

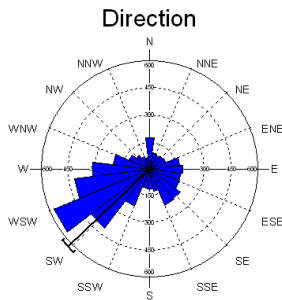
## PRODUCT INFORMATION

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# Oriana

## Oriana version 4 Orientation Analysis/Circular Statistics



Are you working with directional data measured in degrees? Perhaps your research involves looking at patterns in the time of day of events, or things that occur in weekly, monthly or yearly cycles. These are circular data and they require special types of statistics. If you want to analyse this type of data, then Oriana is just what you need.

Oriana is a program written for Microsoft Windows. It calculates the special forms of sample and inter-sample statistics required for circular data. It also graphs your data in a variety of ways, allowing you to easily demonstrate patterns. These analyses and graphs are rarely found in other statistical packages.

Oriana is designed to be full featured and powerful, but also intuitive and easy to use.

### Analyses

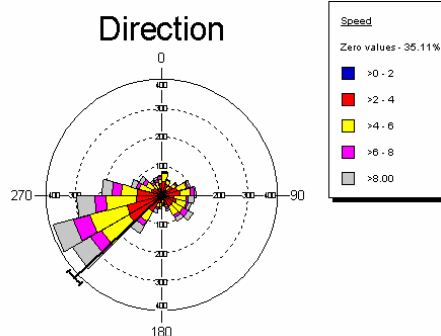
Oriana calculates a variety of single sample statistics as well as inter-sample comparisons. The basic statistics include the circular mean, length of the mean vector, circular standard deviation and 95% and 99% confidence limits. There are also a number of single sample distribution tests, such as Rayleigh's test of uniformity and Rao's spacing test. Samples can be compared with various tests such as Watson-Williams test or Mardia-Watson-Wheeler test. Intersample correlations can also be calculated.

The results of the analyses are presented in a tabular format, ready for pasting directly into your word processor for a report or manuscript.

The number of variables and cases that Oriana can analyze is only limited by the amount of installed memory and disk space (up to 2 billion maximum).

BASIC STATISTICS	
Data file - E:\StatData\Oriana\Ori2 Test Data\Wind2002.ori	
Hourly wind data, garden weather station, Jun-Dec 2002	
Analysis begun: 29 May 2003 15:40:28	
Variable	Direction
Number of Observations	4495
Data Grouped?	No
Group width (& number of groups)	
Mean Vector ( $\mu$ )	226.7189°
Mean Group	
Length of Mean Vector ( $r$ )	0.2845
Median	235°
Median Group	
Concentration	0.5936
Circular Variance	0.7155
Circular Standard Deviation	90.8442°
Standard Error of Mean	2.0794°
95% confidence interval (-/+)	for $\mu$ 222.6424° 230.7955°
99% confidence interval (-/+)	for $\mu$ 221.3619° 232.076°

### Graphics

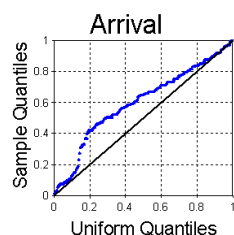


A variety of graph types are available in Oriana. The data for each set of observations can be summarized with rose diagrams or circular histograms. The rose diagram/histogram bars can be stacked to show the relative proportions of subsets within the data. Linear histograms can also be plotted.

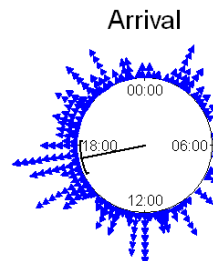
Linear data can be incorporated into two variable rose diagrams/histograms as well as in vector plots, where an arrow or bar is drawn for each case, with the length representing the linear data, and circular scatterplots.

Individual observations can be shown in raw data plots.

Distribution plots allow you to assess whether the data depart from a uniform or von Mises distribution. The distributions of two sets of observations can also be compared with Q-Q plots, and regular scattergrams can also be produced.



Various aspects of the appearance of the graph can be modified, including fonts, colors of lines, objects and background, and text of titles and axis labels. When the graphs are ready you can print them to any Windows printer, save to various graphic formats, or copy and paste them to any other Windows application.



## Data Handling

Oriana can natively handle a wide variety of data types. Besides angular data in degrees (either unidirectional or bidirectional), you can also enter your circular data as time of day, day of the week or month of the year (in your native language), or numeric week or day of the year. You can also enter data as compass directions (e.g. NW for north-west).

Oriana can also accept a variety of non-circular data types, including linear numeric, dates, labels, and a special subgrouping variable. These data can be paired with your circular data to identify cases, allow analysis of subgroups of data, or allow linear data to be incorporated into your graphs and analyses (through two-variable stacked histograms and circular-linear correlations).

Type	Angles	Linear	Linear	Linear	Date	Time
Name	Wind Direction	Wind Speed	Temp	Pressure	Date	Time
1	265.000	9.171	17.200	1010.043	15/06/2002	12:00
2	248.000	6.263	16.100	1010.043	15/06/2002	13:00
3	232.000	8.053	16.900	1011.043	15/06/2002	14:00
4	186.000	5.369	16.100	1011.043	15/06/2002	15:00
5	222.000	5.816	15.600	1011.043	15/06/2002	16:00
6	252.000	3.579	16.000	1011.043	15/06/2002	17:00
7	239.000	10.961	16.600	1010.043	15/06/2002	18:00
8	250.000	10.961	15.400	1010.043	15/06/2002	19:00
9	237.000	6.263	15.100	1010.043	15/06/2002	20:00
10	236.000	5.269	14.700	1009.043	15/06/2002	21:00
11	145.000	4.026	14.800	1009.043	15/06/2002	22:00
12	229.000	3.132	14.700	1009.043	15/06/2002	23:00
13	227.000	2.684	14.300	1008.043	16/06/2002	00:00
14	211.000	7.158	14.900	1007.043	16/06/2002	01:00
15	232.000	6.263	14.700	1007.043	16/06/2002	02:00

Data are entered in a spreadsheet like editor, with special input assistance for some variable types (e.g. enter months by picking them from a list or just typing the first one or two letters, or picking dates off a pop-up calendar). Optionally, you can also enter data in the form of a frequency table.

Oriana can handle grouped circular data. These are data where the observations have been recorded approximately, to the nearest interval (e.g. to the nearest 20° or every hour), rather than recorded

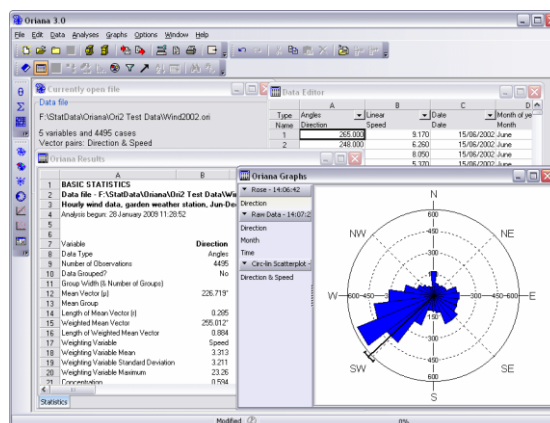
exactly. Oriana automatically detects grouped data and flags them (with user confirmation) so that statistical analyses are adjusted accordingly, where relevant. Oriana can also accept and automatically deal with missing data.

A variety of data manipulation functions are provided. These include filling variables with automatically generated data (identical, incrementing or random from a uniform or von Mises distribution), sorting the data, summarizing dates into days of the week, months of the year, etc., changing between variable types, plus a find and replace facility.

The data can also be imported and exported from/to Excel, Lotus 123, Quattro, dBase, Paradox and ASCII text. Data can also be pasted from any Windows program directly into the data editor.

## Desktop Metaphor

Oriana uses the KCS desktop metaphor. You can spread out your data, the statistical results and several graphs in front of you while you study them, just like paper on your desktop. Try new graphs, add new data, peruse the results, then print or save just those that you need. When you exit Oriana you can save the position and contents of all the windows on your desktop. Later you can restore it to the same state. Oriana lets you pick up where you left off. Multiple desktops can be saved for different projects.



## Evaluation Version

An evaluation version can be downloaded from our web site (<http://www.kovcomp.com/>). You may use this version for up to 30 days while you decide whether Oriana suits your needs. This version has all the features of the full version. The full registered version comes with a complete printed manual. In addition, purchase of Oriana entitles you to 90 days free technical support by e-mail, post, fax or telephone as well as special prices on new versions.

## Prices

Single copy prices are UK£275 or US\$440, plus VAT (UK and European Union only). Academic and charities/NGO users qualify for a discounted price of £175/\$280. Printed manuals and CD-ROMs are available at an extra cost of £20/\$35 + shipping. Multiple copy discounts and site licences are available; contact us for details.

Oriana can be purchased at <http://www.kovcomp.com/>

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## Features of Oriana

### Data Handling

- Built-in spreadsheet-like data editor; supports cut and paste between applications.
- Circular data types:
  - Angles (unidirectional and bidirectional [axial])
  - Time of day
  - Compass direction
  - Day of week
  - Month of year
  - Week of year
  - Day of year
  - Lunar cycle
  - Proportional and percentage (like Angles, but scaled 0-1 or 0-100 rather than 0-360)
- Non-circular data types:
  - Date
  - Linear numerical
  - Label
  - Subgroups
- Flexible data handling; sets of data can be entered as separate columns (the old Oriana ver. 1 method) or can be entered pairwise with other data (linear, dates, labels, other circular data).
- With the paired method a file can also have one or more grouping variables added to allow for analysis of subgroups of data. Subgrouping can also be performed on existing data (such as the date, summarized in different ways).
- Data can be filtered, restricting analyses and graphs to just cases that meet a certain criterion (e.g. Angle > 90 or Month = June).
- Circular data can be entered as x/y coordinates defining the beginning and ending point of a vector. They can then be converted to vectors (angle and length) for analysis.
- Data can be entered either as raw observations or in the form of a frequency table.
- Variables can be automatically filled with identical, incrementing or random (uniform or von Mises) data.
- An optional file creation wizard aids in the process of setting up new data files.
- Dates can be summarized into day of week, month of year, week of year or day of year.
- A Find and Replace facility lets you search for particular data points and make global changes.
- Data can be sorted.
- Grouped circular data (data recorded approximately to the nearest interval, such as every 20° or every hour, rather than exactly) are automatically detected and flagged (with user confirmation) so that statistical analyses are adjusted accordingly, where relevant.

- Missing data capability with pairwise deletion where required.
- Import and export from/to Excel (both .XLS and .XLSX), Lotus 123, Quattro, dBase, Paradox, ASCII text.
- Number of cases and variables limited only by available memory and disk space.

## Statistics

- Basic statistics
  - circular mean,
  - length of mean vector ( $r$ ),
  - median angle
  - circular variance, standard deviation and standard error
  - 95% and 99% confidence interval for the mean vector.
  - mean weighted by linear variable, plus basic statistics for the linear variable itself
  - means and mean vector lengths can be saved to a file for further second order analysis.
- One-sample tests
  - Rayleigh's Test of Uniformity
  - Hotelling's test for weighted data
  - Moore's modified Rayleigh test for weighted data
  - Rao's Spacing Test
  - Chi-Squared
  - V-Test
  - Watson's  $U^2$
  - Kuiper's.

The last two can be used for tests against both the uniform and von Mises distribution.
- Two-sample tests
  - Watson-Wheeler F-test
  - Chi-squared test
  - Mardia-Watson-Wheeler test
  - Watson's  $U^2$  test.
  - Hotelling's paired multisample test
  - Moore's paired multisample test (nonparametric)
- Multisample tests - The first three two-sample tests above can also be performed as multi-sample tests.
- Circular-circular and circular-linear correlations.
- Second order statistical analysis:
  - Grand mean angle, length and confidence limits
  - Hotelling's one sample second order test
  - Moore's modified Rayleigh test for second order analyses
  - Hotelling's two sample second order test
  - Mardia's two sample second order test (nonparametric)
  - Hotelling's paired sample second order test
  - Moore's paired sample second order test (nonparametric)
- All analyses can be performed on subgroups of data as well as the whole data set.

## Graphics

- Graph types include
  - Rose diagrams
  - Circular histograms
  - Linear histograms
  - Arrow graphs - like a histogram, but an arrow is used for each class rather than a bar or wedge
  - Raw data plots
  - Distribution graphs - plot data against expected distribution for either uniform or von Mises distributions.
  - Stacked and stepped circular histograms/rose diagrams- bars or wedges divided into segments to reflect the proportions of each subgroup within the data.
  - Stacked raw data plots - points representing each data point are colored according to their subgroup

- Two-variable circular histograms - segments of each bar represents the classes of a second circular or linear variable (e.g. wind speed plotted as segments on bars representing wind direction)
- Circular-linear plots - these incorporate linear data along with your circular data. An arrow, bar or wedge is drawn for each case, with the length representing the linear data.
- Circular scatterplots - these also plot linear and circular data, with each data pair being plotted as points on a circular plot
- X/Y Scatterplots - can plot any circular or linear variable on X/Y Cartesian axes.
- Q-Q plot - compare distributions of two circular samples to assess whether they have the same distribution
- Mean and confidence limits can be shown on histograms. Mean can alternatively be represented by a mean vector, where the length of the arrow reflects the mean vector length ( $r$ ).
- Circular graphs can have a circle showing the critical value of the Rayleigh test. The length of the  $r$  vector can then be compared to this circle to assess its significance.
- With paired vector data (consisting of angle and length) the mean vector can be weighted by the vector lengths.
- Axes can be extensively customized with regard to number of grid lines, scaling (linear, percentage or logarithmic), format and orientation of labels.
- Circular graphs can be drawn with the  $0^\circ/N$  point at user chosen position on the circle, and oriented either clockwise or counter-clockwise.
- Doubled-angle plots, which plot only the data between  $0-180^\circ$ , but spread around the full circumference of the circle, can be produced. This type of graph is used in fields such as ophthalmology.
- Circular-linear plots can have a standard deviation ellipse plotted (also used in ophthalmology).
- Division of segments in two-variable histograms can be customized or manually defined.
- Bar width of histograms and rose diagrams can be changed.
- Rose diagrams can have frequency depicted by either radius or area of wedge.
- Linear histograms can be plotted as double width plots to emphasise cyclicity in data.
- Table of frequencies used to produce histograms can be displayed in the Results window.
- Graph types and options can be modified without having to create a new graph window.
- Graph appearance can be customized (fonts, color of axes, thickness of lines and grids, color of background of various sections, series of colors, patterns and symbols for stacked and subgrouped diagrams).

### ***User Interface***

- Written specifically for Microsoft Windows. Follows the normal Windows conventions, making it easy to learn and use alongside your other Windows applications. Intuitive menu structure and quick-access toolbar buttons.
- Uses the KCS desktop metaphor. All results and graphs for a single project can be spread out on screen. Contents and arrangement of windows can then be saved and recalled later, letting you pick up where you left off. Different projects can be saved in separate desktop files.
- Graphs and results appear in two tabbed notebooks (one for each), with each graph or page of results on separate pages.
- Results and graphs can be exported for inclusion in reports or manuscripts, using cut and paste. Results can also be saved to text files or Excel spreadsheets, and graphs can be saved in a variety of formats, including EMF, WMF, BMP, PNG, GIF and JPG.
- Data, results and graphs can be printed to any Windows printer or plotter. Different devices can be used for text and graphics.
- Results and graphs can be exported or printed individually or all at once.
- Inclusion of a notepad allows you to make notes about your analyses. These are saved along with the graphs and results in a desktop file, and can be copied or exported to your word processor.
- Customizable toolbars - you can arrange the toolbars at any point around the margin of the window or floating over the window, and you can choose which buttons to display on each toolbar.

- User can select from a number of different color schemes, many with attractive gradient effects.
- Automatically uses local language (as set in Windows) for names of months and days, and local format for times and dates. Compass direction abbreviations can be customized manually.
- Full on-line help and a comprehensive manual with tutorial.

## **System Requirements**

- Microsoft Windows 98SE/Windows NT 4 or later (including Windows ME/2000/XP/2003/Vista/7/8/10)
- 512Mb RAM memory
- 12Mb disk space