*We thank the editor for giving us comments that have helped us better address the reviewers and editors' comments.*

"What should I expect now.... After having gone through your response letter and the revised manuscript, I noted that your detailed responses were not fully incorporated in the revised version, resulting in a slightly modified revised version (this is one of the issues raised by Dr. Laurent). On this regard, I think that commenting further the points raised by Dr. Laurent could reinforce the scientific rationale of your study and robustness of the new approach. Further discussion is needed regarding (i) the peak pressure and (ii) the thermal evolution (i.e. cooling vs. heating exhumation) of the CBU as defined in your study: discussing the limitations and the achievements of the new approach compared to the state-of-the-art. Furthermore, I think your manuscript would benefit of a more extensive discussion in terms of regional implications. I also found section 6.4 not exhaustive and it should be thus expanded more, since, as stated in lines 371-374, your data are relevant to refine the exhumation history and hence the tectonic/geodynamic scenario of the CBU evolution. Your structural and kinematic data should converge in a refined P-T-deformation history for the CBU that is instead just barely discussed."

*We have added 2028 words (previous version = 7465 words, new version = 9493 words) to address the 4 major points brought up by the editor:*

*1) discuss the peak pressures more*
*2) discuss the thermal evolution more (cooling vs heating)*
*3) discuss limitations of elastic thermobarometry*
*4) discuss the tectonic model more*

*1) and 2) are further discussed, and the Gyolami 2021 paper (mentioned by the reviewer) is now discussed in detail (as well as some other Kampos data). 3) We have added a new section (6.4) to discuss the limitations of elastic thermobarometry (over 1 page of discussion) and 4) expanded section 6.5 (exhumation implications) to better describe our tectonic model. Further text/figure modifications were made to address the reviewer's comments.*

*We thank the reviewer for the additional comments that have helped improve this manuscript. We address the reviewer's comments below (italicized). Changes made to the text are in red font.*

"1) Maximum P-T conditions of the CBU

I did insist in my 1st review that pressure results obtained by the authors on garnet crystallization could be interpreted as not representing maximum P conditions as these results match almost perfectly the P conditions reported by Laurent et al. (2018) for their 1st event of garnet crystallization on Syros (16-18 kbar). In their response to my comment, the authors argued that they have several lines of evidence to say that these are the maximum P-T conditions reached by the CBU (note that only a pressure was determined, the maximum temperature is just inferred from previous studies). In my opinion this is a major issue of the present work… In their paper, the authors are presenting and discussing the different thermobarometric estimations previously obtained in the CBU of both Syros and Sifnos islands, opposing the studies yielding ~1.5 – 1.6 GPa to the studies yielding > 1.9 GPa. This is great but it is not enough. The CBU (and more precisely the Upper Cycladic Nappe as described by Grasemann et al. 2018) is observed in other Cycladic islands such as Tinos, Andros, Ios, Sikinos, Milos and even Naxos. And on practically every of these islands, the most recent published articles that have estimated the peak P-T conditions of the CBU yields consistent results > 1.9 GPa (e.g. Lamont et al. 2020 on Tinos; Huet et al. 2015 on Andros; Augier et al. 2014 on Sikinos; Grasemann et al. 2018 on Milos; Peillod et al. 2021 on Naxos; peak P-T conditions are poorly constrained on Ios, see Huet, 2010). Additionally, we can add another new published study on Syros, Gyomlai et al. (2021) (not discussed in the reviewed study as published after re-submission) who found maximum P-T conditions on Syros to be ~2 GPa (I will come back on this study in point 2 as results show a reheating phase at 1.0 – 1.2 GPa that contradicts another conclusion of this work).

*We address this comment in multiple parts:*

***"Missing" high-P rims:*** *We agree with the reviewer that we may have "missed" the high-P rims that the reviewer found in Laurent et al. (2018), and directly stated this in the manuscript:*

*Lines XX – XX: "Sample SY1401 is collected from the same locality as ours (Kalamisia), but our qtz-in-grt results from this study suggest that garnets from this outcrop record the statistically lowest* $P_{trap}$*. It is possible, however, that we did not sample the same rocks as Laurent et al. (2018), or that we have not found or analyzed garnets that record high pressures."*

*To make this more explicit, we now also state this in the opening of section 6.3 (lines 328 – 329):*

*"We herein discuss our qtz-in-grt barometry results as max pressures obtained from our sample suite, but acknowledge that we may have missed high-P rims that have been found in other studies from the CBU on Syros (e.g., Laurent et al., 2018)."*

*We have no argument against "missing" the high-P garnet rims; it's a real possibility. However, despite that it is possible, we have several reasons to think it is not very likely. We have added further text in the manuscript that justifies our interpretation that the garnets in our study are recording peak P conditions (lines 321 – 329):*

*"Several observations support that the qtz-in-grt barometry results record max P conditions of the CBU on Syros: 1) quartz inclusion transects across garnet core-to-rims show no systematic change in $P_{trap}$ (Fig. 6), suggesting that pressures conditions did not change significantly during garnet growth, 2) max pressures from this study are equivalent to qtz-in-grt barometry results from prograde-to-peak eclogites and blueschists (non-retrogressed) from the CBU on Syros (Behr et al., 2018), 3) retrograde ep1 pressures, do not exceed those recorded by qtz-in-grt barometry, and 4) several studies from the CBU have used garnets to constrain max pressures, suggesting that garnets are suitable for constraining maximum pressures (e.g., Laurent et al., 2018; Dragovic et al., 2012, 2015; Groppo et al., 2009)."*

***Retrogressed samples not recording peak conditions:*** *Within line-by-line comments, the reviewer has also commented on our rocks being retrogressed (correctly so and clearly stated in the original text), and therefore do not record maximum P-T conditions. Retrogression should have no effect on the analyzed garnets (and thus pressures), the garnets still record prograde-to-peak metamorphic conditions, even though the matrix is retrogressed. We refer to the data from Behr et al. (2018) or Ashley et al. (2014) for further studies that record the same maximum P conditions from prograde-to-peak blueschists, eclogites, and metasediments (compared in this paper).*

***Pressure comparison with Laurent et al. (2018):*** *We mentioned in the previous replies and in this manuscript that there are significant differences in interpreted results based on application of identical techniques-- garnet modeling-- but conducted by different authors (Laurent et al., 2018; Groppo et al., 2009; Skelton et al., 2018; Dragovic et al., 2012, 2015). Initial garnet growth at ~1.6-1.8 GPa is the result from one of these studies (Laurent et al., 2018), but our work suggests that these seem to be the conditions throughout the duration of garnet growth for the samples we examined (from core-to-rim inclusion transects). Other studies document garnet growth that begins at ~ 1.1 - 1.2 GPa (Skelton et al., 2018). Our results better agree with other garnet modeling results that document near isobaric garnet growth (Groppo et al., 2009; Dragovic et al., 2012, 2015). Albeit, our pressures are statistically lower than the peak pressures from the aforementioned studies (~2.0 – 2.2 GPa). Our results best agree with the thermodynamic modeling results from Skelton et al. (2018) (~1.9 GPa peak pressure from garnet inner rims). This is extensively discussed in section 6.2 (3 pages of discussion).*

***Comparison with CBU rocks from other islands:*** *We had originally focused on comparing reference P-T conditions from the CBU on Syros and Sifnos, because there are reference quartz-in-garnet barometry data from the CBU on Sifnos. Clearly, other studies on other islands have constrained peak P-T conditions that significantly exceed 1.9 GPa (e.g., Tinos: Lamont et al., 2020, max P ≈ 2.3 – 2.6 GPa). We highlight multiple thermodynamic modeling studies from Syros that record P conditions that exceed ~ 1.9 GPa. However, previous studies from the CBU (from the same island and different islands), significantly disagree. In this case, we think a detailed comparison of all data from other islands is beyond the scope of this manuscript. We provided a detailed comparison (6 pages of discussion) for the CBU on Syros (and some Sifnos data) to show how thermodynamic modeling, phase stability constraints, and elastic thermobarometry results all suggest different max P conditions. We believe that this is the most important comparison for the work from this study. In general, phase stability and elastic thermobarometry constraints generally* *agree, and agree with the lower P estimates from thermodynamic modeling, but disagree with the higher P estimates for the CBU on Syros (max P ≈ 2.2 ± 0.2 GPa, Laurent et al. 2018). There are many complications with discussing the CBU in all of the islands in detail; e.g., the reviewer mentions above that Huet et al. (2015) found high-P conditions (> 1.9 GPa) on Andros. However, high-P conditions have never been accurately estimated on Andros (Huet et al. 2015). Huet et al. (2015) constrain maximum P conditions of ~ 1.5 GPa, and used the P conditions from neighboring islands (i.e., Tinos), to suggest that high-P conditions were found on Andros.*

*Huet et al., (2015): "**a. The P-T-t path of the Attic–Cycladic Blueschist unit on Andros** Since more information about the P-T-t evolution of the Attic–Cycladic Blueschist unit is available, it is discussed first. The available peak P-T conditions for this unit are 450–500 °C and minimum pressure of 10 kbar (Reinecke, 1986). Following Bröcker & Franz (2006), **we use peak data from Tinos island – 500– 520 °C and 16–18 kbar (Parra, Vidal & Jolivet, 2002)** – which is compatible with the wider peak range of 450–550 °C and 12–20 kbar (Fig. 7a) determined by Bröcker (1990)."*

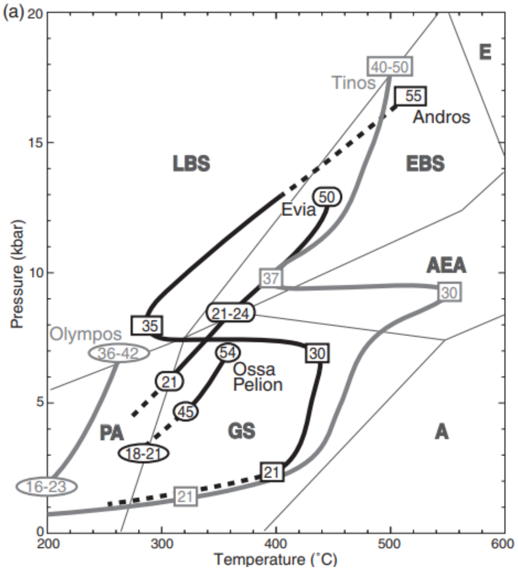


*Figure 8 Huet et al., (2015): the dashed line indicates that peak P-T conditions are inferred.*

*We think discussing other island CBU constraints in the same detail as done for the CBU on Syros, would be too much auxiliary information. We have nonetheless added a description of results from previous studies on other islands in the manuscript (lines 79 –85):*

*"Previous studies have reported a wide range of maximum P-T conditions for rocks from the Upper Cycladic Blueschist Nappe on different Cycladic islands [Sifnos: ~1.4 – 2.2 GPa and 450 – 550 °C (e.g., Schmädicke and Will, 2003; Groppo et al., 2009; Dragovic et al., 2012, 2015; Schliestedt and Matthews, 1987; Matthews and Schliestedt, 1984; Ashley et al., 2014; Spear et al., 2006); Tinos: ~1.4 – 2.6 GPa and ~450 – 550 °C (e.g., Bröcker et al., 1993; Lamont et al., 2020; Parra et al., 2002); Naxos: ~1.2 – 2.0 GPa and ~450 – 600 °C (e.g., Avigad, 1998; Peillod et al., 2017, 2021); Sikinos: ~1.1 – 1.7 GPa and ~ 500 °C (e.g., Augier et al., 2015; Gupta and Bickle, 2004)]."*

***Data from Gyomlai et al. (2021):*** *The reviewer mentions:*

“Additionally, we can add another new published study on Syros, Gyomlai et al. (2021) (not discussed in the reviewed study as published after re-submission) who found maximum P-T conditions on Syros to be ~2 GPa”

*We discuss the peak and retrograde data from Gyomlai et al., 2021 in more detail because the data are from the CBU on Syros (lines 417 – 433). We had not focused on describing studies from Kampos; we now include results from other studies on Kampos as well. Gyomlai et al. (2021) report a pressure value for one sample, in passing, of 1.9 ± 1.99 GPa (the absolute error is technically within error of our P estimates), but the large error (± 1.99 GPa), means that this value is not valid, a point the authors of that paper fully acknowledge:*

*Gyomlai et al. (2021): “Matrix sample L_p135 (L transect): the metasomatic assemblage of Ca-amphibole ($Na_{0.438}\ Ca_{1.545}\ Mg_{4.120}\ Fe2+_{0.561}\ Fe3+_{0.206}\ Mn_{0.016}\ K_{0.019}\ Al_{0.285}\ Si_{7.890}\ O_{22}\ (OH)_{2}$), chlorite ($Mg_{4.153}\ Fe2+_{0.838}\ Mn_{0.009}\ Al_{1.912}\ Si_{3.063}\ O_{10}\ (OH)_{8}$) and talc ($Mg_{2.794}\ Fe2+_{0.138}\ Si_{4.030}\ O_{10}\ (OH)_{2}$)* ***is unconstrained for pressure (1.90 ± 1.99 GPa) but yield temperatures of 561 ± 78 °C****.”*

There is also a sentence in the response to my comments that worries me… The authors says ‘However, we consider it more likely that different techniques are recording different pressures’. What does that mean? Different thermobarometric techniques yield to different maximum P-T conditions for the same rocks? But in this case, it also means that some of these techniques can’t be used to retrieve maximum P-T conditions in these rocks. And in this case, should we better trust ‘conventional thermobarometry’ as stated by the authors, a technique that have proved to be reliable in every HP-LT belt observed all over the world, or the relatively new technique used by the authors in this study? Perhaps, the question that should be treated in this paper is more: why is the elastic thermobarometry technique yielding to lower P-T conditions than more conventional thermobarometry? Note that Peillod et al. (2021) used the Qtz-in-Grt technique in rocks of the CBU in Naxos and find maximum pressures of ~ 2 GPa.

*We do suggest that different techniques/methods are resulting in different pressures for the CBU. This is simply what the data show. This is by no means a new observation-- disagreements over pressure-temperature estimates from different techniques are all over the literature from every orogen. These disagreements are what fuel further study and encourage new approaches and comparisons between approaches, as we have done here. Specifically for the CBU, the thermodynamic modeling technique in particular also indicates higher pressures on other Cycladic islands, in comparison to other techniques. E.g., max P conditions from Tinos vary significantly. Lamont et al. (2020) used thermodynamic modeling, and constrain a max P up to ~2.3 - 2.6 GPa. Parra et al. (2002) used chlorite thermobarometry, and constrain a max P of ~ 1.8 GPa, and Bröcker et al. (1993) used more qualitative constraints (jadeite content in pyroxene and Si-in-phengite), and estimate minimum pressures of ~ 1.5 GPa.*

*In regards to max pressures from thermodynamic modeling vs elastic thermobarometry for the CBU on Syros, the max pressures from quartz-in-garnet barometry tend to be lower than the absolute values from thermodynamic modeling. Thermodynamic modeling has certainly been used* *globally, but the more appropriate question is whether the determined P-T conditions are accurate. We do not have a definite answer for which technique provides the accurate pressures, but we have interpreted our results with the support from external constraints (e.g., rock mineralogy, phase stabilities, equilibria reactions), since pressure-temperatures results should be consistent with basic field and petrographic observations. Discrepancies between techniques is a common problem, e.g., see discrepancy in results between graphite thermometry (Laurent et al., 2018) and Zr-in-rutile thermometry (e.g., Spear et al., 2006) for max T of the CBU. We agree, some techniques are clearly not providing the correct results; however, it is difficult to state which technique is providing more accurate results. Recent experiments have shown that quartz-in-garnet barometry can provide accurate pressures (± 0.1 – 0.2 GPa), when strain is purely elastic (Thomas and Spear, 2018), and we believe that the garnet grains from Syros have only experienced elastic relaxation due to the low maximum temperatures reached by these rocks, and the petrography of the rocks. Garnet flow laws predict that viscous strain of garnet won't occur below ~ 650 °C at geologic strain rates (Wang and Ji, 1999; Ji and Martignole, 1994). In this sense, many recent studies have started to use elastic thermobarometry as the more accurate barometer, due to the sensitivity of thermodynamic modeling to many input components, and potential overstepping of metamorphic reactions. The debate about which technique is providing the accurate pressures, is a very active debate (e.g., see Wolfe and Spear, 2018; Spear and Pattison, 2017). The quartz-in-garnet barometry data could absolutely be incorrect; however, we currently don't have a good explanation for why it would be incorrect. We have added a new section (section 6.4, lines 468 - 511) that explains possible sources of error with elastic thermobarometry results.*

Lines 86-87 the authors write 'The range of previous P-T conditions reflects the lack of comprehensive studies that combine structural geology, petrology, and thermobarometry across the CBU'. I already told the authors that they can't say a statement like that. The CBU is one of the best studied HP-LT belts worldwide for 40-50 years now. In the literature, there are a multitude of research groups and studies that have combined structural geology, petrology and thermobarometry in the CBU at a level of integration that is far more advanced than in this study (e.g. Ring's group; Grasemann's group; Jolivet's group; Lister's group; and so many others...). I personally dedicated most of my PhD thesis on determining the tectonometamorphic history of the CBU by coupling and integrating structural geology (Laurent et al., 2016; Roche et al., 2016), thermobarometry (Laurent et al., 2018) and geochronology (Laurent et al. 2017) with more than 8 months spent at studying in the field the CBU on Syros, Sifnos, Tinos and Ios. So no, the range of previous P-T conditions doesn't reflect the lack of comprehensive studies that combine structural geology, petrology and thermobarometry across the CBU. Such P-T range is observed in the literature of most HP-LT belts across the world and is just the result of the numerous different research groups that have studied these rocks since decades. It is important to note that the implications of the results of this study on the tectonometamorphic history and exhumation model of the CBU is not really clear (see my points 2 and 3 below)."

*This is a fair point. We did not intend to say that no studies have combined structural geology, petrology, and P-T constraints. Clearly several have. We have removed this sentence to avoid confusion.*

2) Results of this study show cooling during exhumation and do not support a phase of reheating at 10-12 kbar.

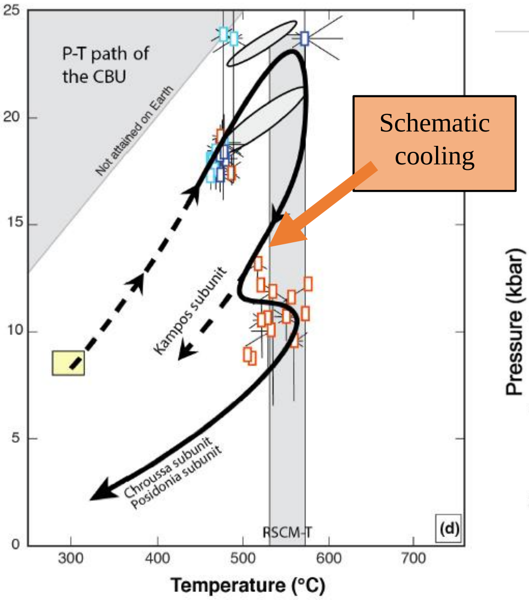
Another main conclusion of this work is that the P-T path obtained for the CBU on Syros show a constant cooling during retrogression, from peak to greenschist-facies P-T conditions. While I quite agree with that, I am not really sure that the data obtained in this study are sufficient to make such conclusion. The authors make it clear in their paper that the entrapment temperature (Ttrap) of quartz inclusions in garnet (garnet growth temperature) is estimated at 500-550°C based on good agreement between previous studies on the maximum temperature reached by CBU rocks from Syros. Ttrap for the ep2 population is deduced from oxygen isotope thermometry of quartz-calcite boudin-neck precipitates (411 ± 23°C). However, Ttrap for the ep1 population is not constrained (in this study or any previously published studies) and estimated as being intermediate between garnet and ep2 growth (~400-500 °C). This last hypothesis means that the P-T path can't show anything else than constant cooling during exhumation. Trotet et al. (or anyone else) could legitimately argue that if you consider a Ttrap of 500-550 ˚C for Ep1 (as this is not constrained in the study), your P-T path would show a 1st event of isothermal exhumation from peak P-T conditions to blueschist facies conditions and then a 2nd phase of cooling from blueschist to greenschist facies conditions (something really similar to what Trotet et al., 2001 proposed). In summary, what I want to highlight here is that the conclusion that the P-T path proposed in this study shows constant cooling during exhumation is only based on the unconstrained assumption of Ttrap for Ep1 that can't yield to another result.

*We have petrologic and tectonic reasons for not considering isothermal decompression during the early stages of exhumation (between 500-550 °C and ~411 °C), and especially the lack of evidence for reheating. Petrological: Isothermal decompression can be argued for, but that would lead to some interesting petrologic consequences for rocks from Syros, Greece. These rocks would then cross the lawsonite --> kyanite + zoisite reaction (terminal retrograde lawsonite-out reaction), but kyanite has not been found on Syros. A second petrologic reason, is that there is no evidence of mineralogy that suggests isothermal decompression, or transition to a stability field where biotite would be stable. Amphibole zonations (magnesio-riebeckite ▯winchite ▯actinolite) also indicate that the rocks underwent cooling during decompression (c.f., Kotowski et al., in review); high-temperature amphibole compositions have not been found on Syros (e.g., pargasite/hornblende). Tectonic: Cooling during decompression would be achieved due to convective heat transfer from the exhuming rocks (CBU on Syros) into the cooler, subducting lithosphere. This would be consistent with subduction channel exhumation, but isothermal decompression would be much more difficult to explain within a subduction channel. Adding isothermal decompression to the even earlier P-T path, would be altering the data to show something that the data simply does not support. Furthermore, explaining significant cooling at mid-crustal depths (after isothermal decompression), is challenging. We have now described evidence for why we don't think isothermal decompression is appropriate (lines 439 – 447):*

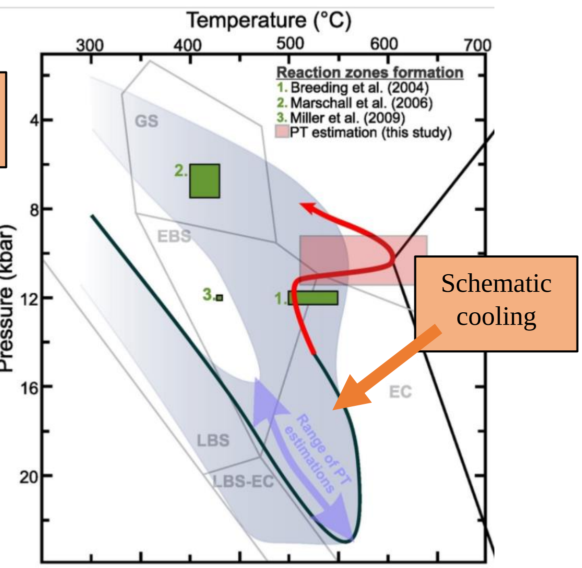
*"We do not have a temperature constraint for the ep1 population; however, we consider cooling during decompression from garnet growth (~500 – 550 °C) to ep2 growth (~400 °C), to be the most likely P-T path for CBU rocks from Syros. Isothermal decompression from ~1.8 GPa and*

*~500 – 550 °C to ~ 1.0 GPa, would lead to terminal lawsonite breakdown above ~ 450 °C and produce kyanite + zoisite (Hamelin et al., 2018; Schumacher et al., 2008); however, kyanite has not been found on Syros, therefore requiring temperatures below ~450 °C at ~ 1.0 GPa. It is possible that sluggish kinetics did not lead to lawsonite breakdown, but given the prevalent evidence of retrograde deformation on Syros and the extensive presence of retrograde overprinting/mineral growth, we consider kinetic-limitations to be unlikely. Furthermore, the chemical evolution of amphiboles (magnesio-riebeckite winchite actinolite) suggests that CBU rocks from Syros followed a cold P-T path during decompression (c.f., Kotowski et al., 2020).”*

*We remind the reviewer that previous studies have imposed cooling during decompression during initial CBU exhumation (Laurent et al., 2018; Gyomlai et al., 2021), but there was actually no data from those studies that pinned cooling during decompression. Cooling during decompression was schematically imposed, because it was the tectonic model that the authors preferred. We show the data from previous studies below:*



*Laurent et al. (2018): Figure 17d*



*Gyomlai et al. (2021): Figure 16*

*Our data does show the initial cooling during decompression, but does not support re-heating at ~ 1.0 GPa.*

My second comment is that this study claims their results don’t support the reheating phase at 10-12 kbar and from ~500 to 550˚C proposed by Laurent et al. (2018). I did insist in my 1st review that for me, the results of this study don’t contradict the existence of this reheating phase but rather add more constrains on the greenschist P-T conditions during exhumation. The authors of this study completely have the right to disagree with what Laurent et al. (2018) proposed (even more considering that this is shows by only 1 garnet). However, I would like to highlight that a newly published study (published after the resubmission of this study – Gyomlai et al. 2021 in Lithos) has determined exactly the same reheating phase after looking to fluid-rock interactions and metasomatism in the northern block-in-matrix structures on Syros. A difference is that they were able to constrain this reheating phase from rocks located at the top of the CBU on Syros, implying that all subunits of the CBU has undergone this reheating phase. As mentioned in my previous review, this reheating phase has already been described in the CBU of Tinos and Andros and has also recently been shown in the CBU of Naxos (Peillod et al., 2021). So here again, I think that if we consider the previously published studies in different Cycladic islands where the CBU is observed (and again some very recently published studies that the authors can't have considered as published after re-submission), it seems that there are various pieces of evidence suggesting the existence of this reheating phase, contradicting one of the main conclusion of this study.

*We remain unsure about how to address this comment. The absolute temperatures from our quartz-calcite boudin data (stable isotope thermometry) in this work simply does not indicate reheating. Clearly, multiple previous studies from the CBU on Syros have constrained different exhumation P-T paths; however, most suggest cooling during decompression (Miller et al., 2009; Marschall, 2006; Trotet et al., 2001; Hamelin et al., 2018), or isothermal decompression (Trotet et al., 2001; Breeding et al., 2004). Gyomlai et al. (2021) is the second study to propose reheating in the CBU on Syros, but it is unclear if their data support reheating. Gyomlai et al., (2021) estimate max T to be 561 ± 78 °C (no pressure constraint), and two retrograde pressure-temperature conditions for the proposed re-heating event at ~ 1.0 GPa: 1.02 ± 0.15 GPa and 505 ± 155 °C, and 1.03 ± 0.11 GPa and 653 ± 27 °C. The retrograde pressures are reasonable (~1.0 GPa with small errors), but the max temperatures have some issues that the authors themselves discuss in the manuscript. The main issue is the T constraint above ~ 600 °C, which would lead to serpentine breakdown across the island of Syros (Guillot et al., 2015; Wunder and Schreyer, 1997); because this result conflicts with the basic observation of serpentinite stability on Syros, the authors disregard this temperature estimate. Furthermore, terminal lawsonite breakdown (retrograde lawsonite-out reaction) should be expected above ~ 450 °C at ~ 1.0 GPa (Schumacher et al., 2008; Hamelin et al., 2018), something we now further discuss in the manuscript (lines 439 – 447). The authors are left with a rather uncertain temperature estimate, therefore, of 505 ± 155 °C, which means the temperature could have been as low as 350 °C, or as high as 660 °C. At a T > ~500 °C and ~ 1.0 GPa, we should also be observing biotite across Syros, but biotite has never been found. The authors used the absolute value of 505 °C, to suggest that heating occurred at ~1.0 GPa between 500 – 600 °C (below serpentine breakdown). The absolute temperatures of the data can be treated as being correct, but the error bars cannot simply be ignored, along with supplementary petrologic constraints. These data could also be interpreted as linear cooling during decompression down to ~350° C at 1.0 GPa, isothermal decompression, or re-heating. The point being, it is impossible to differentiate between those different possibilities from the presented data. Results from Gyomlai et al. (2021) are now further discussed on lines 417 – 433:*

*"Gyomlai et al. (2021) estimate max and retrograde P-T conditions, but from metasomatic rocks from the Kampos belt in northern Syros. The authors estimate maximum* T *conditions of 561 ± 78 °C, and two retrograde pressure-temperature conditions: 1.02 ± 0.15 GPa and 505 ± 155 °C, and 1.03 ± 0.11 GPa and 653 ± 27 °C. The retrograde pressures are reasonable (~1.0 ± 0.1 - 0.2 GPa), but the max temperatures raise questions that the authors discuss. Specifically, temperatures above ~600 °C (at ~1.0 GPa) would lead to serpentine breakdown (Guillot et al., 2015; Wunder*

*and Schreyer, 1997); however, serpentine is abundant across Syros. The authors used the 505 ± 155 °C temperature constraint, and a temperature below 600 °C, to suggest their studied rocks reached temperatures between 500 – 600 °C at ~ 1.0 GPa. Several other studies on retrograde metasomatic rocks from Kampos constrain P-T conditions: ~1.17 – 1.23 GPa and 500 – 550 °C (Breeding et al., 2004), ~ 0.60 – 0.75 GPa and 400 – 430 °C (Marschall et al., 2006), and ~ 1.20 GPa and 430 °C (Miller et al., 2009). Breeding et al. (2004) did not constrain a temperature, but used an estimated temperature from Trotet et al. (2001a), and constrained a pressure of ~1.17 – 1.23 GPa at the estimated T of ~500 – 550 °C) using Thermocalc V. 3.2. Marschall et al. (2006) used the garnet-clinopyroxene thermometer and Thermocalc V. 3.01 to calculate temperatures, and estimated a pressure based on jadeite +* $SiO_2$ *□ albite reaction. Miller et al. (2009) used Perple_X and the thermodynamic database of Holland and Powell (1998) to calculate P-T conditions from reaction zones. In general, most studies indicate cooling during decompression for metasomatic rocks from Kampos, with the exception of interpretations by Gyomlai et al. (2021); however, the large uncertainty in their temperature estimate (505 ± 155 °C) makes it difficult to differentiate between cooling during decompression, isothermal decompression, or re-heating."*

*We don't have an issue with the heating event on places like Naxos, which is next to a migmatite dome, and where biotite is prevalent (and other islands adjacent to large-scale detachment systems, where biotite is also found). We reiterate, that if the above temperatures were reached by rocks from Syros, biotite and/or pargasite/hornblende should be common across the island, but these phases have never been observed (we have also searched). Furthermore, the presence of lawsonite pseudomorphs and absence of kyanite suggests that temperatures did not exceed ~ 450 °C at ~ 1 GPa (Schumacher et al., 2008; Hamelin et al., 2018). These conditions would all verge into lawsonite-absent fields, where lawsonite would break down to kyanite + zoisite. It is possible that sluggish kinetics did not lead to lawsonite breakdown, but given the prevalent evidence of retrograde deformation on Syros and the extensive presence of retrograde overprinting/mineral growth, we consider kinetically-limited breakdown to be unlikely.*

3) Implications of the results on the tectonometamorphic history and exhumation model of the CBU.

Last thing I would like to highlight is about one of the promises of this study, which was to provide a 'more robust' P-T-D path 'than what is commonly possible with conventional thermobarometry' (as this is important to determine the tectonometamorphic history of the CBU and exhumation mechanisms). In my opinion the present study doesn't propose a more robust P-T-D path for reasons exposed above and hereafter. The P-T-D path presented in Figure 7 is mostly incomplete, with only the Dt2 deformation event being shown. What about the other fabrics described in this study? And more importantly, what about the numerous previously published structural studies on the CBU of Syros, Sifnos and the other Cycladic units? There is no discussion of the previously published P-T-D path in the CBU. As actually written, it is practically impossible to understand the view of the authors about the full tectonometamorphic evolution of the CBU.

*We have added further information on the relationship between deformation, mineral growth, and P-T conditions to figure 7. This is also now further discussed in sections 6.4 and 6.5. Initially, we only labelled Dt2 because ep2 is the only mineral for which we know the P-T conditions and can relate it to a distinct stage of mineral growth (Dt2). Ep1 grows transitionally during Dt1-Dt2, and the exact stage of epidote (and when it grows relative to these stages of deformation), is much more difficult to reconcile. The stage of garnet growth (relative to deformation) is also difficult to reconcile, and does not represent a distinct point in P-T space (grows during Ds and Dr). Previous P-T paths from the CBU (Syros) are extensively discussed in sections 6.1 - 6.3.*

The short section (Section 6.4) on the implications for exhumation mechanisms where an exhumation model of the CBU is proposed is not enough detailed in my opinion. Be more specific on what is exactly the input of your study on the tectonometamorphic history and the exhumation model of the CBU? When do you think exactly there is a rotation from N-S to E-W stretching lineations (after peak metam or later during exhumation?) and make it clear how your data support this model (actually I don't see any measurements of N-S stretching lineations in your Fig. 1). Should we understand that, in your opinion, there is no record of deformation acquired during back-arc setting in Syros? You presented different exhumation models (e.g. subduction channel vs. extrusion wedge models) in the geological setting and it would be great to come back on this here. Why do you prefer the subduction channel model compare to other models? Perhaps illustrating your exhumation model would help. I think that this section should be entirely redrawn and further developed to clearly expose the implications of the results on the tectonometamorphic history of the CBU.

*We agree with the reviewer that more information can be added for the tectonic model in this manuscript. This section was originally short, to leave the tectonic model for the manuscript of Kotowski et al. (in review). We have added more information to section 6.5 (previously 6.4) to further discuss the tectonic model. Several comments mentioned above, were previously discussed, e.g.,*

*When does rotation from N-S to E-W lineations occur (lines 516 – 531): "This would suggest that exhumation was achieved parallel to the subducting plate, in a subduction channel geometry prior to core-complex formation. During this phase of exhumation, CBU rocks remained within a cold forearc until they reached the mid-crust (~1.0 GPa), and exhibit a progressive change in kinematics, from N-S stretching lineations during subduction (e.g., Behr et al., 2018; Laurent et al., 2016; Philippon et al., 2011), to lineations that swing towards the E-W during exhumation (c.f., Kotowski and Behr, 2019; Laurent et al., 2016)."*

*Should we understand that Syros does not record deformation in a back-arc setting? (lines 535 – 549): "The inferred P-T conditions and kinematics of our studied samples are consistent with Syros recording early deformation and metamorphism within a forearc setting, whereas adjacent Cycladic islands that border the North and West Cycladic Detachment Systems record late-stage kinematics and greenschist facies metamorphism that capture the CBU transition to a warmer back-arc setting (e.g., Laurent et al., 2016; Ring et al., 2020; Roche et al., 2016; Schmädicke and Will, 2003)."*

*We have added additional information to the two above comments, but in short: yes, we do not think Syros records significant back-arc deformation. Clearly, some back-arc deformation does occur locally in the footwall of the Vari detachment. But the deformation in the footwall of the Vari detachment is significantly more localized in comparison to deformation in the footwall of large-scale detachment systems (e.g., Jolivet et al., 2010; Grasemann et al., 2012; Lamont et al., 2020; Soukis and Stockli, 2013). The reviewer is also correct, no prograde lineations were measured for this study; we are referring to prograde lineations documented in previous studies (Behr et al., 2018; Philippon et al., 2011; Laurent et al., 2016).*

**Line-by-line comments:**

Line 48: not only retrograde.

*Extracting retrograde P-T conditions was the focus of this manuscript (see abstract), but some prograde-to-peak conditions were also constrained. This has been added (lines 47-49):*

*"The purpose of this study is to illustrate the potential of using elastic thermobarometry in combination with structural and microstructural observations, to better understand the P-T-deformation (D) conditions of prograde-to-peak and retrograde mineral growth in subduction-related HP/LT metamorphic rocks."*

Lines 55-56: sorry but I quite disagree. For me your P-T path is not as robust as the ones proposed in previously published works (see my main review report).

*We don't necessarily understand why not, but we can agree to disagree. Each mineral we analyzed had microstructural and structural context, and we could distinguish distinct stages of mineral growth. This sub-sentence ("is more robust than what is commonly possible with conventional thermobarometry"), referred to being able to extract quantitative P-T information from outcrop and microstructurally constrained single mineral growth. Something that usually requires 2 or more minerals in equilibrium with conventional thermobarometry (e.g., our quartz-calcite stable isotope thermometry).*

*However, we have rephrased this to read (lines 54-55):*

*"The results demonstrate that combining qtz-in-ep barometry with careful structural and microstructural observations allows us to delineate a retrograde P-T-D path that is contextually constrained, and provide new insights into the exhumation history of the CBU on Syros, Greece."*

Lines 77-79: Please, be more precise here. In this study they find that maximum P-T conditions of the Upper Cycladic Nappe is ~19.5 kbar at 550˚C.

*This has been changed to read ~2.0 GPa at 550 °C, for the Upper Cycladic Nappe (lines 77 – 79):*

*"The CBU has been separated into the "Upper Cycladic Blueschist Nappe" and the "Lower Cycladic Blueschist Nappe" on Milos Island; the Upper Nappe records peak pressure conditions above ~0.8 GPa (~2.0 GPa and 550 °C; Grasemann et al., 2018)."*

Lines 79 – 83: It is really important to consider works that have been done in the CBU of different Cycladic islands (and more specifically in the Upper Cycladic Nappe as defined by Grasemann et al., 2018). And if you look at the scale of the CBU, there is now a clear consensus that maximum P-T conditions in the CBU is around 2.0 ± 0.2 GPa (see my main review report). Since this study has been resubmitted, at least 2 new studies found maximum P-T conditions around ~2 GPa (one on Syros: Gyomlai et al. 2021; one on Naxos: Peillod et al. 2021). The real question that should be treated in this paper is more: why is the elastic thermobarometry technique yielding to lower P-T conditions? Note that Peillod et al. (2021) used the Qtz-in-Grt technique and find pressures of ~ 2 GPa.

*We agree, it is important to consider all of the islands discussed above; however, the focus of this manuscript is the CBU on Syros. However, as discussed in the manuscript and the above comments, thermodynamic modeling has produced the highest P results in the Cyclades, and most other techniques provide lower P results. We discuss previous P-T constraints from the CBU on Syros in detail (6 pages of discussion) for this purpose. We remind the reviewer that our results are actually in fairly good agreement with 2.0 ± 0.2 GPa, our maximum P is ~1.8 ± 0.2 GPa (2 σ). Our results just don't agree with results that significantly exceed 2.0 GPa. Previous studies (e.g., Laurent et al., 2018), constrain a best-estimate of max P of 2.2 ± 0.2 GPa, but extend their max P estimate to ~ 2.4 GPa.*

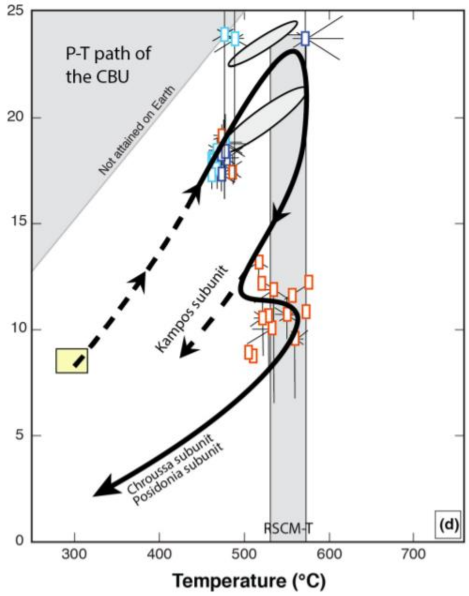


*Figure 17d: Laurent et al. (2018)*

*We have also added a full section that discusses the limitations of elastic thermobarometry, and the pressure estimates from this study (section 6.4).*

Lines 86 – 87: Again, for me you can't say that. The CBU is one of the best studied HP-LT belt worldwide since 40-50 years now. In the literature, there are a multitude of research groups and studies that have combined structural geology, petrology and thermobarometry in the CBU at a level of integration that is better than in this study (e.g. Ring group; Grasemann group; Jolivet group; Lister group; and so many others...). There is another thing that concern me... The detailed structural study that these authors are referring to in their response to my comments is a study that has not been published yet (Kotowski et al.).

*This is a very fair point. The CBU is very well studied. We didn't mean to suggest that other studies have not done a great job; there are many excellent previous studies. We just meant to state that there are few studies from the CBU on Syros that combine structures, petrology, P-T, and timing constraints, all in one study (the reviewer's own work being an exception). We have removed this sentence to avoid this confusion.*

Lines 93-94: One of the main goal of this study is to try to determine maximum P-T conditions in the CBU. I wonder why the authors have not analysed any non-deformed eclogitic sample with unretromorphosed HP-LT parageneses (from the northern part of Syros for example) which seems to be the ideal candidate to retrieve maximum P-T conditions.

*The focus of this manuscript was to primarily address the retrograde P-T path, hence we focused on retrograde rocks. For further elastic thermobarometry constraints from prograde-to-peak rocks from Syros, we refer to the data from Behr et al. (2018), which comes from prograde-to-peak blueschists and eclogites. There is no difference in max P. The garnets record the max P conditions; the amount of retrogression does not affect the pressures (as long as the garnet has survived retrogression). The prograde-to-peak data from Behr et al. (2018) is now explicitly mentioned (lines 321-329):*

*"Several observations support that the qtz-in-grt barometry results, record max P conditions of the CBU on Syros: 1) quartz inclusion measurements across core-to-rims of garnets that show prograde growth (decreasing Mn), show no systematic change in $P_{trap}$ (Fig. 6), 2) max pressures from this study are equivalent to qtz-in-grt barometry results from prograde-to-peak eclogites and blueschists (non-retrogressed) from the CBU on Syros (Behr et al., 2018), 3) retrograde ep1 pressures, do not exceed those recorded by qtz-in-grt barometry, and 4) several studies from the CBU have used garnets to constrain max pressures, suggesting that garnets are suitable for constraining maximum pressures (e.g., Laurent et al., 2018; Dragovic et al., 2012, 2015; Groppo et al., 2009). We herein discuss our qtz-in-grt barometry results as max pressures constraints, but acknowledge that we may have missed high-P rims that have been found in other studies from the CBU on Syros (e.g., Laurent et al., 2018)."*

Line 262: Section 3 should be considered in your Results section (see previous comment). Or at least rename your section 5. as 'Thermobarometry results'.

*We have renamed this section to "thermobarometry results".*

Lines 360: Effectively our sample SY-14-01 is a poorly deformed unretromorphosed eclogite while your sample collected in Kalamisia is described as a retrograde blueschist (Section 3). So clearly, you have not sampled the same rock.

*This is correct, our sample is a retrogressed eclogite (now blueschist), and sample SY-14-01 from Laurent et al. (2018) is a near pristine eclogite. Both eclogites could still be from the same eclogite* *body (Kalamisia appears structurally coherent), but exhibited different degrees of retrogression. However, this retrogression has no effect on the quartz-in-garnet pressures.*

Lines 362-367: What is the point here? If it has been shown that kyanite is not expected in the CBU of Syros what is the interest of saying that?

*This has been shown for one eclogite composition from an outcrop that is not extensively discussed in this manuscript (Fabrikas). This does not exclude the possible presence of kyanite in other eclogites from the CBU on Syros. Eclogites from other outcrops (e.g., Kini, Kampos, Kalamisia), likely have very different compositions. The eclogites (e.g., Kini, Kampos, Kalamisia) are derived from metabasic protoliths that likely formed in an ocean basin, whereas the protoliths of eclogites from Fabrikas (extremely intermixed with sediments), may represent from shallow intrusion during Cretaceous rifting (or older mafic rocks related to Triassic rifting).*

Lines 409 – 412: There is now a new recent study on Syros that has find exactly the same reheating phase after looking to fluid-rock interactions and metasomatism in the northern block-in-matrix structures (Gyomlai et al. 2021). Please discuss. A difference is that they were able to constrain this reheating phase from rocks located at the top of the CBU on Syros, implying that all the CBU has undergone this phase.

*Different studies have proposed different cooling paths for the CBU on Syros. Most studies propose cooling during decompression (Schumacher et al., 2008; Hamelin et al., 2018; Marschall, 2006; Miller et al., 2009; Trotet et al., 2001) or isothermal decompression (Trotet et al., 2001; Breeding et al., 2004). Two studies now report a heating excursion at ~ 1.0 GPa (Gyomlai et al., 2021; Laurent et al., 2016). Results from Gyomlai et al. (2021) are now further discussed on lines 417 – 433:*

*"Gyomlai et al. (2021) estimate max and retrograde P-T conditions, but from metasomatic rocks from the Kampos belt in northern Syros. The authors estimated maximum T conditions of 561 ± 78 °C, and two retrograde pressure-temperature conditions: 1.02 ± 0.15 GPa and 505 ± 155 °C, and 1.03 ± 0.11 GPa and 653 ± 27 °C. The retrograde pressures are reasonable (~1.0 ± 0.1 - 0.2 GPa), but the max temperatures raise questions that the authors discuss. Specifically, temperatures above ~600 °C (at ~1.0 GPa) would lead to serpentine breakdown (Guillot et al., 2015; Wunder and Schreyer, 1997); however, serpentine is abundant across Syros. The authors used the 505 ± 155 °C temperature constraint, and a temperature below 600 °C, to suggest their studied rocks reached temperatures between 500 – 600 °C at ~ 1.0 GPa. Several other studies on retrograde metasomatic rocks from Kampos constrain P-T conditions: ~1.17 – 1.23 GPa and 500 – 550 °C (Breeding et al., 2004), ~ 0.60 – 0.75 GPa and 400 – 430 °C (Marschall et al., 2006), and ~ 1.20 GPa and 430 °C (Miller et al., 2009). Breeding et al. (2004) did not constrain a temperature, but used an estimated temperature from Trotet et al. (2001a), and constrained a pressure of ~1.17 – 1.23 GPa at the estimated T of ~500 – 550 °C) using Thermocalc V. 3.2. Marschall et al. (2006) used the garnet-clinopyroxene thermometer and Thermocalc V. 3.01 to calculate temperatures, and estimated a pressure based on jadeite +* $SiO_2$ □ *albite reaction. Miller et al. (2009) used Perple_X and the thermodynamic database of Holland and Powell (1998) to calculate P-T conditions from reaction zones. In general, most studies indicate cooling during*

*decompression for metasomatic rocks from Kampos, with the exception of interpretations by Gyomlai et al. (2021); however, the large uncertainty of their temperature estimate (505 ± 155 °C) makes it difficult to differentiate between cooling during decompression, isothermal decompression, or re-heating."*

*As discussed above, Gyomlai et al., (2021) constrain two pressure-temperature conditions for the proposed re-heating event at ~ 1.0 GPa: 1.02 ± 0.15 GPa and 505 ± 155 °C and 1.03 ± 0.11 GPa and 653 ± 27 °C. The retrograde pressures are reasonable (~1.0 GPa with small errors), but the temperatures have some issues that the authors point out in the manuscript. The main issue is the T constraint above ~ 600 °C, which would lead to serpentine breakdown across the island of Syros (Guillot et al., 2015; Wunder and Schreyer, 1997), so the authors did not use this temperature. Furthermore, retrograde lawsonite breakdown to kyanite + zoisite should be expected above ~ 450 °C at ~ 1.0 GPa (Schumacher et al., 2008; Hamelin et al., 2018), something we further highlight in the manuscript now (lines 419 – 433). Serpentine and lawsonite are prevalent on Syros. So the authors were left with a single temperature constraint of 505 ± 155 °C, which means the temperature can be as low as 350 °C, or as high as 660 °C. The authors used the absolute value of 505 °C, to suggest that heating occurred at ~1.0 GPa between 500 – 600 °C (below serpentine breakdown). The absolute temperatures of the data can be treated as being correct, but the error bars cannot simply be ignored, along with supplementary petrologic constraints. This data could also be interpreted as linear cooling during decompression down to ~350 C at 1.0 GPa, isothermal decompression, or re-heating. The key is, it is difficult to differentiate the end-members, based on the presented data.*

Lines 416-419: Again, this is not completely true as only the estimations calculated using a bulk composition and considering Mn suggests that (note that in this case the rim grt is expected to crystallise at ~10-12 kbar / 500-550KC). When Mn is not considered bulk rock compo also yields to results of ~ 10-12 bar 500-550˚C.

*This is a good point for clarity, only the SY1407 core/mantle results that used Mn (bulk rock composition) plot at ~ 1.8 GPa [core (1) and mantle (2)]. The remaining results indicate that garnet grew at ~1.0 GPa. This has been clarified on lines 455 – 458:*

*"Furthermore, results from sample SY1407 of Laurent et al. (2018) sometimes disagree when using local vs. bulk compositions for modeling. Models that use bulk compositions and consider Mn suggest that the core and mantle of the garnet record P-T conditions of ~1.8 GPa and 475 °C, whereas models that use local compositions or do not consider Mn suggest that the garnets do not record conditions above ~1.0 GPa (model residuals are lower using local bulk composition models)."*

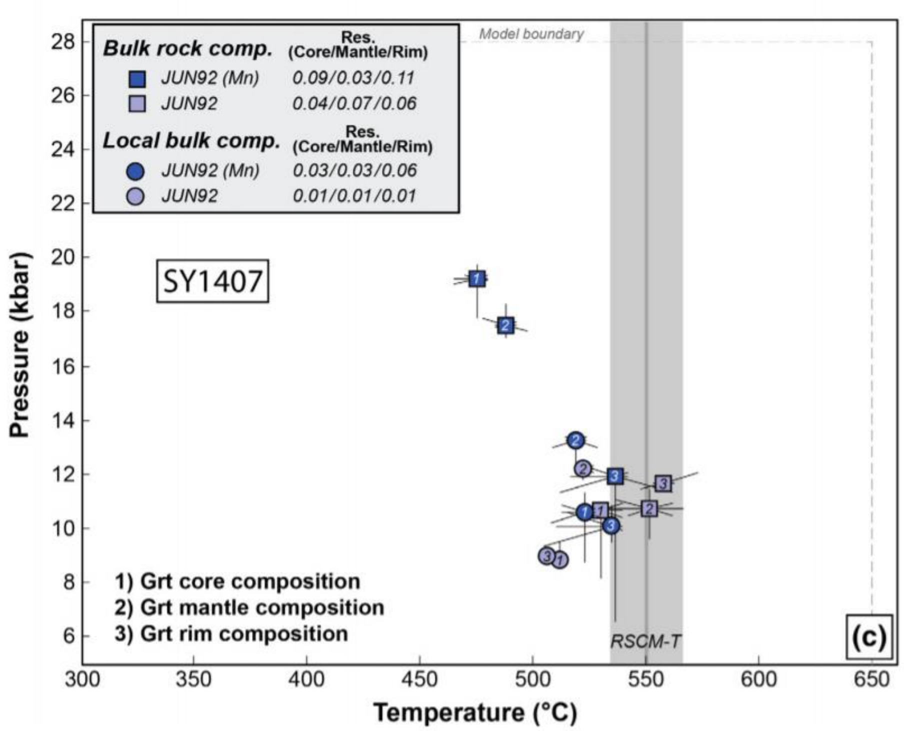


*Figure 15c (Laurent et al., 2018)*

Lines 420-421: This sentence indirectly suggests that results from Laurent et al. (2018) can be disregarded due to this 'issue'. However, it is very important to note that Laurent et al (2018) have looked to this 'issue' by using (and publishing) results obtained everytime with both a bulk rock and local composition. Clearly for this sample, it seems that there is quite clearly event of garnet crystallisation at 10-12kbar and 550-550˚C. This is now comforted by the recent study of Gyomlai et al. (2021).

*We did not intend to imply that the Laurent et al. (2018) should be disregarded. It is a very good dataset, and the authors do a nice job comparing multiple thermobarometry techniques. But we do think that many previous studies deserved some more "digging" into, to make sure P-T conditions are petrologically consistent. We have removed this sentence; it was not our intention to make this come across this way.*

*However, we do re-iterate that most results from the CBU on Syros (e.g., Schumacher et al., 2008; Miller et al., 2009; Hamelin et al., 2018; Marschall, 2006; Trotet et al., 2001), do not support this heating event.*

Lines 424-425: This was already known (and not subjected to debate) before your study. Syros is - with Sifnos - the Cycladic Island where HP-LT parageneses are the best preserved. So of course it is part of the Upper Cycladic Nappe as described by Grasemann et al. (2018). This is the sort of info that should appear in the Geological Setting not in discussion.

*Agreed, we had mentioned the Upper Cycladic Nappe in the Geological Setting (lines 77 – 79):*

*"The CBU has been separated into the "Upper Cycladic Blueschist Nappe" and the "Lower Cycladic Blueschist Nappe" on Milos Island; the Upper Nappe records peak pressure conditions above ~0.8 GPa (~2.0 GPa and 550 °C; Grasemann et al., 2018)."*

*We mentioned that the CBU rocks from Syros belong to the Upper Cycladic nappe here, since quartz-in-garnet barometry can be a "window" into the peak-to-prograde conditions of rocks from the CBU (for retrogressed rocks). We thought that this would be a good place to re-highlight that all of the retrogressed rocks (primarily greenschists) seem to have reach similar max P conditions, because the max P conditions of significantly retrogressed rocks from the CBU on Syros are not explicitly known from previous studies (there is no data that actually supports this). We've clarified this for readers (lines 460– 463):*

*"The similar peak pressures (> 0.8 GPa) between different Syros outcrops suggests that these rocks belong to the Upper Cycladic Blueschist Nappe (Grasemann et al., 2018), even though in some cases significant retrogression overprinted indicators that would suggest these rocks reached P conditions above ~0.8 GPa."*

Lines 436 – 438: Be more detailed here (when do you think exactly there is a rotation from N-S to E-W stretching lineations - after peak metam or later during exhumation?) and make it clearer how your data support this model (actually I don't see any measurements of N-S stretching lineations in your Fig. 1).

*This is addressed in the same sentence (lines 528-531):*

*"During this phase of exhumation, CBU rocks remained within a cold forearc until they reached the mid-crust (~1.0 GPa), and exhibit a progressive change in kinematics, from N-S stretching lineations during subduction (e.g., Behr et al., 2018; Laurent et al., 2016; Philippon et al., 2011), to lineations that swing towards the NE (this study, Roche et al., 2016: Sifnos) and E-W during exhumation (c.f., Kotowski and Behr, 2019; Laurent et al., 2016)."*

*We have added more information to the proposed tectonic model in Section 6.5 (previously 6.4).*

Lines 438-440: Not only. Stretching lineations are also oriented NE-SW with top-to-the NE sense of shear on Sifnos.

*Agreed. This has been added (lines 528 – 531):*

*"During this phase of exhumation, CBU rocks remained within a cold forearc until they reached the mid-crust (~1.0 GPa), and exhibit a progressive change in kinematics, from N-S stretching lineations during subduction (e.g., Behr et al., 2018; Laurent et al., 2016; Philippon et al., 2011), to lineations that swing towards the NE (this study, Roche et al., 2016: Sifnos) and E-W during exhumation (c.f., Kotowski and Behr, 2019; Laurent et al., 2016).*"

Lines 440 – 444: Can you be a bit more specific on what is exactly the input of your study on the exhumation model of the CBU? Should we understand that there is no record of deformation acquired during back-arc setting in Syros? You presented different exhumation models (e.g.

subduction channel vs. extrusion wedge models) earlier in the manuscript and it would be great to come back on this here. Why do you prefer the subduction channel model? Perhaps illustrating your exhumation model would help.

*We now further discuss our exhumation model in section 6.5. In short, we think deformation that is related to back-arc extension does occur, but back-arc extension is primarily recorded locally, directly adjacent to the Vari detachment on southern Syros.*

Figure 2: I am really not convinced by picture 2a. The fold is not clearly visible and it seems that the foliation in the greenschist cross-cuts the fold axial plane.

*We've updated figure 2a to better illustrate the broad-scale fold and core of the fold. The foliation ($S_s$), is subsequently folded during $D_{t2}$. The figure shows the axial plane of the $F_{t2}$ fold, "cutting" the $D_s$ foliation. The $S_s$ foliation is a bit tricky to envision, but we consider it an early foliation that is continually retrogressed during $D_{t1}$ (blueschist) and $D_{t2}$ (primarily greenschist) upright folding. The $S_{t2}$ axial planar cleavage that is formed during $D_{t2}$ is primarily non-penetrative, but only locally produces a penetrative cleavage in the cores of the $F_{t2}$ folds (Figure 2a,b,c).*

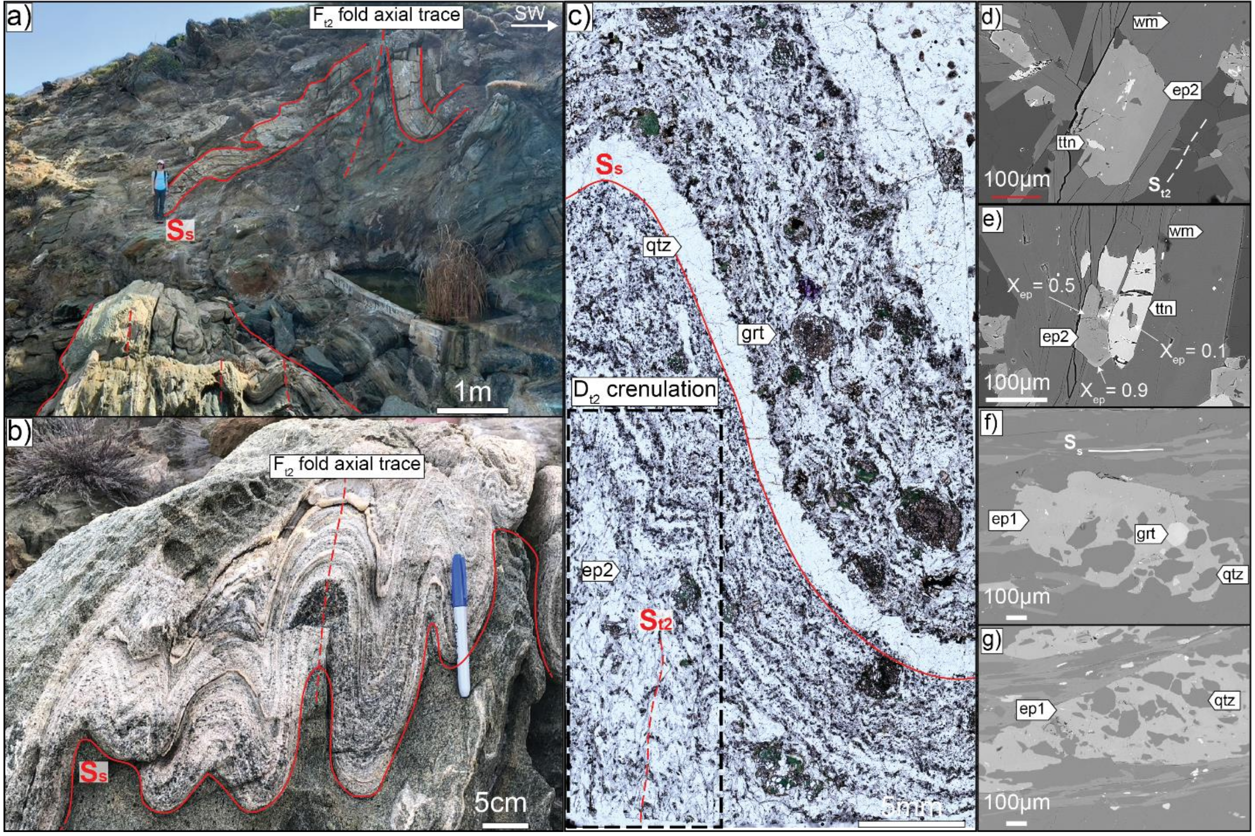


*Figure 2*