Solid Earth Discuss.,
https://doi.org/10.5194/se-2018-49-RC1, 2018

Solid Earth Discussions

Interactive comment on "Linking Alpine deformation in the Aar Massif basement and its cover units – the case of the Jungfrau-Eiger Mountains (Central Alps, Switzerland)" *by* David Mair et al.

Anonymous Referee #1

Received and published: 2 July 2018

This paper presents a detailed structural study of the northwestern Aar Massif. The text is beautifully illustrated by 11 excellent figures in addition to an appendix, but I have difficulties with the detailed distinction of numerous deformation and fabric events and I am not sure that they are of interest for a large, international audience. I believe that the valuable data and interpretations of this paper should be presented to a more regionally-focused, Alpine journal. This is also reflected by the conclusions of the paper whose essence is that the observed structures are consistent with a previously published model. The distinction between phases of deformation in the basement, based

Printer-friendly version

Discussion paper

on their orientation doesn't seem to be very robust, especially between SZ2 and SZ3 (see detailed comments). Their different orientations could reflect a large scatter of the structures rather than two distinct populations.

SPECIFIC COMMENTS Lines 12- 13 : replace Âń T at deformation ranged from xx. . . Âż with : "Deformation temperatures range between xx and xx. . ." Line 14: either "ductilely" or "in a ductile manner". Here you are using the present tense, on line 13 it's the past. . . Line 21: "NW-striking" is enough Line 22: "feature an immense topographi c expression": a complex, but not very clear sentence to say "high altitude"? Line 22: replace "SE-NW striking rim" with "NW striking rim" Line 23: "offset" between what and what? Line 24: replace "the sedimentary" by "its sedimentary" and delete "rocks of the Aar Massif". Line 28: Helvetics Line 29: early stage of what? Line 29: you can decouple from a basement but you cannot decouple from an evolution (at least not in this context). Line 32: add a 150 years old reference Line 36: later? Line 39: delete "which" Lines 40 to 43: there is no real usable information for the readers here. Line 49: delete "and to fill the knowledge gap". Line 53: delete "in the field and" Line 56: Delete "In addition. . ..history". Line 62: Repetition of line 20 Line 66: "in between": not very clear Line 68: SW-strike Line 75: delete "Alpine" and add "of Alpine age" after "metamorphism". Line 84: Replace "These mechanisms are considered not to. . ." with " This process does not appear to be" Line 85: Massif Line 86: add reference at the end of sentence Line 86: what sort of deformation fabric? Line 88: the name of the deformation phase is not so interesting if the kinematics of the deformation are not described. Line 90: "thrusting": nw-vergent? Line 93: which recumbent fold? Does it have a name? Is it visible in a figure? Any references? Line 95: what is an inverse succession? Line 100: I would delete "differential" Line 101: delete "a phase of" Line 101: "strain partitioning": only interesting to know if you describe what is partitioned into what Line 101: "simultaneously with dextral strike-slip": unclear. Is dextral strike slip part of the partitioning? Lines 103-104: Pfaffenkopf and Oberaar have no references Lines 104-105: delete "the uplift passively rotated". The uplift is not a force. . . And add "were passively rotated" after " Doldenhorn Nappes". Line 108: which type of brittle

structures? Line 114: not necessary Line 117-118: delete Line 120: “only” should be before, not after mapped Line 121: delete only Line 145: basement Line 145: replace “are present as” with “consist of” Line 148: what is a “granodioritic texture”? Magmatic texture? Line 152: delete “see also” Line 155: evidence Lines 174-176: delete sentence Lines 180: brittle shear zone? Lines 181-182: “Note that. . ..sediments” doesn’t need to be between parentheses. Line 182: replace “faulting behavoiur” with kinematics Line 183: “However” ??? Line 183: I cannot see the offset of older structures in Fig. 5b Line 189: no dot after SZ2 Line 189: “offsets”: this could give you a shear sense? Why is there no shear sense described? Looking at Fig. 6 I do not find the distinction of SZ2 and SZ3 convincing based on the orientation data. The Rottal net shows a possible distinction into two groups based on the different dip, but there aren’t many data and even there it could be one population only. The Trugberg net doesn’t show two”populations” in my view. Line 190: “wider”: give an idea Line 190: replace “occurred” with “is” Lines 190-193: any references to figures? Line 193: “kinematics”: you did not say much about it in the last lines (see comment on Line 189) Lines 201-204: a verb is missing in this sentence Line 210: I doubt it. . ..Mapping certainly reveals something, but I guess something else. Line 213: why “the first”? It was not mentioned that there were many. Is it S1? Line 214: what is the spacing of mylonitic foliations? Spacing between shear zones? Line 217: The reference to Fig. 7c comes after “more than one def phase”, but it doesn’t show that. It only shows the boudinage. Line 219: past tense (led) not always used in the text. Reference to maps and figures? Line 222: argument for the synchronous development of S1 and SZ1? Line 223: what is the shear sense of these shear zones? Line 225: it needs to be stated before that these shear zones are thrusts. And what displacement direction? Line 225: “of” the footwall rather than “in”? Line 227: subsequent to what? Line 228: what is a rotated sigma clast? And. . .why does a rotated sigma clast indicate rotation of the initial structures? And . . . what deformation phase causes an anticlockwise rotation of some 50°, looking East? “As a result”: of something that is not really explained. Line 229: what are EN and EW? Line 230: “This deformation stage”: I am lost. Which one? The one that rotated the

fabrics? What are the kinematics of this deformation? Line 230: how do you know it is not preserved? Line 231: “and the folding”: so this deformation phase is the folding? What axial plane and fold axes orientation? Line 233: “Subsequent NW directed shearing”: not easy to understand and visualize and I cannot really see it in Fig. 11b that is quoted at the end of the sentence. Where do I see the flat-lying limbs? What is the evidence for a subsequent NW-directed shearing in the first place? Line 234: “now”: do you think the limbs were initially steep? Line 234: this observation of the result should be described by a photo or sketch of the structures, not by a schematic recap of the Discussion/Conclusions. Line 234-235: S3? How can one distinguish S3 from S2 that are sometimes parallel? Line 236: difficult to follow. Why is it really necessary to distinguish an S3 from an S2 here? Line 237: which one is the “same” orientation? Line 237: “This foliation. . .cut”: I don’t understand the sentence. Lines 210-240: not easy to follow, especially the mixture of orientation with cross-cutting relationships and of microstructural characteristics. Line 243: what does oblique mean here? Kinematics of these faults? Line 258: specify and justify the geothermal gradient used for the conversion of T in depth Line 266: evidence for being deformed as an “ensemble”? Line 267: consistent? With what? Line 268: less shortening: evidence? Quantified? Lines 269-270: why? Line 272: The cover-sediment interface? Line 283: why “already”? Line 284: has this wedging been described before in the text? Wedging associated with folding? I am lost. . . Line 286: evolution of what? Line 289: succeeding??? Line 293: favorable for what? Lines 295-301: I am not sure why these observations are important in the context of the results session and of the paper. Lines 302-305: why to mention an own stratigraphic model here that was not presented in the results? Lines 305-307: I am still not sure about the importance of these lines. Line 311: Substratum T constrained by RSCM? Line 311: why to give an upper limit to calcite thermometry and mention calcite thermometry at all? Line 314: ok, but you should also quote the lower T suggested by XX and White. I think it must be Burkhard, 1993, not Burkhard, 1990. Line 322-323: repetition of line 317. Line 323: well, I am not sure that this can be constrained. The only thing that can be said is that T of 270° C was attained following

the recrystallization T inferred by Stipp et al., 2001. What is known about the T peak anyway? Line 325: pelitic Line 325: synchronously: what is the evidence? Line 326: delete “rheological” Line 333: was it quantified? What is the evidence? Line 344: was really shown that incorporation of basement slivers in the cover is associated to the 1st deformation phase? Line 361: how significant? Line 365: repetition of 361 Line 369: so why should they be called shear zones? Line 380-384: So S1 is at < 330°C, shows dynamic rexx of quartz, but no fabric in the basement, as stated in Line ....? Lines 386 – 388: so ... under which T conditions did these shear zones develop? Lines 390-392: An amazing change of scale of interpretation! Lines 394-395: 3remaining compressional orogenic forces”: I think these speculations are not really necessary. Line 400: “aggravated”: aggravating a link? First, it sounds quite dramatic, second it’s not the link, but its interpretation that may be “aggravated”. Line 404: “is key”: structure of the sentence needs to be reconstructed. Line 405: “and discrete”:? Lines 404-406: “while” and “whereas” is too much for the same sentence. Needs to be reformulated. Line 406: “bulk of the rock behaved in a brittle manner”: do you mean that between the shear zone the rock was also deforming but in a brittle manner? Not clear. Line 410: “multiphase tectonics”: strange term. Lines 411- 412: “the structural imprint ....sets up the stage for erosion”: strange statement. I guess the authors wish to say that the steeply oriented displacements created uplift and exhumation by erosion?

Interactive comment on Solid Earth Discuss., https://doi.org/10.5194/se-2018-49, 2018.

Printer-friendly version

Discussion paper