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Interactive comment on "Robust Isochron Calculation" *by* Roger Powell et al.

Anonymous Referee #1

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Comments on "Robust Isochron Calculation"

The algorithm employed to compute the estimate will converge as long as the initial values are close enough to the solution. The algorithm is in this sense "correct", but it is unnecessarily complicated. I would prefer to use the algorithm of "Iterative weighted least squares", described in Section 4.5.2 of (Maronna et al, 2006), which is very simple and has guaranteed convergence.

As to the estimator itself, it has a flaw. Here the x_k's are observed with a random error. This situation is called "regression with errors in variables". It is known that the Least Squares estimator, and in general any estimator based solely on the residuals –like the one proposed– has a bias that does not decrease with the sample size (it

is "inconsistent" in the statistical jargon). The adequate estimator for this situation is called "orthogonal regression", of which there are also robust versions. The size of the bias depends on the ratio between the standard deviation of the assumed x errors (called σ_{xk} in the paper) and that of the x's. Unfortunately, for their simulations the authors choose $\sigma_{xk} = 0$ (line 247), which implies that there is no bias, and therefore this flaw is not visible in the results.

I cannot say however that the proposed estimator is "wrong": if the σ_{xk} are "sufficiently small" compared to the dispersion of the x's, the results may be accurate enough for practical purposes. How much is "sufficiently small" can be determined by more detailed simulations and/or theoretical calculations.