Further characterisation of validation reference material JT:

43 pieces were cut and are ready for distribution. Each piece was analysed by 10 laser ablations for U-Pb. The pieces, having an average sizes in the range of approximatively 10 x 5 x 3 mm and are shown with corresponding numbers in Figure 1. Each piece contains a substantial amount of calcite vain material that can be used as validation reference material VRM, but were neither polished nor extensively cleaned, resulting in some high Pb values, especially in pieces 16, 19, 25, 31, 33, and 41, which gave no isochrones or isochrones with very high uncertainty. In sample 36 the U concentration was found always below 0.2 μg/g resulting also in high uncertainty isochrone. All pieces labelled with a red X in figure 1 need additional analyses after polishing/cleaning before distribution. All the data can be found in the Supplementary Table S3. In this file all individual results for JT are given including 43 Terra Wasserburg concordia plots for the individual pieces. The pooled data of all integrations is shown in Fig. 2, where the intercept age of 13.48 ± 0.27 Ma agrees well with the pooled data of previous analyses of 13.75 ± 0.11. However, the location of point on the isochrone are shifted towards the initial Pb side likely due to surface contamination during cutting and handling of the pieces and the raw surface making efficient cleaning difficult. Additionally, the uncertainty of individual analyses is larger due to smaller spot size (110 micrometre and 5Hz vs. mostly 163 micrometre and 10Hz in previous analyses shown in the main manuscript) and shorter analysis time (30 seconds vs. 40 seconds). Overall, the U concentration ranges from below 0.01 μg/g up to 5 μg/g with a mean of 0.6 ppm and a median of 0.44 μg/g. The 238/206 ratio varies between 0.04 and 455 with a mean of 84 and a median of 45.

Due to the fact that the first 15 seconds often contained higher initial Pb we divided the signal in 2 integrations to improve the isochrone and to show the influence of downhole fractionation to different integration intervals. To show the influence, we used the online version of IsoplotR and the possibility to correct each analysis for initial Pb by the isochronal method to give individual concordant ages. This method is not tested for validity in the case of carbonate dating and applying this to sample is not recommended. Nevertheless, we can show in Figure 3 that the influence of the selected integration interval (first half versus second half) has no significant influence on the age for the sample JT. For other samples, especially older and with higher U contenet similar as WC-1, we would expect some influence.

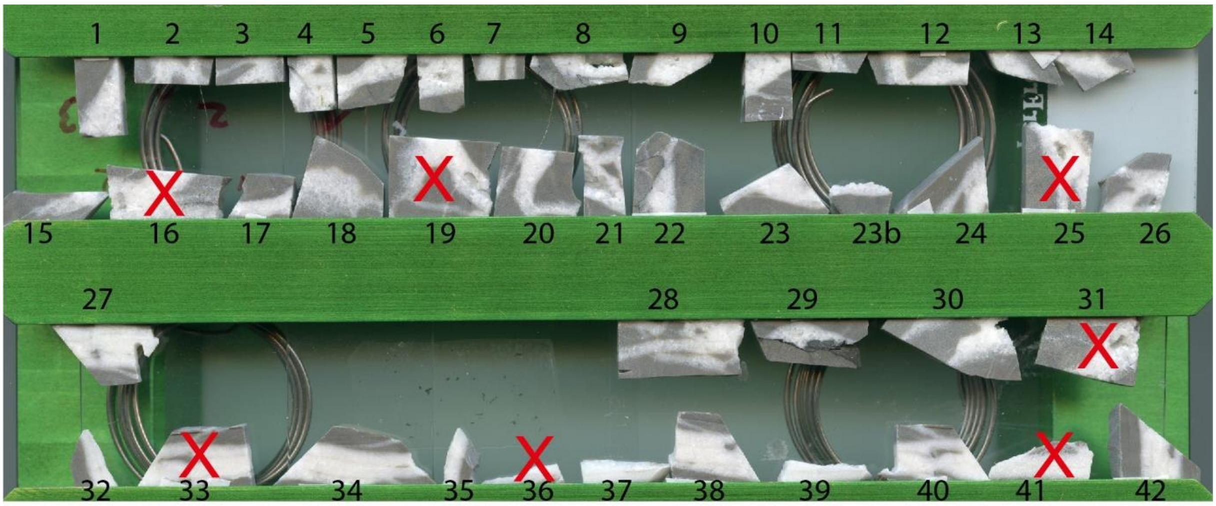

Figure 1: 43 pieces of JT sample analysed each 10 times ready for distribution. The red X indicates high initial Pb or Pb contamination making these pieces

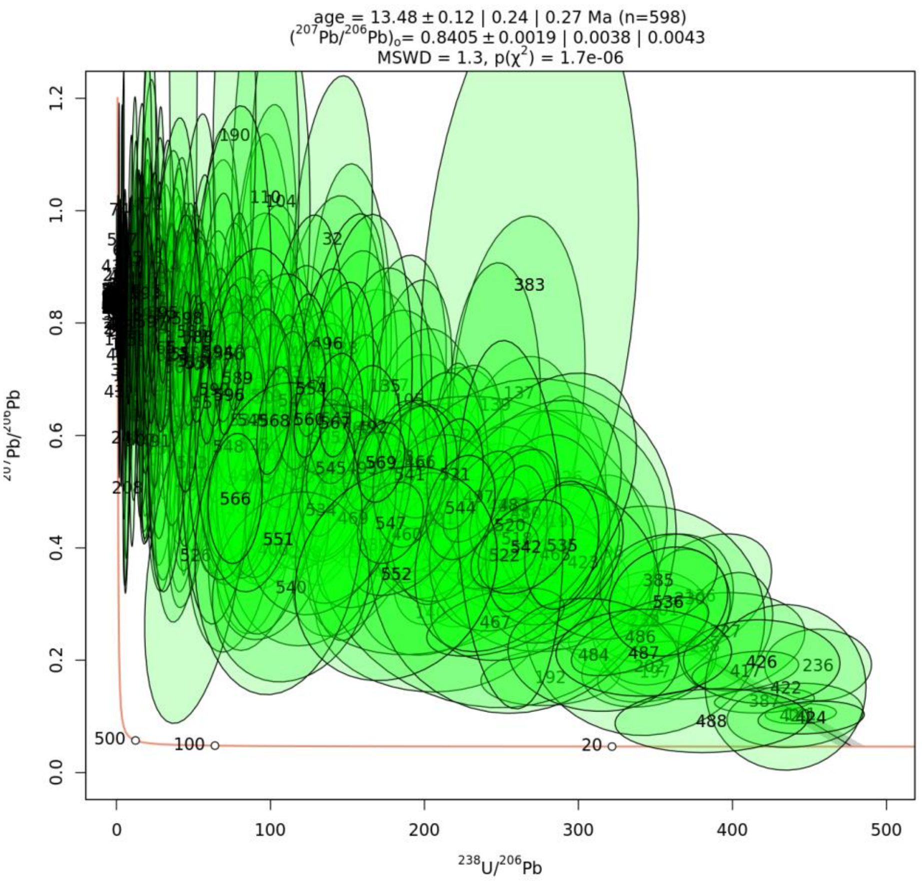

Figure 2: Pooled data of 598 integration intervals within 430 point analyses. No outlier rejected.

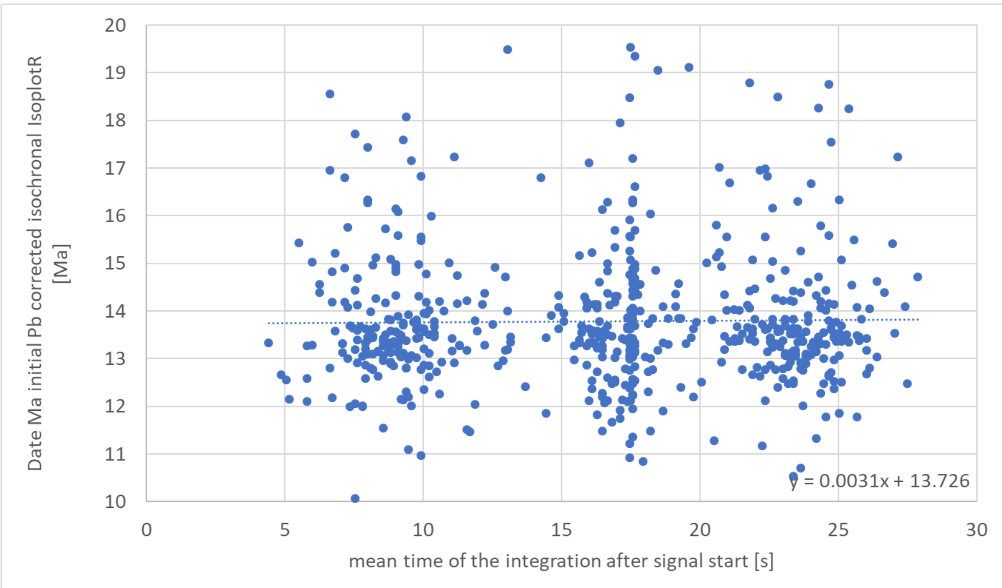

Figure 3: Age of initial Pb corrected data (Isochronal, IsoplotR) of 586 individual integrations in dependence of the integration. The first 4 seconds after laser start was discarded, the overall signal length was 30 seconds, so the whole signal plots at 17, the first half of the signal at 9 the second half of the signal at 24 seconds. Only a very week correlation was found due to downhole fractionation. (the 6 oldest and youngest ages were discarded) Uncertainties were not calculated, the whole common Pb correction is not tested for accuracy but is the only way to actually show the influence of downhole fractionation to the signal.