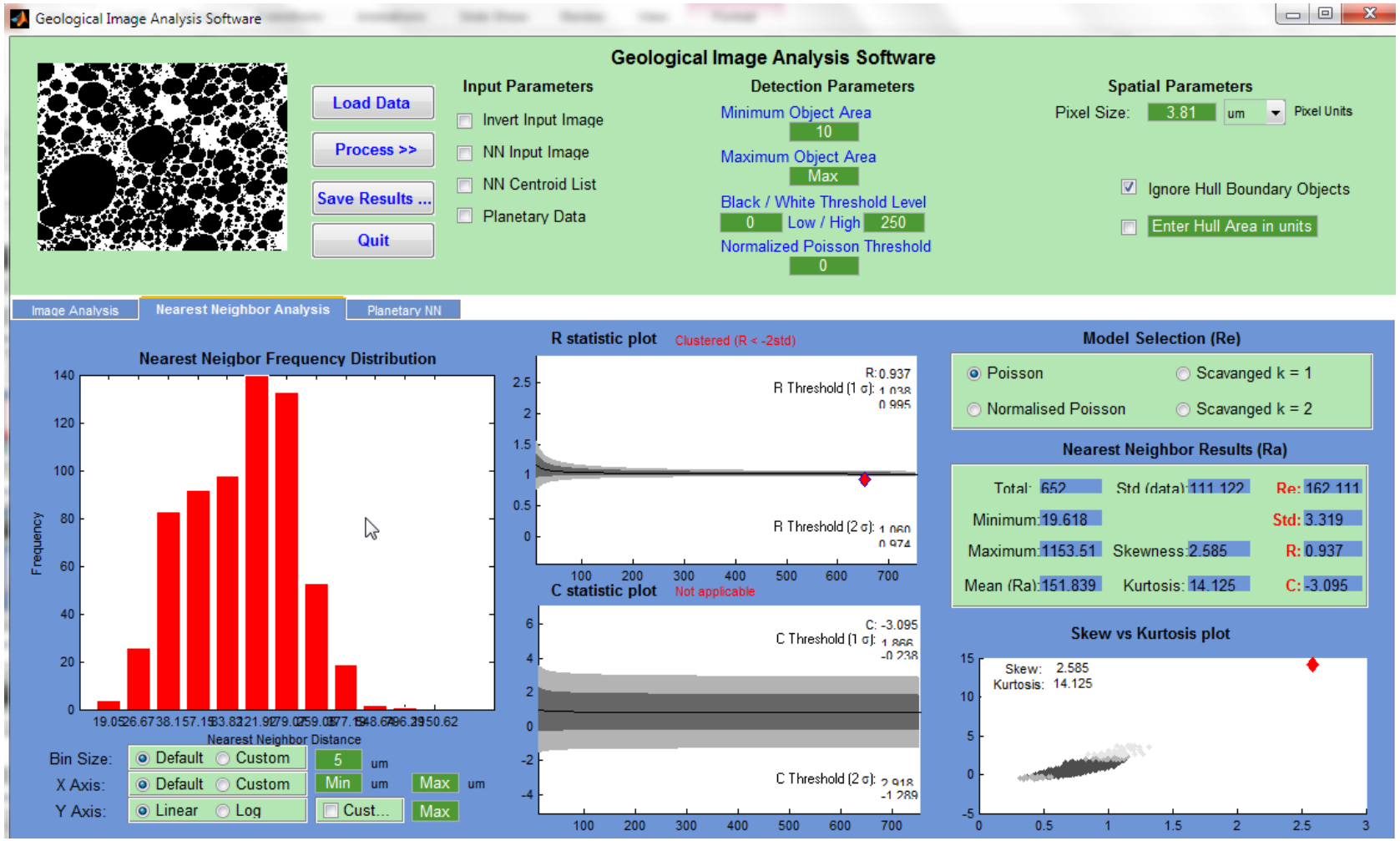


Notes on the Image Analysis Tab

- The histograms and graphs are intended for quickly looking for dominant features only
  - The object-size histogram shows the size distribution of the objects
  - The object perimeters shows how circular the objects are compared to an equal-area circle (e.g. what about crenulations?)
  - The eccentricity histograms shows the elongation of the objects (0 = circular -> 1 = flattened ellipse)
  - The rose diagram indicates the direction of the sample fabric
  - The information box displays the statistics of the chosen radio button (e.g. Perimeter length)
- Save the data to file to build and customise your own figures

Results: Nearest Neighbor Tab

- These are the results for the Nearest Neighbor Tab

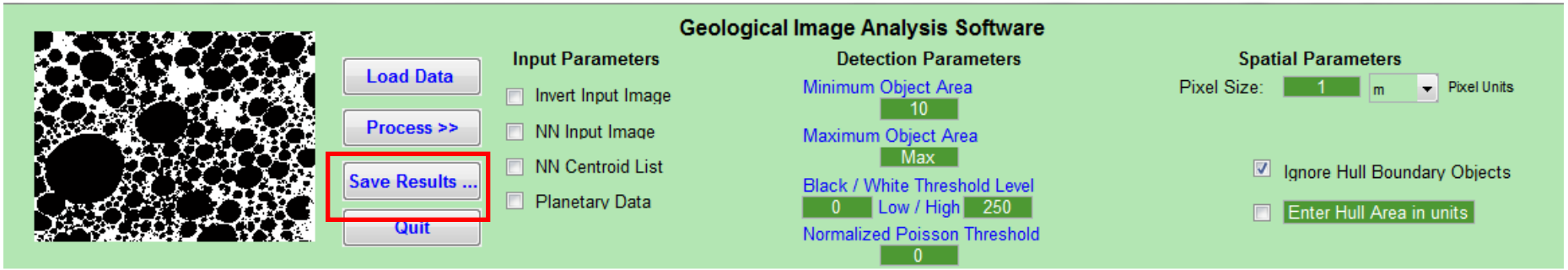


Notes of the NN Analysis Tab

- The histograms and graphs are intended for quick look only
  - The NN distance histogram indicates the spread of distances
  - The R and c plots give an idea of whether the NN distribution is compatible with the null hypothesis of Poisson distribution (i.e. randomly distributed)
  - Skew vs. kurtosis gives shows the bias versus peakedness of the distribution
  - If a different model selection is made (e.g Scavanged k=1) the 'Process' button must be pressed again to update the figures, though the NN Results box will be refreshed without rerunning
- Save the data to file to build and customise your own figures

Saving output (1)

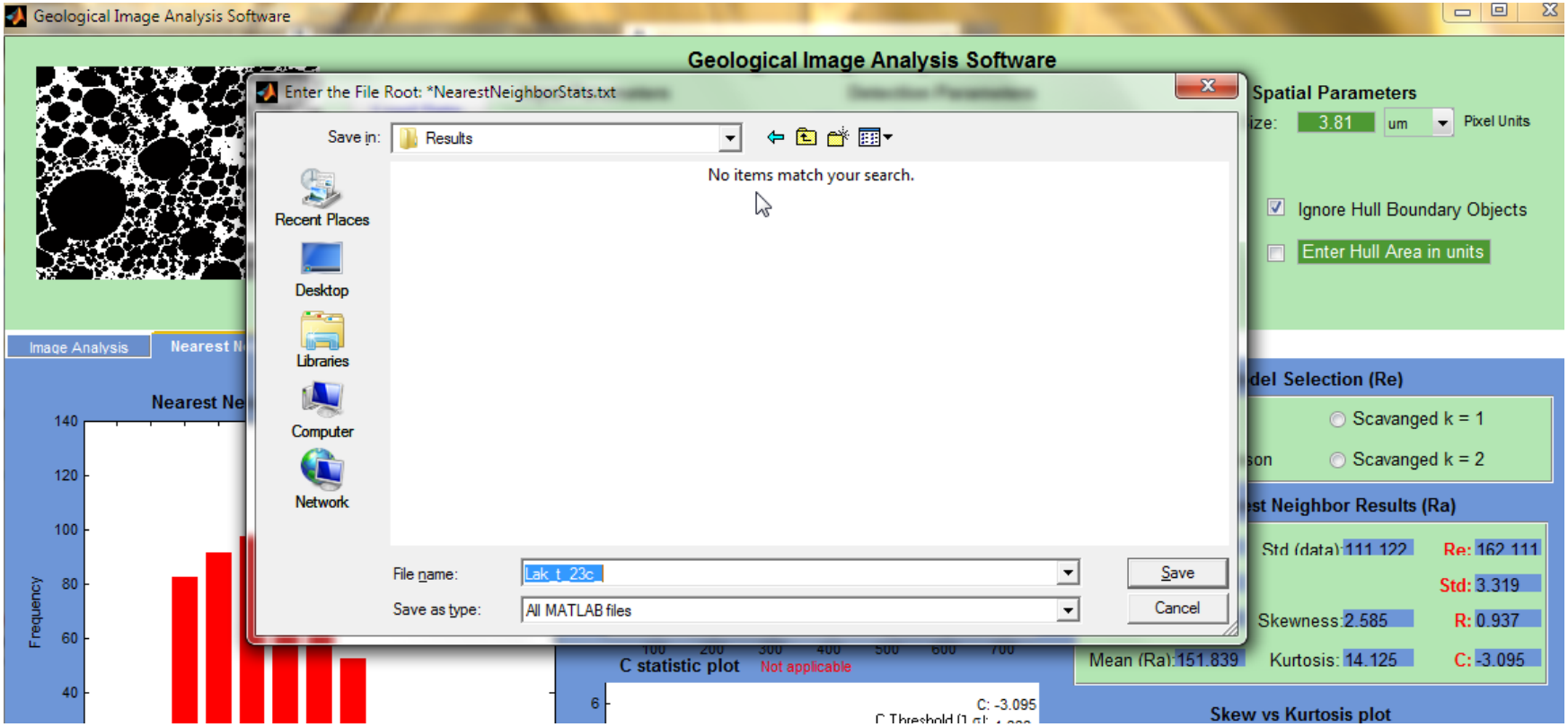
- You can save all the graph calculations using the ‘Save Results’ button



- This opens a GUI dialogue box with the default name of ‘Output_’, saved into the current directory. Change the filename and directory as required

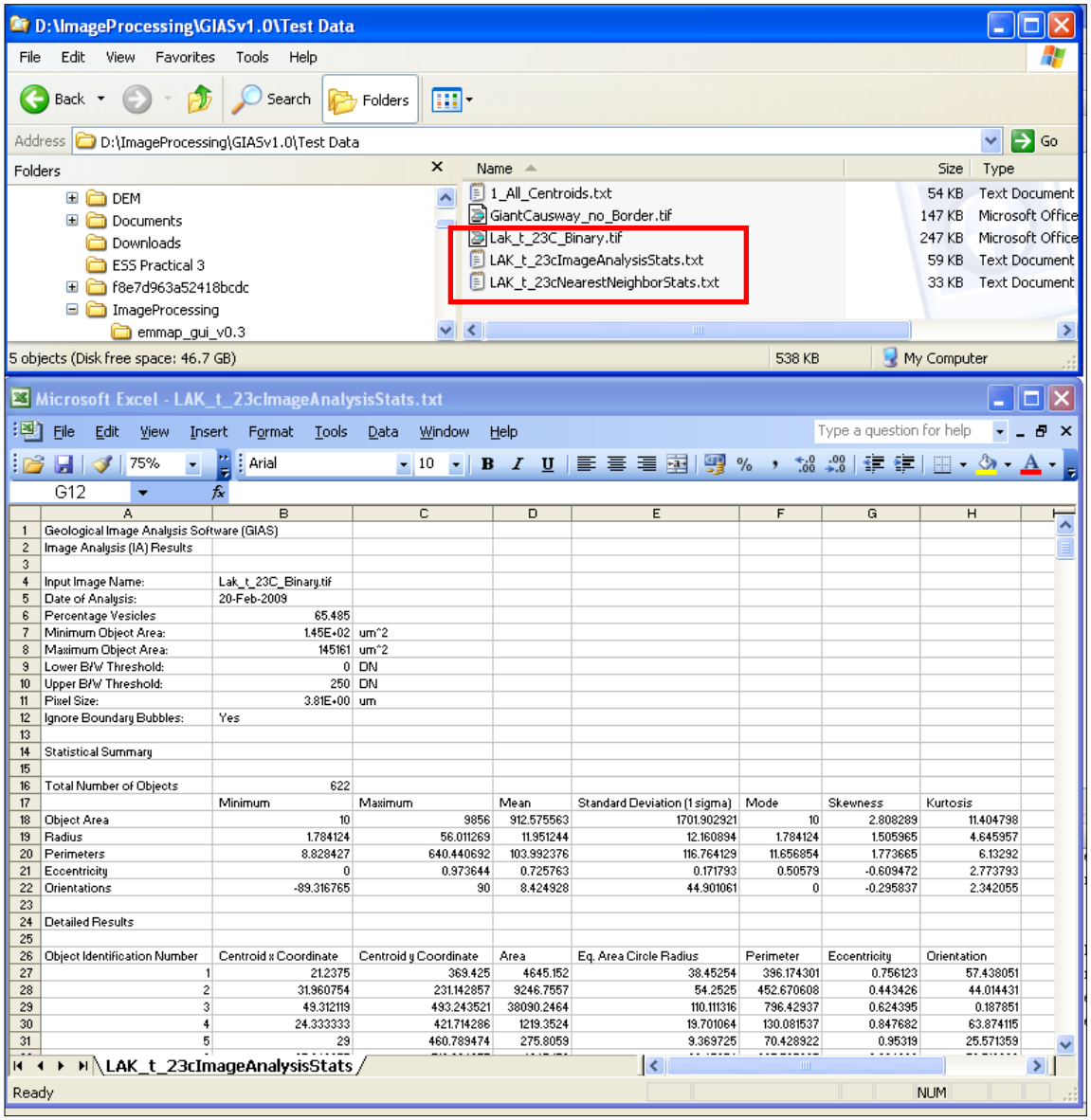
Saving output (2)

- GIAS writes two Excel-readable tab-delimited files named from the output filename box: LAK_t_23c_
- It also prints the R and c plots from the NN Analysis Tab



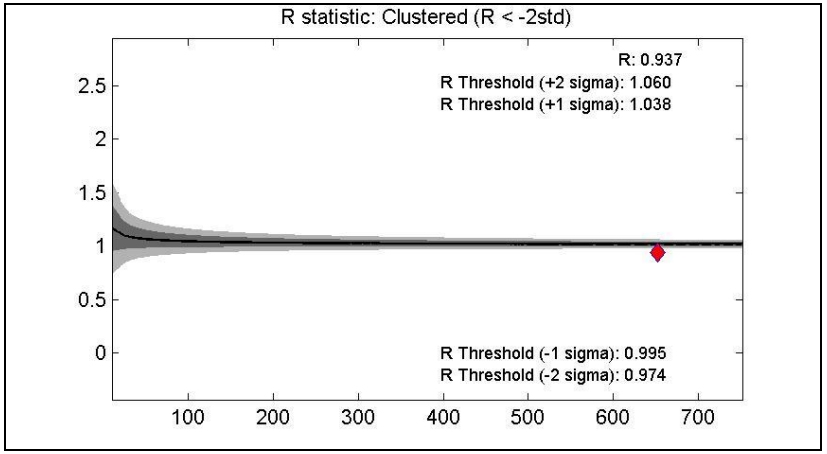
Results in Excel

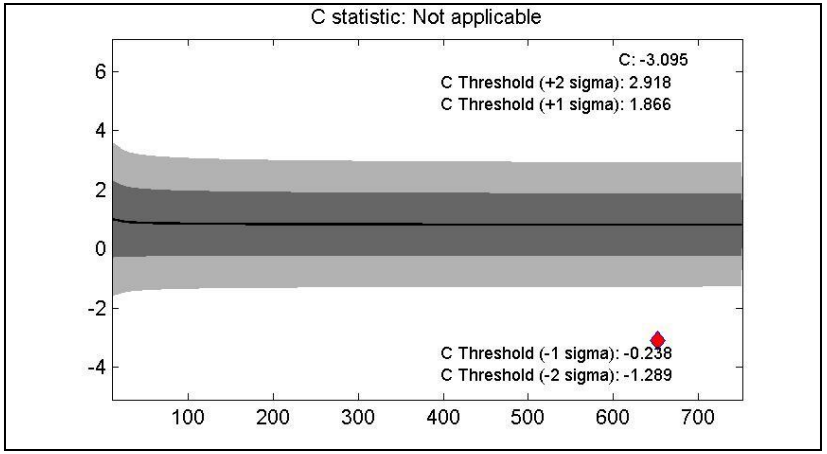
- You results are written to two separate files in the local working directory
- One is for *image analysis* statistics, the other for *nearest neighbor* statistics



Results of R and c

- R and c graphs are printed to jpg files, with relevant statistics and a suggested implication: random, clustered or uniform
- Again, these are for illustration purposes – use the data in the NN analysis data file for your own detailed figures
- The data for the bias/error envelopes are stored in the skdata folder as NNbias_flat_k_0.dat for Poisson test





Other options for NN analysis

- You can load data in as two other types of file
  - NN Input image: this is an image with single pixels representing the centroid or single points (within a landscape for example). Useful for ArcGIS exports
  - NN Centroid List: A list of X and Y coordinates (e.g. in UTM or another ‘flat’ coordinate system) assumed to be a two column .txt or .dat file
  - Invert Input Image: by default, GIAS assumes that the objects of interest (e.g vesicles) are the blackest pixels. Tick this box to invert the image colors (e.g white becomes black)

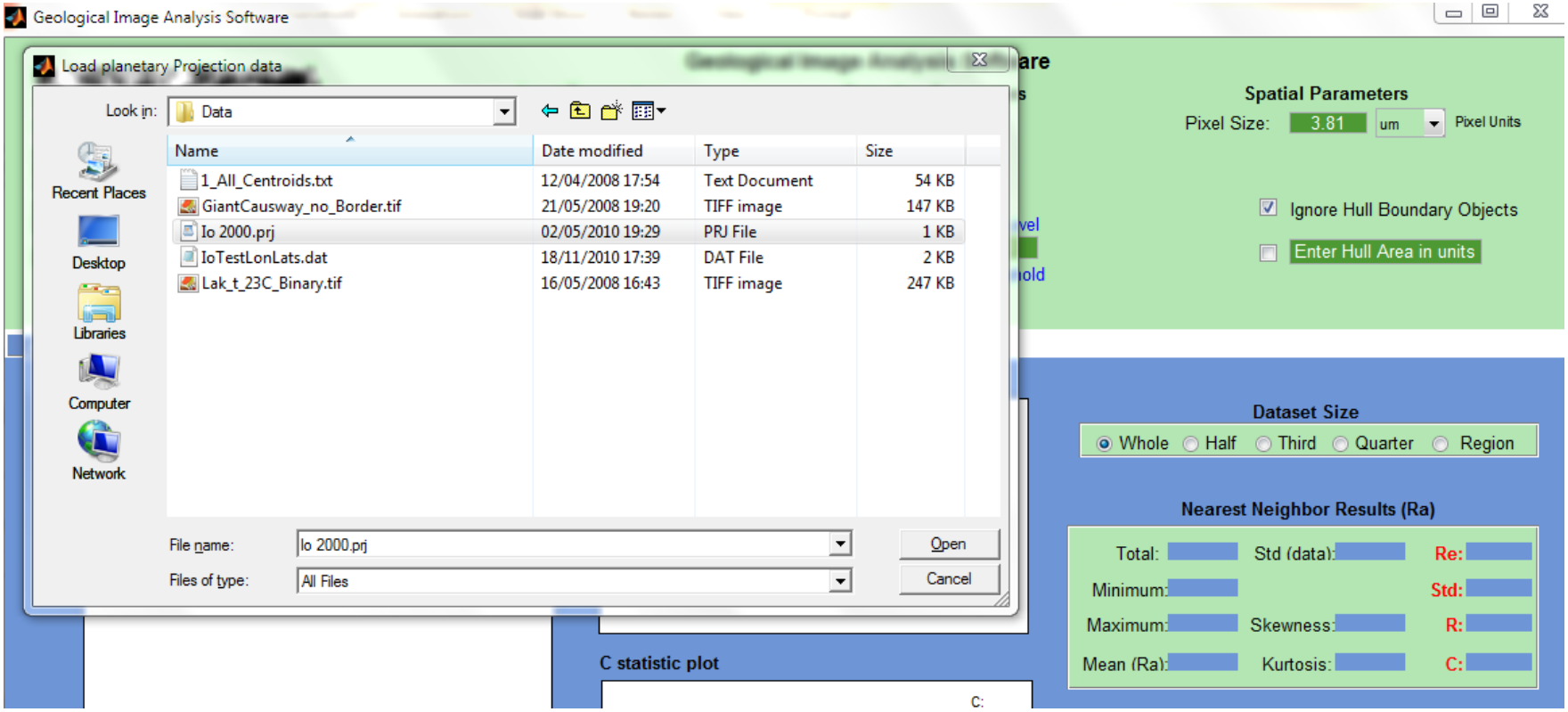
Planetary analysis

- This new tab (in version 2) allows analysis of planetary-scale features or those measured on a spherical object given in degrees of longitude and latitude
  - Analyse NN distributions across the whole sphere, half, third or quarter sphere.
  - Compare to a ‘flat’ Region with size computed or input via the Hull Area box

- To use this Tab, select the Planetary Data tick box
  - An Open File GUI will appear prompting you for projection file, which gives the radius and flattening of the planet of interest.
  - Then load in a two column file consisting of longitude and latitudes for the points of interest
  - The following example is for hotspots on the Jupiter moon Io

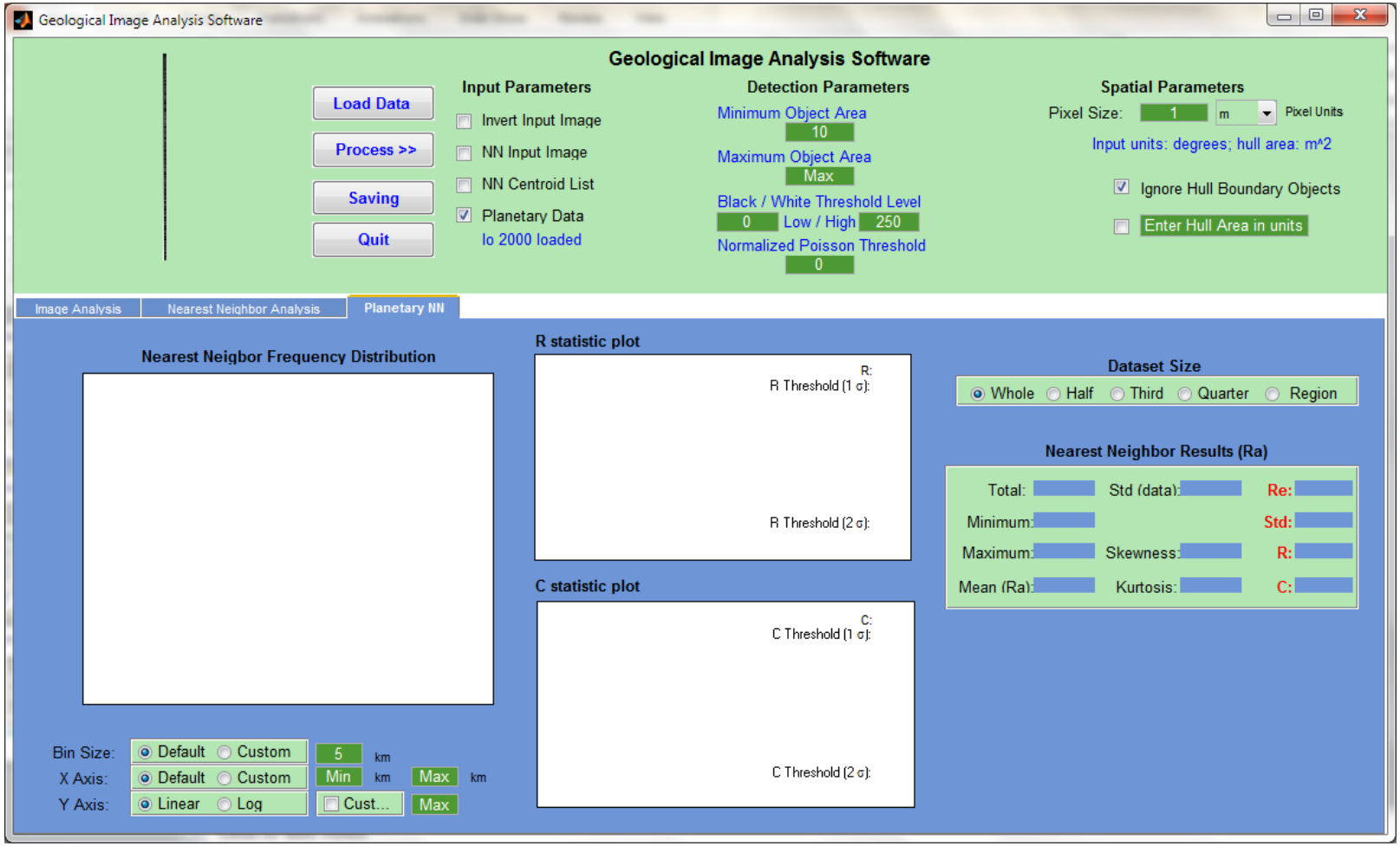
Planetary Tab: Load projection file

- Load the ArcGIS projection file (e.g. Io.prj)
- Then click ‘Load Data’ to load in a two column file of longitude and latitudes in degrees (e.g. IoTestLonLat.dat)



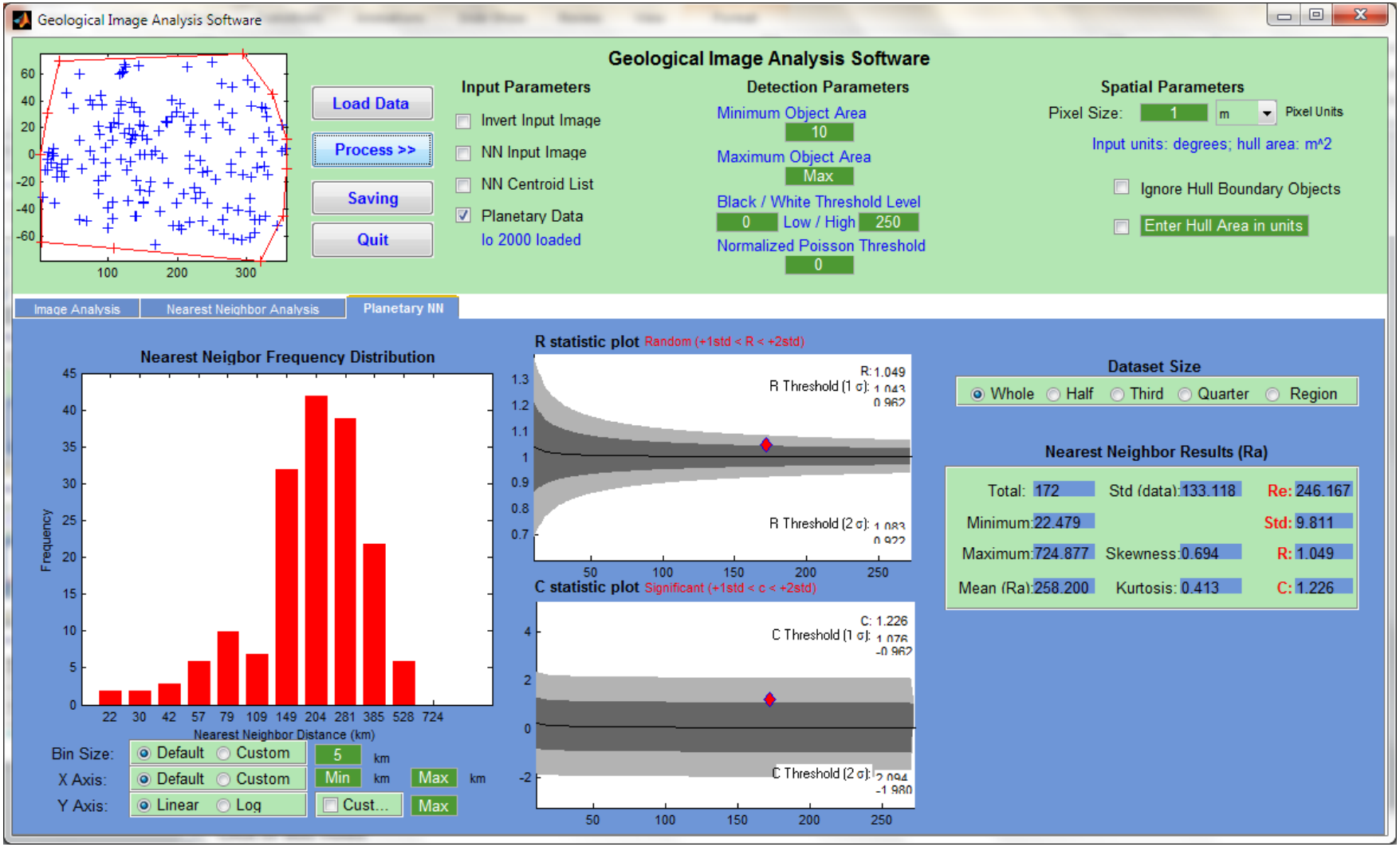
Planetary Tab: Load data

- You should see the two columns of data displayed in the Input panel as a thin line (see upper left). Now hit ‘Process’



Results of hotspots on Io

- The hotspots are randomly distributed when compared against the whole moon's area - what about subsets of the data …?



Notes on Planetary Tab

- The Image Analysis and NN Analysis Tabs are ignored once the Planetary Data Tick box is enabled
  - Untick to start using the other two tabs
- Use the ‘Normalized.prj’ projection file if you are analysing items on the surface of a sphere. Assumes the radius of the sphere is equal to 1.
- The NN distances are also correctly computed with ellipsoidal planetary projections
- If using the whole sphere, untick the ‘Ignore Hull Boundary Objects’ box.
- Saving the data is similar to the other two tabs. A file with the NN data and two jpg images of R and c are written out with the XXX_PlanetNearestNeighborStats.dat ending.

Other options

- See the Help files for advice on how the other options work
- If the code stops working correctly, the best thing to do is to close the programme and restart it
- If it is persistently crashing, check the image format is correct and that you have set the path in Matlab correctly.
- If all else fails, contact us via the www.geoanalysis.org website