

RadialPlotter: a Java application for fission track, luminescence and other radial plots

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Radial plots are bivariate (x_j, y_j) scatterplots where:

$$x_j = 1/\sigma(z_j), \quad y_j = (z_j - z_0)/\sigma(z_j), \quad \text{for } 1 \leq j \leq n \quad (1)$$

with z_j a transformation of some data and $\sigma(z_j)$ the corresponding measurement uncertainty. For example, if $z_j = \log(t_j)$ then $\sigma(z_j) = \sigma(t_j)/t_j$. z_0 is a convenient central value such as the weighted mean. The slope of a line connecting the origin ($x=0, y=0$) of a radial plot with a data point (x_j, y_j) equals z_j , and the horizontal distance along x-axis is a measure of its precision. Thus, the radial plot simultaneously visualises a measurement's value and precision. No other graphical method achieves this goal with the same elegance (Galbraith, 1988). This makes the radial plot the method of choice for visualising heteroscedastic data, i.e. data with (large and) variable measurement uncertainties. Traditional applications in the Earth Sciences are fission track and luminescence dating, which are governed by Poisson processes (e.g., Galbraith, 1990; Galbraith et al., 1999). In principle, however, radial plots can be used for any kind of data.

RadialPlotter is a user-friendly application for generating radial plots. It has the following advantages over existing programs such as **Trackkey** or **MacTrack**. (1) The program was developed solely for radial plots and does not perform other functions for data reduction or interpretation. Therefore, radial plot functions are not buried deep inside the menu structure and the interface is very straightforward. (2) **RadialPlotter** was written in Java (version 5) and is, therefore, perfectly platform independent. (3) In addition to fission track radial plots, **RadialPlotter** also offers the possibility to generate radial plots for luminescence dating, or any other kind of data such as (U-Th)/He or $^{40}\text{Ar}/^{39}\text{Ar}$ ages.

RadialPlotter can be downloaded free of charge from <http://pvermeesch.andropov.org/radialplotter>. The program consists of a single executable jar file (**RadialPlotter.jar**). This makes installation straightforward: it suffices to download and open this file to run **RadialPlotter**. For testing purposes, three example input files are provided on the website, one for each of the three possible input formats ('Fission Tracks', 'Luminescence' and 'Other'). The graphical output can be saved as either bitmap or vector images, in a .png or .pdf format, respectively. **RadialPlotter** automatically performs a χ^2 -test for statistical homogeneity of fission track data. For populations that have failed this test, the program implements the mixture modeling algorithm of Galbraith and Green (1990) (Figure 1). Data points can be colour-coded to show an additional variable such as chemical composition or a kinetic parameter. Colour-coding can also be a useful tool for double-dating, which is rapidly gaining popularity in detrital studies (e.g., Campbell et al., 2005). For example, the U-Pb ages of double-dated zircons could be shown as colours on a (U-Th)/He radial plot. Hopefully, this kind of flexibility will give the radial plot the wider user base which it deserves.

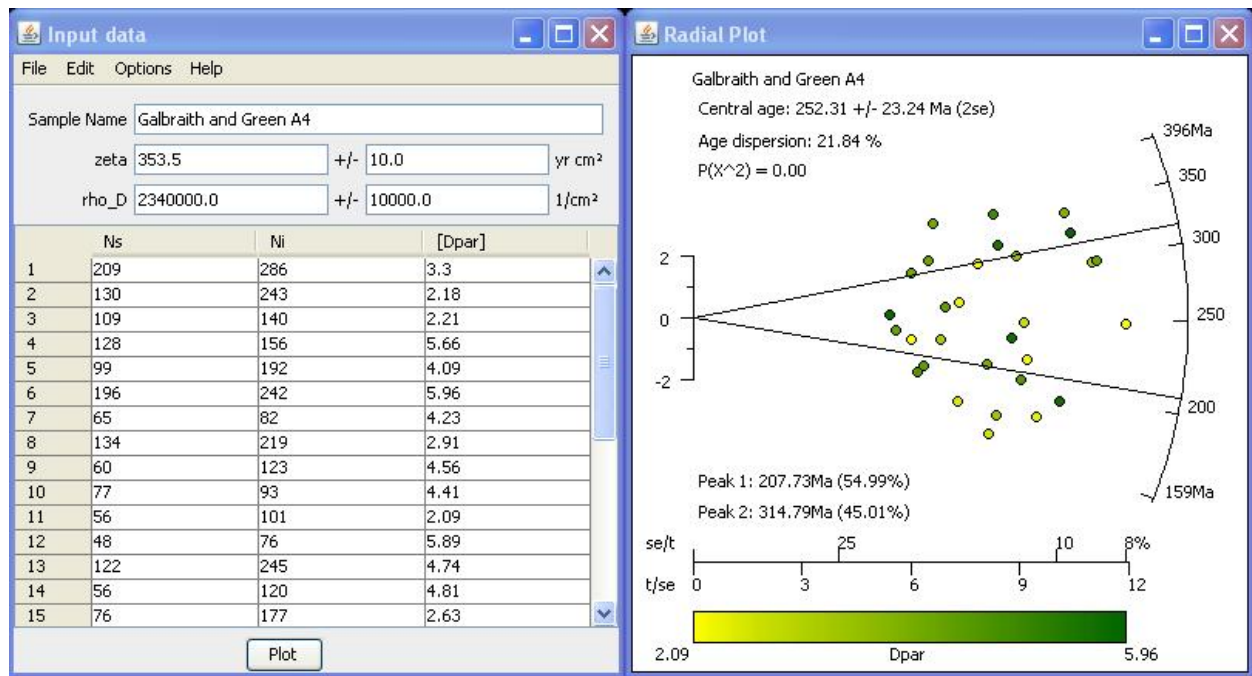


Figure 1: Input (left) and output (right) in the case of fission track dating.

References

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