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

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The reviewer suggests that an "iterative weighted least squares" algorithm (e.g. Maronna et al, 2006, Section 4.5.2) should be preferred. In the process of finding an algorithm for our study, we did initially devise an iterative weighted least squares algorithm that uses the analytical uncertainties as the scale of data scatter, rather than the usual robust regression scale given by the scatter of the data about the linear trend. But in fact the algorithm converged only very slowly (100s of iterations), making it impractical. The algorithm eventually adopted may not converge for "poor" data from a less good starting estimate, but in our experience it works well (with less than 5 iterations for the family of contaminated-Gaussian datasets investigated—and showed no failures to converge in application to hundreds of thousands of simulated datasets). Additions to the algorithm may be needed to allow handling of poor data but such handling was not part of the object of our study. Contaminated-Gaussian datasets are relatively

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well-behaved (they are relatively “good” datasets), even though `mswd` may be large. Indeed, most datasets that geochronologists would feed into an isochron calculation also tend to be classified as relatively good.

We are confused by the idea that YORK and by extension the approach taken in our manuscript is “inconsistent”. The algorithms work on the residuals (A4). Each is a scalar for a datapoint, given the data and analytical uncertainties. Although the data may involve uncertainties on x and y, a particular residual could be considered as just an uncertainty on y, with the uncertainty on x being zero. There is nothing in the scalar which flags there is, or is not, an uncertainty on x. In this sense, is YORK really “regression with errors in variables”, given that the uncertainty on each data point is specified by its analytically-defined covariance matrix (A1)? Regardless of this, it is certainly true that the design width in isotopic datasets is generally much bigger than the individual x uncertainties, so according to the reviewer’s explanation, the problem alluded to would be minimised.

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