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

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[The response-to-review lodged earlier was before we knew that 2 more reviews would be forthcoming. The first paragraph of this response is largely unchanged, but the second paragraph is new, replacing the original second paragraph. This change is a consequence of the 4th review and the reading done in response to that.]

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 and 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 that was not part of the object of our study. Contaminated-Gaussian datasets are relatively well-behaved (they are relatively "good" datasets), even though $\mathtt{mswd}$ may be large. Indeed, most datasets that geochronologists would feed into an isochron calculation also tend to be classified as relatively good. See also the response to review 4.

The reviewer, not realising that the algorithm in the manuscript (and indeed YORK) properly accounts for errors in x as well as y, clearly thought we had fallen into the error-in-variables trap. If we had fallen into that trap, the slope estimates from the algorithm might indeed have been biased downwards, and the approach would have been inconsistent. Section 2 in the manuscript now provides the background necessary for such a reader to more clearly see that the algorithm is sound in that regard. See also the response to review 4.