
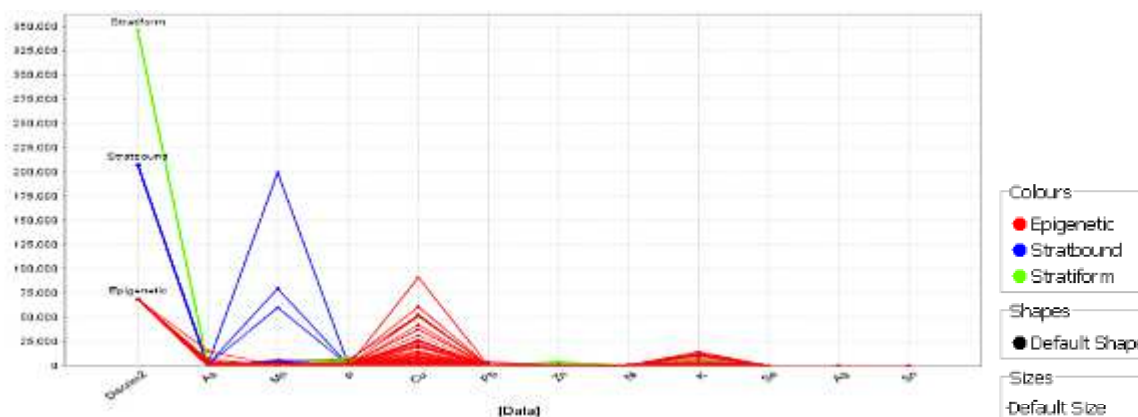


## Parallel Coordinate Plots

Parallel coordinates plots are a technique used for representing high-dimensional data.

To show a set of points in an  $n$ -dimensional space onto a 2D surface (the computer screen), a graph is drawn consisting of  $n$  vertical, equally spaced parallel line segments. The lines themselves are not visible in ioGAS but the samples are plotted as points onto these vertical lines according to that value of the sample for corresponding variable.




The number of vertical lines depends on the number of variables selected in the  [Select Variables](#) dialog. Polylines are created for each sample by joining each variable point on the various vertical lines.



Parallel Coordinate Plot showing selected variables coloured with attribute groups

Part of the value of parallel coordinates is that certain geometrical properties in high dimensions translate into easily seen 2D properties. For example, a set of points that lie on a line in  $n$ -space will translate to a set of polylines in parallel coordinates that all intersect at a common point and two sets of points which occupy distinct spatial clusters will form 'knots' of lines that do not intersect. Selecting more variables and creating another PC plot is equivalent to adding more dimensions to the parallel coordinate plot.

### To display a Parallel Coordinate Plot:

1. In the  [Column Properties](#) dialog make sure each variable to plot is correctly set as a numeric or text variable.
2. In the  [Select Variables](#) dialog choose at least two variables to display on the plot.
3. Select **Graph>Parallel Coordinate Plot** or click on the  icon on the main Toolbar.
4. A plot window is opened containing a single graph.










The variables are displayed from left to right in the plot depending on the order of the variables in the **Select Variables** dialog. The currently visible attributes are shown in the legend on the right and these are used to determine the colour, size and shape of the data points and colour of the polylines.

### Parallel Coordinate Plot RHS Toolbar

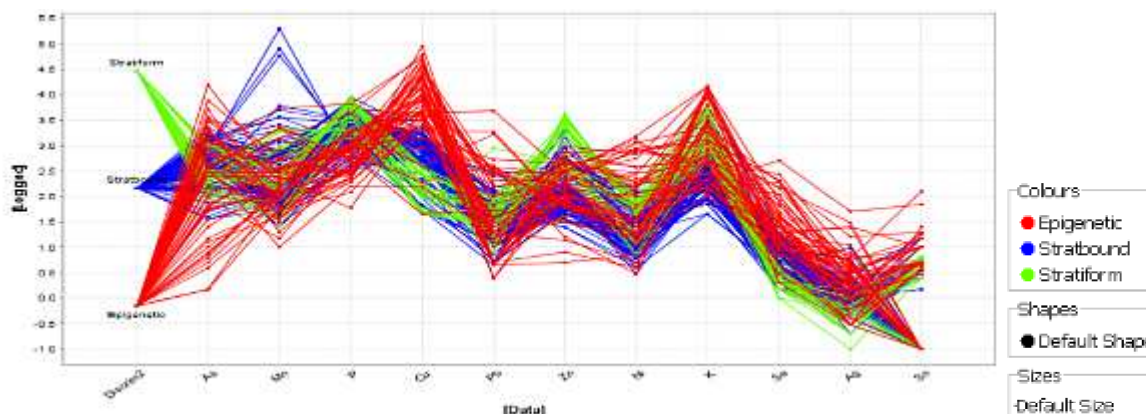
ioGAS has a number of summary tools available for use in the Parallel Coordinate Plot. Both parametric and ranked based statistics can be plotted per colour attribute group. The samples points can be hidden to make

viewing these summary statistics easier. To aid in interpretation, a slightly heavier line is drawn at values of  $y=1$  (horizontal line).

The following functions are available from the RHS (Right-Hand Side) Toolbar:

	<b>Attribute Point</b> - Apply current <u>attributes</u> to selected point and all other points along the line that represents the selected sample. Only the top data point is attributed if two samples occupy the same node.
	<b>Change Visibility of Data Points</b> - Toggle between displaying polylines for all data points or one polyline representing the mean for each variable.
	<b>Change Parametric Statistical Summary</b> - Toggle between parametric and ranked based statistics per colour attribute group. See <a href="#">Parallel Coordinate Statistics</a> for more information.
	<b>Change Percentile Summary</b> - Toggle between no percentile summary, median and median with 25 <sup>th</sup> and 75 <sup>th</sup> percentiles.
	<b>Change Scaling</b> - Cycle through Y scaling options from Min to Max (0-1), 0 to Max and levelled by colour
	<b>Logarithmic Y Scale</b> - Apply base 10 log to Y axis
	<b>Lock the Axes</b> - When turning on/off group <u>visibility</u> in Attribute Manger axes will not re-scale
	<b>Auto-Scale the Axes</b> - When turning on/off group <u>visibility</u> in Attribute Manger axes will re-scale
	<b>Edit Common Plot Settings</b> - Set title and axis label font, colour and size, show/hide tick labels or display gridlines for all plots in the window.

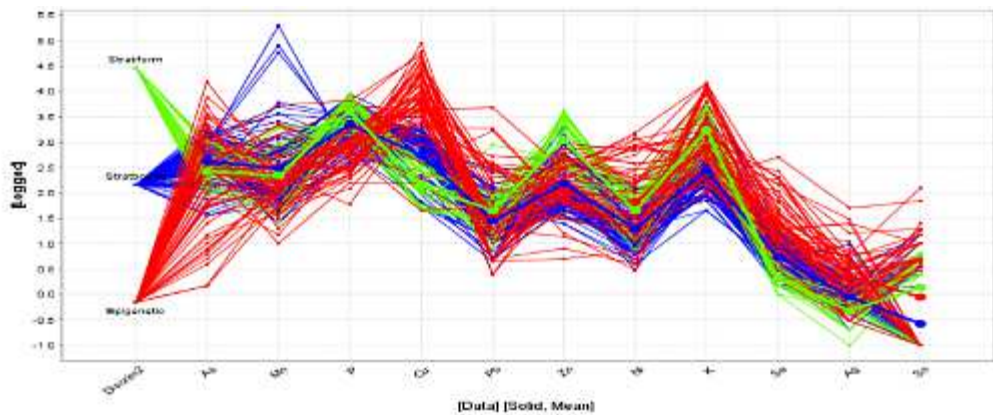
## Parallel Coordinate Statistics



Log Y Axis Parallel Coordinate Plot Showing Selected Variables Coloured with Attribute Groups

Despite the log Y transform, the Parallel Coordinate plot above is confusing due to the large number of data points it contains. To make it easier to decipher it is sensible to add summary statistics and then turn off the data points from view.

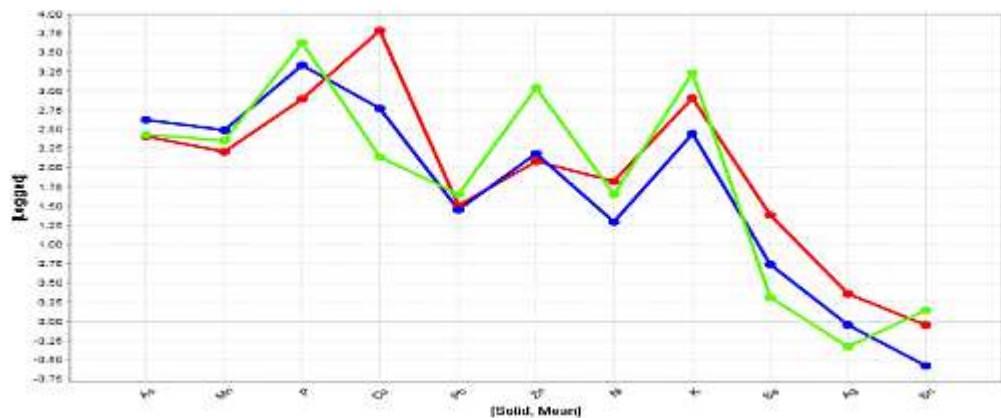
1. Select the  icon from the RHS (Right-Hand Side) toolbar to add the Parametric (Summary) Statistics.



Log Y Axis Parallel Coordinate Plot Showing Added Parametric Statistic Lines

Parametric statistics have been added in the above plot as designated by the thicker coloured polylines for each group.

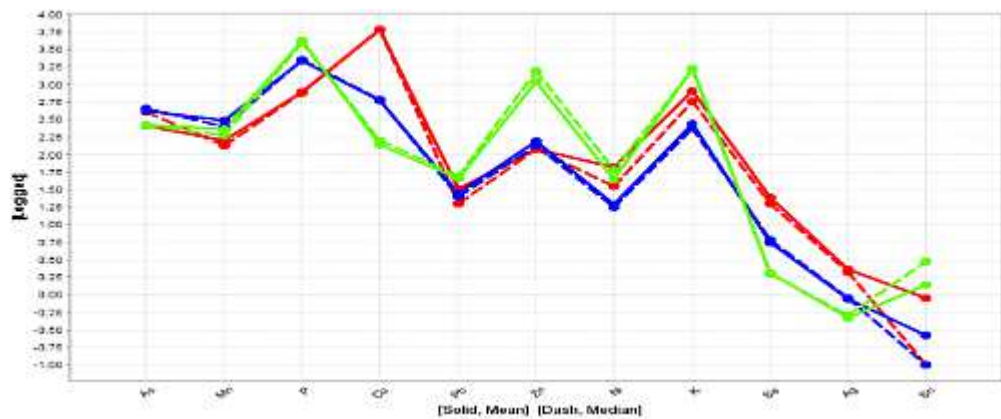
2. Select the  icon from the RHS (Right-Hand Side) toolbar to turn off the visibility of the individual data points.



Log Y Axis Parallel Coordinate Plot Showing Only Parametric Statistic Lines

Now the 'average' trend of the various colour data groups is readily discernable. Note that the text field is not present when data values are turned off. This is because an average value for a text field group is meaningless.


3. Select the  icon from the RHS (Right-Hand Side) toolbar to view percentile based statistics.

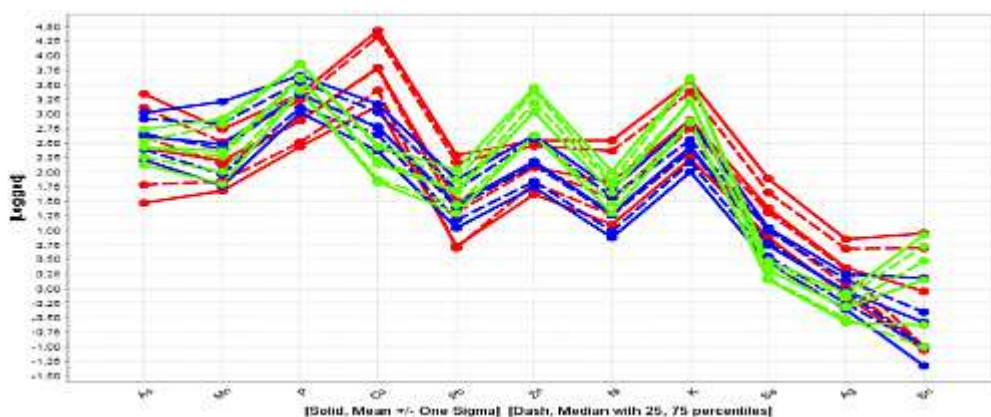


Log Y Axis Parallel Coordinate Plot Showing Parametric Statistic and Median Percentile Lines

The percentile polylines are represented by a dashed line as indicated in the X axis title. These are slightly different to the parametric summary as the distribution of data within each group for each element is not perfectly normal.


Note that once the raw data is hidden the statistical summaries will not contain shape or size information from the raw values only colour attributes.

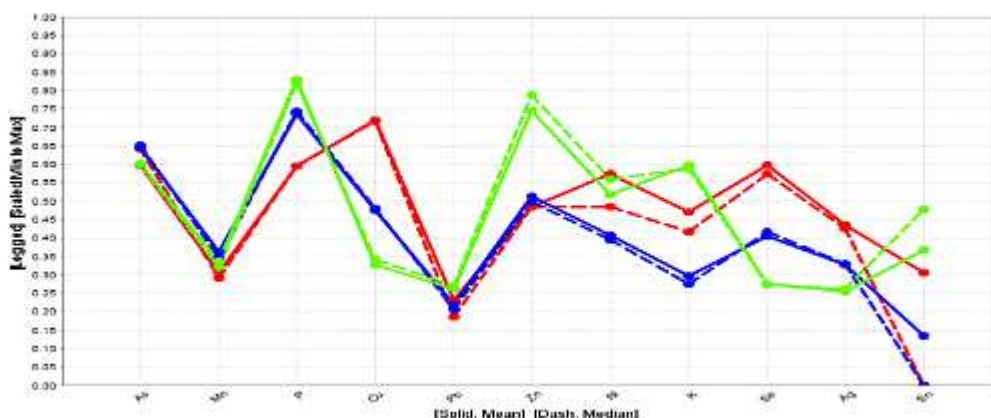
- Click on the  icon again to view summary statistics for spread such as standard deviation and interquartile (25-75<sup>th</sup> percentile) range on the plot.




Log Y Axis Parallel Coordinate Plot Showing Parametric Statistic and Median, 25, 75 Percentile Lines

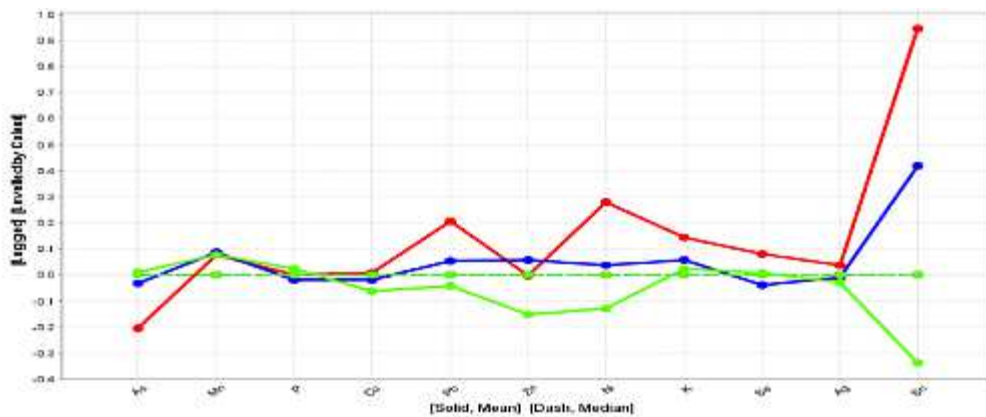
The middle line is the mean or median, and the outer lines of the same style (solid or dashed) are those for the spread statistics.

- Select the  icon to alter the Y axis scaling. This tool cycles through Min - Max (0-1), 0 to Max and Levelling to Colour Groups.




Parallel Coordinate Plot Scaled to Min - Max (0-1)

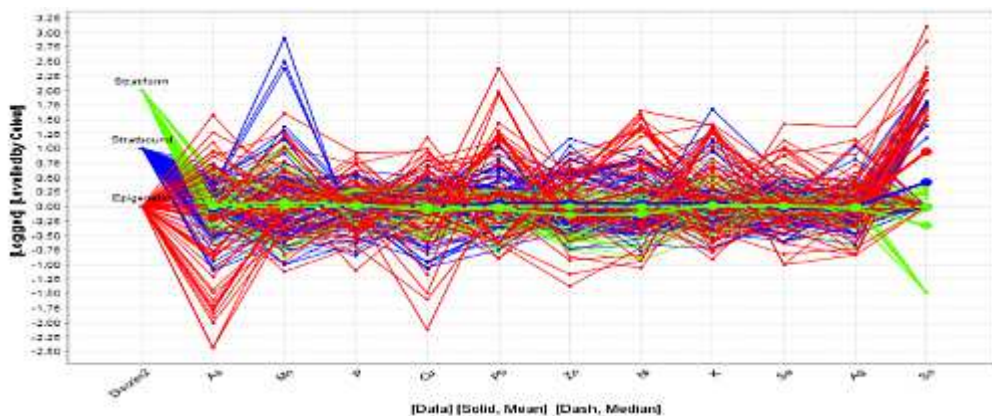
- Select the  icon again until the Y axis changes to Levelled by Colour. This scaling option levels each group to the median of that group and will result in the medians having a log value of 0 (because log(1)=0). This effectively gives the response ratio within each group.



Parallel Coordinate Plot with Levelled by Colour Y Scaling

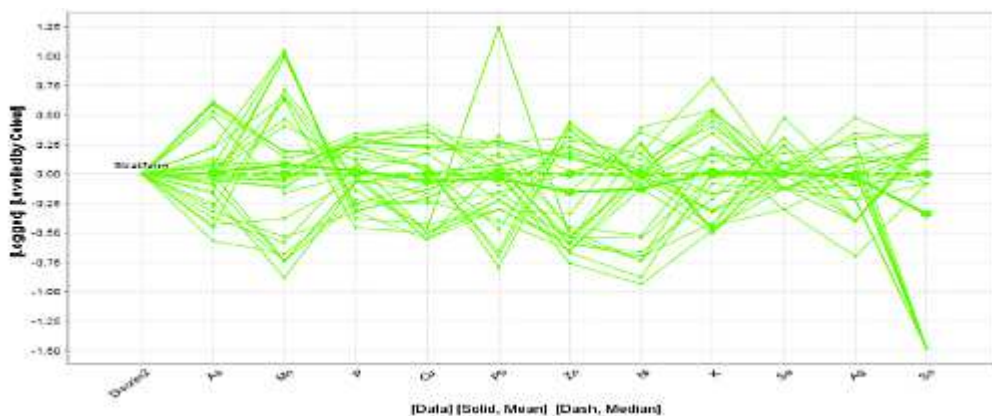
The summary values will have less meaning for the levelled scaling option so turning the data back on using

the  icon is useful. However, as the figure below shows, the diagram is quite crowded again.



Parallel Coordinate Plot with Levelled Scaling and All Data Points Displayed

7. Use the **Attribute Manager** to toggle the visibility of colour groups on and off. Reducing the visibility to one or two groups *may* allow the raw data to be toggled back on without obscuring much of the information. The view below is restricted to the Stratiform subset.



Parallel Coordinate Plot with Levelled Scaling and Data Points for Single Colour Group

NOTE: The mean summary statistic is calculated on the displayed data. So the mean shown on the raw Y-axis is not the same as the mean of a log transformed y-axis!

**See Also:**

Graph [FAQ](#) for more information on common issues.

**Help>Training Videos (web): *Parallel Coordinate Plot & Parallel Coordinate Plot 2*** (Maintained users only)