Reply to Michael Newman

Dear Dr. Newman,

thank you very much for your input on the manuscript, it is highly appreciated. Here is our reply to your comments. We hope the changes we implemented improve the shortcomings of the manuscript highlighted by your comments and suggestions. Please do not hesitate to contact us shall this not be the case for some comments.

1. Comments from Dr. Newman

Comment 1: I found this manuscript thoroughly research and referenced. It is probably a good time to review the Ellesmirian situation in Svalbard as a lot of new data has been published recently. I have attached a pdf that mostly just highlights minor points.

Comment 2: One thing I do think needs to be addressed is the abstract, as it does not really present the results found in the conclusions and elsewhere. A lot of readers do not get further than the abstract, so you need to get their attention by telling them your conclusions, such as, the Mimerdalen Subgroup is upper Givetian to lower Frasnian, etc.

Comment 3: The other thing is more of a suggestion rather than a criticism, in that there is a lot of hyphen use. I think the English might flow a little better if 'to' and 'and', etc., were used when appropriate. That's it really.

Comment 4: line 17: And yet in the conclusions you say it might not have happened in Svalbard at all? The abstract should be more of a synopsis of your results and conclusions rather than a list of the problems with dating the Ellesmerian, etc.

Comment 5: line 43: It might be an idea to put a date range and a general reference for the Caledonian orogeny for those not so familiar with arctic geology.

Comment 6: line 143: So is the specimen considered lost in a ICZN sense? I wonder if it might be worth using Schweitzer's figure of the Spitsbergen specimen compared with a genuine R. lepidophyta at the same scale to illustrate the size difference. Really put a nail in the coffin of the argument. It's up to you.

Comment 7: line 231: Best use 'Ellesmerian' rather than 'Svalbardian' even if they mean the same thing as you have for the rest of the text.

Comment 8: line 235: Did you mean discussion and debate?

Comment 9: line 244: 'Speculation and debate' maybe?

Comment 10: line 282: northwestern or western?

Comment 11: line 796: doi number needed, I found it via the title.

Comment 12: line 799: Similar comment to the one above, only I could not find this one.

Comment 13: line 982: How does a reader get access to this - is there a doi number or website?

Comment 14: line 985: How does a reader get access to this?

Comment 15: line 1061: Py not in the figure caption - presumably this is Pyramiden?

2. Author's reply

Comment 1: agreed.

Comment 2: agreed.

Comment 3: agreed.

Comment 4: agreed. See response to comment 2 below.

Comment 5: agreed.

Comment 6: agreed.

Comment 7: agreed. However, the anonymous referee (other referee) is based in Canada where the Ellesmerian Orogeny was define and argues that the term "Svalbardian" should be used in Svalbard rather "Ellesmerian". Therefore, we adjusted the whole manuscript to "Svalbardian".

Comment 8: agreed.

Comment 9: agreed.

Comment 10: disagreed. The paragraph deals with southern Spitsbergen.

Comment 11: agreed.

Comment 12: agreed. This contribution is almost ready and will be submitted to Tektonika later this summer, so unfortunately no DOI available yet, but will be adjusted as soon as possible.

Comment 13: agreed.

Comment 14: agreed.

Comment 15: agreed.

3. Changes implemented

Comment 1: none commanded by the reviewer's comment.

Comment 2: added “The Mimerdalen Subgroup is upper Givetian to lower Frasnian (ca. 385–380 Ma) in age and the Billefjorden Group is mid Famennian to Upper Mississippian (ca. 365–325 Ma), therefore constraining the Svalbardian event in central and northern Spitsbergen to 383–365 Ma if it ever occurred. The Adriabukta Formation in southern Spitsbergen is Middle Mississippian and, therefore, cannot have been involved in the Svalbardian event, thus suggesting that all the deformation in southern Spitsbergen in early Cenozoic in age and that strain partitioning processes had a major role in localizing deformation in weaker stratigraphic units. The few geochronological age constraints yielding Late Devonian–Mississippian ages in Svalbard may reflect either Svalbardian contraction or extensional processes and are therefore of no use to validate or invalidate the occurrence of the Svalbardian event. On the contrary, the contradicting lines of evidence used to support the occurrence of the Svalbardian event and new regional geophysical studies suggest that Svalbard was subjected to continuous extension from the late Silurian to early Permian times.” lines 31–43.

Comment 3: replaced hyphen characters by “to” lines 18, 21, 35, 41, 43, 49, 57, 84, 87, 100, 108, 117, 146, 161, 191, 195, 201, 209, 228, 229, 231, 349, 353, 361, 372, 379, 398, 399, 402, 426, 431, 468, 497, 507, 518, 519, 525, 527, 530, 531, 532, 558, 559, and 578, by “and” lines 25, 54, 81, 120, 165, 189, 198, 223, 230, 237, 242, 339, 389, 422, 447, 481, 490, 491, 492, 501, 508, 520, 536, 541, 561, and 1075, by “and/or” lines 34, 65, and 100, and by a comma line 129.

Comment 4: see response to comment 2.

Comment 5: added “(ca. 460–410 Ma; Horsfield, 1972; Dallmeyer et al., 1990; Johansson et al., 2004, 2005; Faehnrich et al., 2020)” lines 47–48, and Dallmeyer et al. (1990), Faehnrich et al. (2020), Horsfield (1972), and Johansson et al. (2004, 2005) to the reference list.

Comment 6: added a new S1 supplement illustrating the size difference between the misidentified specimen of Brinkmann (1997), Schweitzer (1999), and Piepjohn et al. (2000), and actual specimen of Retispora lepidophyta from detailed studies by Playford (1976) and Maziane et al. (2002). Also changed supplement S1 into supplement S2 to include the new supplement.

Comment 7: changed “Ellesmerian” into “Svalbardian” throughout manuscript lines 1, 22, 24, 26, 33, 45, 51, 59, 64, 71, 76, 80, 88, 90, 94, 100, 106, 114, 115, 120, 124, 126, 128, 130, 144, 153, 163, 164, 186, 232, 239, 240, 283, 288, 304, 337, 338, 342, 356, 358, 366, 368, 376, 379, 385, 387, 393, 420, 424, 435, 446, 451, 458, 460, 471, 480, 489, 491, 500, 501, 502, 513, 526, 532, 538, 558,

561, 562, 569, 584, 586, and 588. Deleted “Ellesmerian” line 19. Added “Svalbardian (and” line 203. Added “in Svalbard” line 527.

Comment 8: rewrote into “debate” line 241.

Comment 9: replaced “discussion” by “speculation and debate” line 243.

Comment 10: none.

Comment 11: added DOI to the reference.

Comment 12: none.

Comment 13: the Ph.D. thesis is available for purshase at various online libraries, and in paper version at the library of the Norwegian Polar Institute.

Comment 14: the submitted (but never published) manuscript is found at the end of the Ph.D. thesis.

Comment 15: added “Py: Pyramiden; “ line 1076.

Additional revisions by the author of the present manuscript

-deleted “in Svalbard” line 29.

-replaced “Svalbardian” by “Ellesmerian” lines 33–34.

-deleted reference to Piepjohn (2000) line 56.

-added “mostly” line 75.

-added “e.g., “ line 115.

-changed “for example” into “Furthermore” line 119.

-added reference to Maher et al. (2022) lines 148, 263, 527, 567–568, and 599, and to the reference list.

-replaced “initiated in” by “occurred during” line 149, and added “initiating” line 150.

-added “, e.g., in pointing out that field studies based on long-distance observation of poorly exposed and inaccessible transects should be given little (if any) credit.” lines 181–183.

-added “, and neither does the claim of Piepjohn et al. (2000) that the older Devonian spores found in the sample with the misidentified specimen of *Retispora lepidophyta* were reworked” lines 241–243.

-added “(Birkenmajer, 1964)” line 280.

-added “Previous works (e.g., Kempe et al., 1997) used the strike and vergence of structures in Blomstrandhalvøya todistinguish Eurekan from presumed Svalbardian structures. This argument is not valid because a single tectonic event may very well produce structures with varying vergence

and strikes, e.g., the Eurekan in Svalbard, which resulted in the formation of east-verging structures in western and southwestern Spitsbergen (e.g, Maher et al., 1986; Dallmann et al., 1988, 1993; Andresen et al., 1994) and northeast-verging folds and thrusts in Brøggerhalvøya (e.g., Bergh et al., 2000; Piepjohn et al., 2001). Furthermore, recent regional studies have shown the occurrence of major, WNW–ESE-striking, several to tens of kilometers thick, thousands of kilometers long, inherited Timanian thrust systems extending from northwestern Russia to western Svalbard (Koehl, 2020; Koehl et al., 2022). One of these structures, the NNE-dipping Kongsfjorden–Cowanodden fault zone, extends into Kongsfjorden, where it was reactivated during the Caledonian and Eurekan events as a sinistral-reverse oblique-slip fault, thus partitioning deformation between northern and southern to western Svalbard during those two events and leading to oppositely verging Eurekan thrust across (e.g., west-verging in Andrée Land and Blomstrandhalvøya and east-verging in Røkensåta and Adriabukta and Hornsund) the fault and to bending Eurekan structures in the vicinity of the fault (e.g., in Brøggerhalvøya).” lines 411–426.

-deleted “strongly” line 434.

-added “west-dipping” line 470.

-added “part of” line 492 and deleted “area” line 493.

-changed “lower” into “early” line 557.

-added “and precise” line 583.