Reply to Dr. Keppler's Comments

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We thank Dr. Keppler for the constructive comments. The manuscript has been modified following the suggestions. Below is our reply.

p. 4, l. 23: Which other thermobarometer?
[Reply] TitaniQ is a thermobarometer and depends on temperature, pressure and other variables. In order to obtain a single point in the pressure-temperature space, another independent thermometer/barometer/thermobarometer is needed. In this study, we combined TitaniQ with the phengite barometer for P-T estimates of D3.

p. 6, l. 3: Why start with 3d and not 3a? (same with fig. 4)
[Reply] The figures were ordered from deep to shallow structural level in Figs. 3 and 4. However, as suggested by the reviewer in the following comments, we have marked the sample/figure locations on the map in Fig. 2a. So the images in Figs. 3 and 4 have been rearranged following the sequence of their first occurrence in the text.

p. 7, l. 16: "deeper than Iron Fork" is not a very precise location. This is the first time I thought the map would strongly benefit from points with the sample names at their locations. I know the locations are given with coordinates in table S1, but I think the average reader will not have the time to check where in the map the samples are from. Especially in the discussion of the shear senses it is difficult to follow, which location you are talking about. The same happens again later when you write about the PT conditions. So I would recommend putting the sample names at their locations in the map and the sample names in the text for better understanding.
[Reply] Done.

p. 8, l. 25: Are you suggesting shear sense reversal due to annealing?
[Reply] The sense of shear from the quartz c-axis pole figure of PS186 is unclear. The pole figure does not show obvious asymmetry and might have been modified during annealing.

p.9, l. 20: "with the old muscovite grain compositions reported by Jacobson" I suggest: "with the muscovite grain compositions previously reported by Jacobson"
[Reply] Jacobson (1983, 1984) reported two sets of muscovite grains, and interpreted them as old and recrystallized, respectively. The results in this paragraph agree with the muscovite compositions of old grains. So it is revised as "with the compositions of old white mica grains."

p. 10, l. 4-14: This whole section should either be part of the geological overview or the discussion. You make quotations, here, but later discuss this data as if it was part of your results.
[Reply] The content in L. 4-14 section was first introduced in L. 15-20 of P. 3 as an overview. When discussing the timing of deformation of the Pelona schist in this section,

we think it is necessary to summarize the published geochronological data before introducing our detrital zircon fission track results.

p. 11, l. 14-23: Here would be the place to quote the previous studies.
[Reply] Added.

p.12, l. 24-31 + p. 13, l. 1-6: I have worked on subduction channels myself and I had difficulties reconstructing what you are writing based on your data. Originally the subduction zone was dipping E, resulting in a top-E sense of shear in structurally higher levels (e.g. the top part of the exhumational path of the subduction channel in its original position), which would geographically be located in the E. Top-W sense of shear would be found in structurally lower levels (e.g. bottom top part of the exhumational path), which would geographically be located in the W. From the profile in fig. 1, I assume that the subduction channel was overturned at some point since everything is dipping SSW. If the exhumed subduction channel is overturned, there would be a top-E sense of shear in structurally higher levels now located geographically in the W and top-W sense of shear in lower levels, now geographically located in the E. Everything fits, but it is difficult to follow without an illustration (maybe a further step in your fig. 11) and without the sample locations in your map.
[Reply] Yes, we think the subduction zone and the Vincent fault were originally dipping E, and have been rotated and tilted to the west afterwards (but not overturned). Paleomagnetic study of Neogene volcanic rocks in the San Gabriel block bounded by the San Gabriel fault and the San Andreas fault yielded a net clockwise rotation of 37.1 ° ± 12.2 ° since the early Miocene (Terres and Luyendyk, 1985). As a result of this rotation, the dip of the subduction channel was rotated toward SE and the top level of the subduction channel shows top-to-SE sense of shear. May and Walker (1989) argued for a southerly tilting of the San Gabriel Mountains based on biotite K-Ar cooling ages reported by Miller and Morton (1980), and decreases in both the white mica Ar-Ar ages (Grove et al., 2003) and the apatite fission track ages (Blythe et al., 2000) from south to north of the San Gabriel Mountains between the San Gabriel fault and the San Andreas fault support a southerly tilting. The East Fork area lies on the SW-dipping limb of a faulted antiform that was produced during Neogene motion on the San Andreas and Punchbowl faults.

Fig. 2: This map would benefit from contour lines to be able to follow the structures better.
[Reply] A satellite image was used as the base map to show the topography.

Fig. 11: Here a more detailed caption would be helpful and I would also include the last step explaining the current position of the schists.
[Reply] Done.

Table S4: Not knowing this method too well it is difficult to retrace where your results come from with the data shown in the table. There should either be a detailed caption or a better explanation in the methodical part of the MS.
[Reply] Additional text and figure are added accompanying Table S4.

Reference:

Blythe, A. E., Burbank, D. W., Farley, K. A. and Fielding, E. J.: Structural and topographic evolution of the central Transverse Ranges, California, from apatite fission-track, (U-Th)/He and digital elevation model analyses, Basin Research, 12(2), 97–114, doi:10.1046/j.1365-2117.2000.00116.x, 2000.

Grove, M., Jacobson, C. E., Barth, A. P. and Vucic, A.: Temporal and spatial trends of Late Cretaceous–early Tertiary underplating of Pelona and related schist beneath southern California and southwestern Arizona, Geological Society of America Special Paper, 374, 381–406, doi:10.1130/0-8137-2374-4.381, 2003.

Jacobson, C.: Relationship of deformation and metamorphism of the Pelona Schist to movement on the Vincent thrust, San Gabriel Mountains, southern California, American Journal of Science, 283, 587–604, 1983.

Jacobson, C. E.: Petrological evidence for the development of refolded folds during a single deformational event, Journal of Structural Geology, 6(5), 563–570, doi:10.1016/0191-8141(84)90065-8, 1984.

May, D. J. and Walker, N. W.: Late Cretaceous juxtaposition of metamorphic terranes in the southeastern San Gabriel Mountains, California, Geological Society of America Bulletin, 101(October), 1246–1267, doi:10.1130/0016-7606(1989)101<1246:LCJOMT>2.3.CO;2, 1989.

Miller, F. and Morton, D.: Potassium-argon geochronology of the eastern Transverse Ranges and southern Mojave Desert, southern California, Geological Survey Professional Paper, 1152, 1–30, 1980.

Terres, R. R. and Luyendyk, B. P.: Neogene tectonic rotation of the San Gabriel Region, California, suggested by paleomagnetic vectors, Journal of Geophysical Research, 90(B14), 12467–12484, doi:10.1029/JB090iB14p12467, 1985.