Referee # 1

General formal points are:

- Latin plant names should consistently be printed in italic font. REVISED

1. - Definitions of abbreviations appear repeatedly throughout the text, they should only be introduced on their first occurrence. REMOVED all repetitive abbreviations

2. - The verbs "to experience" and "to respond" are used excessively and sometimes not in the appropriate context. It is clearly a matter of taste but I would advise to revise some sentences. Fluency could partly be improved by language simplification. Removed/modified a number of recurring instances, may need to further edit

3. - Tenses are not always used consistently, please revise (see line comments). REVISED

Scientific issues:

4. - "Carbon" is partly used interchangeably with "carbon dioxide". There are more components to the carbon cycle in forests than vertical CO_2 exchange. Therefore, sometimes statements are not entirely correct, please review. REVIEWED

5. - Measurement and model uncertainty are not addressed. The authors should add some information on this topic. The ranges of the annual flux sums given in the abstract likely describe inter-annual variability (not measurement/model uncertainty), I assume using mean and standard deviation of the six annual flux sums per forest. An explanation should be added. Added a section in the methods detailing the model uncertainty and confidence intervals for the measurements presented. However, I still kept the standard deviations with the mean values to highlight interannual variability as mentioned.

6. - The description of the used partitioning models (equations 1 and 2) is very concise, at least units should be added. For equation 1 a citation is provided, the short description is defendable. Equation 2, however, is not clearly referenced and therefore definitely needs more explanation. The optimization process of the temperature, VPD and soil moisture functions behind the scaling terms need to be described better, to only mention the sigmoidal shape is not enough in my opinion. Added the necessary citation (Richardson et al., 2007), completely rearranged the entire section, and added an additional equation to better explain the sigmoidal functions used within the partitioning models.

7. - Some of the conclusions about the effects of drought rely on the analysis of the especially warm and dry year 2012. The fact that there was a disturbance (thin cutting) in one of the forests in this year is not discussed comprehensively enough. The authors should for example include the effect of a diminished leaf area on CO_2 exchange fluxes in their interpretation of this (and the next?) year's budget and explore if for the interpretation of the data set from 2012 to 2017 post disturbance effects should be considered. Included additional information in the site information and methods which highlighted the past findings at the site in regards to the thinning/disturbance.

Line comments:

8. Page 1, Line 3 (Title) "similar-age" should not be hyphenated. REVISED

9. Page 1, Line 19 I would suggest replacing the somewhat complicated sentence ", ... the evergreen forest saw greater annual reduction" with e.g. "..., net CO_2 uptake was reduced more at the evergreen forest than at the deciduous forest." However, during warm and dry years, the evergreen forest had largely reduced annual NEP values compared to the deciduous forest.

10. Page 1, Line 22 "Annual ET was driven by changes in air temperature" Are you sure? Is T change really the driver? It sounds like the slope of a T change determines ET. If so, which timescale do you refer to? Maybe average temperature actually is the driver? Variability in annual ET at both forests was related most to the variability in annual air temperature (Ta), with the largest annual ET observed in the warmest years in the deciduous forest.

11. Page 1, Line 23 "During drought years, …" It is a bit hard to follow the logic. The preceding sentence says that dry periods greatly reduced ET at the deciduous forest. Now it is stated that the sensitivity of ET to temperature changes (?) at the deciduous forest is comparably low. Maybe say: ET is sensitive to dry periods/increased T at both sites. ET reduction at TP39 is comparably larger. Additionally, ET was sensitive to prolonged dry periods that reduced ET at both stands, although the reduction at the conifer forest was relatively larger than that of the deciduous forest.

12. Page 1, Line 25 "If longer periods..." Longer than what? Can you give us an idea about time scales? If prolonged periods (weeks to months) of increased Ta and reduced precipitation are to be expected under future climates during summer months…

13. Page 1, Line 26 "...the carbon sink capacity [...] will continue." is a bit complicated. Maybe "...will continue to act as a sink..." "...while that of..." is not very elegant, consider reformulating. … the deciduous broadleaf forest will likely remain an annual carbon sink, while the carbon sink-source status of the coniferous forest remains uncertain.

14. Page 1, Line 29 Remove comma before "through". "Absorption of CO2 emissions" can be replaced by "CO2 uptake". REVISED

15. Page 1, Line 30 remove "processes". REVISED

16. Page 2, Line 38 I would add "events" after "extreme weather". Remove "stress". Stress is the consequence of extreme weather not an example for an extreme event. REVISED

17. Page 2, Line 39 "Adversely impacting [...] forest–atmosphere interactions" What does that mean? Sounds like there is no interaction anymore due to extreme weather, you clearly do not mean that. Also: replace hyphen with en-dash in expression "forest–atmosphere". REVISED
    … forests to sequester carbon, and thus regional forest–atmosphere interactions

18. Page 2, Line 40 The authors state that there are positive and negative feedbacks but give only an example for a process leading to a positive feedback. Example for opposite case? Had thought to mention enhanced CO_2 leading to partial stomatal closures and reduced water loss leading to possible cooling, but REMOVED feedback sentence instead

19. Page 2, Line 46 I do not get the reasoning. "The result of a shifting climate..." [which result?] impacts both forest types differently because broad-leaved species are replaced by needle-leaved species? I do not understand the cause-effect concept behind the statement, consider revising. REVISED beginning of the paragraph
However, climate change will impact deciduous and coniferous forest ecosystems differently due to their physiological differences.

20. Page 2, Line 50 I assume you refer to a disturbance of regional cycles and not within forest cycling, can be formulated more clearly. REMOVED sentence

21. Page 2, Line 51 "Conversely," I do not see an opposition to the previous statement, which is about photosynthetic rate. This sentence talks about season length.
REVISED sentence but ultimately removed conversely

22. Page 2, Line 58 "...have the ability to conduct research..." is needlessly convoluted. Consider replacing with e. g. "Few studies have reported multi-annual time series." Also: omit "sufficiently long". Otherwise you need to explain which timescale would be sufficient. Even fewer studies have reported multi-annual time series

23. Page 2, Line 59 In my opinion, there is no need to construct ("Such a study would...") the need for the current study. I would omit lines 59 to 63 and go straight to Page 3, Line 73 ("This study..."). REMOVED suggested section

24. Page 2, Line 61 The "benefit" of forests to "terrestrial–atmosphere gas exchange" seems vague. Gas exchange takes place anyway, there only is a benefit if you prescribe a service of forests (e. g. carbon sink function), which is not mentioned here. As stated before, I would omit the whole section. REMOVED suggested section

25. Page 3, Lines 64-69 Should be moved to section 2.1 (Study sites) REMOVED

26. Page 3, Lines 70 to 73 As no results of the previous studies are mentioned here, listing them is not very informative. I would move this section to the results or discussion section and mention the results of previous studies there in comparison/relation to the current study. Paragraph REMOVED

27. Page 3, Line 80 "will be used". The choice of tense in confusing to me. Starting in line 73, present tense is used, future here. Sentence was REMOVED

28. Page 3, Line 83 What is "natural terrain"? REMOVED the word natural

29. Page 3, Line 83 "The forest is classified". By whom? Is there a citation or a classification system this assumption refers to? REMOVED. The forest is unevenly aged

30. Page 3, Line 91 "Conifer species including make-up..." Sentence incomplete. REVISED Conifer species only account for a minor component…

31. Page 4 Line 106 Personally, I do not like the frequent use of the verb "experience". For this sentence a simpler way could be: "While edaphic and climatic conditions are similar between both sites, they differ in vegetation cover and canopy structure." REVISED While edaphic and climatic conditions are similar between both sites, they differ in vegetation cover and canopy structure and physiology.

32. Page 4 Line 107 What do you mean by "historically defined"? That past events (ice age) shaped the landscape or that authors in the past defined the landscape like this? These sandy soils are part of the Southern Norfolk Sand Plains, an area shaped by past ice age glacial melt processes.

33. Page 4 Line 109 It would be easier for international soil scientists to understand if the name according to the FAO World Reference Base would be given additionally to the name according to the national Canadian system. …classified by the Canadian Soil Classification Scheme and FAO World Reference Base as Brunisolic grey-brown luvisol and Albic Luvisol/Haplic Luvisol, respectively.

34. Page 4, Line 113 "Help" is not ideal. How does the lake control cold temperatures? REMOVED sentence – moderating effect of water body

35. Page 4, Line 114 "...were 8 ◦C and..." past tense? The mean is still the mean. Next sentence present tense again. REVISED is 8.0 ± 1.6°C and 997 mm

36. Page 4, Line 116 The citation is incomplete. Based on the information provided, the given data cannot be verified. Updated the citation and included a link to the website

37. Page 4, Line 116 Last sentence of paragraph can be omitted, it is poorly formulated. Information also given in "Data availability" section. REMOVED

38. Page 4, Line 121 Omit ", though". Start new sentence with "Measurements". REVISED Measurements at both sites are still ongoing

39. Page 4, Line 124 Supplementary material would be a separate pdf-file, I think. Table A1 seems to be in the appendix. REVISED …are outlined in the appendix (Table A1).

40. Page 4, Line 124 "...are calibrated". Present tense? Paragraph starts in present perfect (..."have been measured"). At both sites, IRGAs are calibrated monthly using high purity N_2 gas for the zero offset. Measurements at both sites are still ongoing/being calibrated.

41. Page 4, Line 125 The expression "Environment Canada Greenhouse gas specified CO2" is not understandable. Which concentration did the span gas have? At both sites, IRGAs were calibrated monthly using high purity N2 gas for the zero offset and CO_2 gas (360 μmol mol^{-1} CO_2; following WMO standards) for the CO_2 check.

42. Page 5, Line 127 It comes as a surprise that there is more than one IRGA per EC setup. In line 123 singular was used ("...an IRGA"). I would stress this type of setup more as it is typical and necessary for forest EC. Half-hourly net ecosystem exchange (NEE, μmol m^{-2} s^{-1}) is calculated as the sum of the vertical CO_2 flux (F_c), and the rate of CO_2 storage (S_{CO2}) change in the air column below the IRGA (NEE = F_c + S_{CO2}).

43. Page 5, first two paragraphs A mixture of tenses is used. "is completed", "were assumed", "have been conducted", "are measured", "will focus". Check for consistency. REVISED

44. Page 5, Line 139 Unclear what "Environment Canada Delhi CDA" is. Why mention if precipitation data is not used after all (as stated in line 141)? REMOVED … P data from an accumulation rain gauge (T-200B, GEONOR) installed 1 km south of TP39

45. Page 5, Line 145 What is the difference between quality control, filtering and cleaning? If you do not want to go into detail just mention the citation and say e. g. "processed as described by Brodeur (2014)". REVISED entire section. All meteorological and flux data were processed on lab-developed software following the FluxNet Canada Research Network (FCRN) guidelines as described by Brodeur (2014).

46. Page 5, Line 147 How was the frequent cross-checking with AmeriFlux done? Statement seems vague. Sentence REMOVED – not very frequently

47. Page 5, Line 148 How were outliers identified? A two-step cleaning process was used to remove outliers in half-hourly meteorological data: coarse upper and lower thresholds were applied to half-hourly values to remove obvious outliers, and additional erroneous half-hourly data were removed from time series when instruments were known to be malfunctioning or visual inspection by multiple reviewers resulted in certain agreement that an outlier was present. Added citation of Papale et al. (2006).

48. Page 5, Line 150 There are other EC towers at Turkey Point Observatory? Where are they? Can you expect them to be representative for your site? Only then using them to gap-fill your data would make sense. More information needed. Missing meteorological data of all lengths were gapfilled using extant data for the same half hours from either (in order of preference) a second sensor at the site, or an equivalent sensor from a nearby (1-3 km away) station in the network (sites described in Peichl et al., 2010).

49. Page 5, Line 150 What is "mean flux recovery"? Percentage of half-hourly measurements left after filtering? Including or excluding times of instrument maintenance/malfunction? Yes, the mean flux recovery was the data remaining after all the filtering processes, including data lost from the start (i.e. maintenance and malfunctions). The resulting final mean flux data recovery following both threshold filtering methods

50. Page 5, Line 159 Omit "where daytime and nighttime"; it means all fluxes, correct? No need to specify then. REMOVED

51. Page 6, Line 160 It is stated that filtered NEE was gap-filled using soil temperature. Why is "flux recovery" after gap-filling only 49 %. Check if this gap-filling step was actually applied. It seems unlikely. Later more complicated methods for flux partitioning and gap-filling are described. The simple NEE-Ts model seems redundant. REMOVED the sentence. Flux recovery would be before any gap-filling just filtering.

52. Page 6, Line 164 Symbol for soil moisture appears here first. Explanation too late in line 163. Introduced the soil water content in Line 119 when discussing met measurements.

53. Page 6, Line 164 Partitioning of NEE into GEP and RE has not been introduced. The reader does not know the RE time series at this point. If you talk about gaps in it you have to introduce it first. NEE gap-filling and its partitioning into components of ecosystem respiration (RE) and gross ecosystem productivity (GEP) were achieved using the methods described in Peichl et al. (2010a), which are summarized below.

54. Page 6, Line 166 What is the definition of nighttime? A radiation threshold?
Yes, radiation threshold… nighttime (PAR < 100 μmol m^{-2} s^{-1}) fluxes

55. Page 6, Line 166 It is stated that nighttime NEE was modeled as a function of soil temperature and moisture in order to (!) describe the relationship of RE and Ts which represents diurnal air temperature variability. Check meaning of the sentence. It seems incoherent to use nighttime measurements to describe diurnal variability of something. Sentence was removed and preceding paragraph modified (edit shown above)

56. Page 6, Line 173 What are the units of the model parameters, especially of a1 and a2? a1 and a2 are not a function of soil moisture (as stated) when looking at equation 1. I assume all four parameters were fit during the same optimization process. Added an additional equation to better explain everything (Equation 2). where a_1 and a_2 are fitted parameters that describe a sigmoidal curve that ranges from 0 to 1 (Richardson et al., 2007). In this approach, the Ts_{5cm} component of the function defines a theoretical maximum half-hourly respiration rate based on soil temperature (i.e. driving variable), while the $\theta_{0\text{-}30cm}$ component modulates the resultant predicted value as a function of the volumetric water content (i.e. scaling variable).

57. Page 6, Line 173 "...acting to scale the RE relationship" to what? REMOVED (above)

58. Page 6, Line 180 Explanation of equation 2 needs more detail. How are these sigmoidal functions set up? Do they have parameters? Parameters optimized at the same time?
The remaining terms use the functional form introduced in Equation 2 to described the responses of GEP to Ts, vapor pressure deficit (VPD), and $\theta_{0\text{-}30cm}$, respectively.

59. Page 6, Line 187 Seems inconclusive. Don't you need the modeled GEP time series in order to calculate phenologically-derived summer months? For the GEP model you in turn need the derived summer months. Please explain. No change made. Phenologically-derived summer months and all phenologically-modelled periods were found using 'non-gapfilled GEP' (only periods where non-gapfilled NEE matched gap-filled NEE).

60. Page 6, Line 189 Sentence starting with "Furthermore..." ending in line 191 with "both sites" can be omitted, unnecessary/circular information. Yes, in the growing season plants grow, therefore it is a key season of CO2 uptake. REMOVED

61. Page 7, Line 201 Omit first sentence of paragraph, contains no new information. REMOVED sentence

62. Page 7, Line 208 "water or heat stressed periods", check meaning, the periods are not under stress. … during low water or high heat periods

63. Page 7, Line 210 Contents of last paragraph can be moved to results, stays a bit vague here anyway. Section mostly REMOVED. Added an ANOVA/t-test sentence in results

64. Page 8, Line 237 GEP might not be gap-filled, still it is not direct measurement data but modeled as the difference of RE (modeled) and NEE (=EC Fc, measured). Could be stressed here, it took me a while to get my head around this fact. From half-hourly non-gapfilled data (calculated as the difference between modeled RE and measured non-gapfilled NEE), the maximum daily photosynthetic uptake (GEPMax) was calculated.

65. Page 8, Line 240 The approach does not calculate, the computer calculates according to the approach. This approach identified photosynthetic transition dates

66. Page 8, Line 241 "logistic curve" instead of "logistics curve" REVISED

67. Page 8, Line 241 "The second derivative estimated the end of greenup..." How? Time when derivative turns zero or similar? The local minima of the second derivatives estimated the end of greenup (EOG), the length of canopy closure (LOCC), and the start of browndown (SOB), while the local maxima of the third derivatives estimated the start of the growing season (SOS), and the end of the growing season (EOS).

68. Page 8, Line 242 "while the third derivatives calculated..." see two comments above. REVISED
69. Page 8, Line 251 accumulation REVISED

70. Page 8, Line 257 Ta responds to what? behaved similarly

71. Page 8, Line 258 "Record warm Ta conditions". Expression unclear to me. Annual mean above 30-year average? Most days/half hours above 30-year average of corresponding DOY/half hour? Added (exceeding 30-year mean daily maximum values)

72. Page 8, Line 260 What does extreme mean? What does "magnitude of extreme cold days" mean exactly? Added (exceeding 30-year mean daily minimum values)

73. Page 9, Line 261 "record Ta outside the normal peak summer period" Unclear, what does record and normal mean? Temperature is outside the period? Check meaning of sentence. with record Ta outside of the typical summer (June – August) period

74. Page 9, Line 262 The sites are not growing, the vegetation is. REVISED

75. Page 9, Line 263 "Meteorological conditions between the sites were [...] examined". Check meaning. Consider replacing with "Differences in meteorological conditions between the sites were examined" or "Meteorological conditions at both sites were examined" REVISED

76. Page 9, Line 263 "..., beginning with..." Sequence of analysis steps not relevant. REMOVED

77. Page 9, Line 264 Sentence "However, the shapes..." is circular and can be omitted. It says: The seasonal course of APAR depicts the course of absorbed PAR, meaning APAR is APAR. REMOVED

78. Page 9, Line 267 "APAR was similar throughout the year". Not true, see figure 2. Relative quantity FPAR might be about constant during annual course, APAR is not. Updated the methods/figure to describe why the sites show similar APAR measurements

79. Page 9, Line 270 Cloudy conditions along with a reduction in incoming radiation are not a coincidence. Daily reductions in PARdn and APAR often resulted from cloudy conditions and precipitation (P) events (Fig. 2a).

80. Page 9, Line 278 Could replace "followed closely to Ta" with "follow Ta closely" REVISED

81. Page 9, Line 281 replace "of TPD" with "at TPD". REVISED

82. Page 9, Line 282 replace "similar patterns between sites" with "similar patterns at both sites" REPLACED

83. Page 9, Line 283 Soil moisture deficit compared to what? At which value does it start to be deficient? …with prolonged summer θ declines in 2012, 2016, and 2017 (Fig. 2f). Changed to declines instead of deficits so there's no specific threshold

84. Page 9, Line 283 "In summer" comma missing REVISED

85. Page 9, Line 285 "while all other times of the year TP39 was higher". Soil moisture was higher not TP39. Yes. during all other times of the year θ at TP39 was higher (Fig. 2g).

86. Page 9, Line 292 Consider replacing unit "day" with unambiguous "day of year (DOY)" throughout manuscript, first occurrence here. Replaced all cases of 'day' with DOY

87. Page 10, Line 295 Check meaning. "The response [...] to changes in GDD was considered as a trigger for SOS." The response is the trigger? I think GDD change is the trigger and the response of the forest to this trigger manifested in SOS. The response of the forest to increasing GDD was shown to be a trigger for the SOS.

88. Page 10, Line 296 "cumulative GDD" GDD is cumulative by definition, is it not? Total

89. Page 10, Line 297 Cumulative heat is not expressed directly in GDD, GDD is a proxy for absorbed heat as correctly stated above. I would omit the half-sentence "However, [...], which we calculated as" REMOVED

90. Page 10, Line 299 "represented" not anymore? check tense. Represents - REVISED

91. Page 10, Line 303 replace "start" with "are reached" REVISED

92. Page 10, Line 314 Omit first sentence of paragraph, it is a bit vague. "influenced by a certain degree of cooling"? REMOVED

93. Page 10, Line 316 replace "were found to be highly correlated" with "were highly correlated" REVISED

94. Page 10, Line 325 "At first glance..." Sentence seems vague. What do you mean by similar? Which properties of the forests responded similar to which forcings? What does "seasonal irregularities" mean? Difference between same season of different years or within one year between seasons? How do these irregularities govern annual fluxes (cumulative fluxes?). Highest contribution to sum during periods when forcings deviate from average behavior? Consider restructuring or omitting sentence. REMOVED
The water (evapotranspiration) and carbon (photosynthesis and respiration) fluxes were analysed in both forests from 2012 to 2017, with the seasonal patterns of these fluxes illustrated in Fig. 3 and cumulative fluxes in Table 3.

95. Page 11, Line 327 replace "within" with "at" REVISED

96. Page 11, Line 337 "...did not greatly benefit the forest..." seems unassertive. What do you mean? No increase in CO2 uptake? If the latter is meant, I would question the statement. Sure, when you look at average daily GEP, a longer spring increases n for the conifer forest and adds mostly low values (from earlier in the year) lowering the average. Looking at spring GEP/NEP sums might lead to a different interpretation. In all 6-years, spring was the only season when daily GEP was similar between the forests, as the advancement of SOS at TP39 did not statistically benefit carbon uptake due to seasonal meteorological conditions (i.e. low PAR, Ta, etc.) acting to limit photosynthesis.

97. Page 11, Line 339 Details about statistical tests could be inserted here. I am not sure what the p-value refers to, a t-test? Added a sentence describing tests. Using the analysis of variance (ANOVA) technique, t-tests were completed to evaluate statistical differences between the two groups (i.e. deciduous broadleaf vs. evergreen needleleaf) of data.

98. Page 11, Line 341 I would replace "minimums/maximums" with "minima/maxima", might be a matter of taste. Sentence removed at advice of reviewer/comment below

99. Page 11, Line 341 How is a maximum significant? Consider removing. REMOVED

100. Page 11, Line 342 RE was modeled not measured. greatest annual RE was found…

101. Page 11, Line 344 replace "let the year to have" with "led to" REVISED

102. Page 11, Line 346 see previous comment REVISED

103. Page 11, Line 349 response to what? Updated to behaved similarly

104. Page 11, Line 351 check meaning. Ta always high between rain events? In both cases, maximum rates of RE and ET occurred following precipitation events, as the soil was sufficiently wet, helping to promote ET and enhance RE through respiration pulses (Misson et al., 2006).

105. Page 12, Line 363 Should it be "sink" instead of "source"? REVISED

106. Page 12, Line 369 Check meaning. "NEP [...] exceeded TP39" Following SOS, daily NEP at TPD exceeded that at TP39 in all years except 2015 ($p < 0.01$).

107. Page 12, Line 385 "to" missing, should be "let to rates" REVISED

108. Page 12, Line 387 Consider replacing "deviations" with "variability expressed as standard deviation" and omitting the plus-minus sign in brackets. REVISED

109. Page 12, Line 391 "WUE varied [...] due to different [...] overall GEP and ET". Check statement, seems circular to me. Does it say: "The ratio of GEP and ET varies because GEP and ET vary"? REMOVED sentence

110. Page 13, Line 394 "..., the SOS began..." Reformulate, now it says "the start began" In 2016, an early SOS (March 15; DOY 74) promoted prompt increases in spring GEP, when Ta and ET remained low.

111. Page 13, Line 396 remove "forest" REMOVED

112. Page 13, Line 400 Same number for TPD and TP39. REVISED

113. Page 13, Line 405 monthly GEP and APAR sums or averages? Mean monthly

114. Page 13, Line 409 Sentence incomplete. "To better understand and the water...." Meteorological variables (i.e. Ta, PAR, θ, etc.) were analysed during the study period to better understand their impact on water and carbon fluxes within each forest.

115. Page 13, Line 410 remove "first". Sequence of analysis steps irrelevant. REMOVED

116. Page 13, Line 412 "the impact of winter soil water storage..." on what? A smaller secondary effect on ET ($R^2 = 0.83$; Table 4) was found for winter and early spring (January 1st to SOS) $\theta_{0\text{-}30cm}$, which helped to explain the impact of winter soil water storage and seasonal water availability on ET at the start of each year.

117. Page 13, Line 419 Consider reformulating "responses between". I would expect "the response of something to something else" REVISED to The response of monthly ET to monthly VPD was similar between sites

118. Page 13, Line 425 Maybe there is no linear relationship between GEP and meteorological variables. There should, however, definitely be relations with PAR. As far as I understand GEP was modeled using PAR, you should see the saturation curve you prescribed in the model (eqn. 2) in a PAR-GEP plot. You are correct. I believe here it's only considering the annual values, so no annual relationship between PAR and GEP.

119. Page 13, Line 426 There is an extra space after the closing bracket and "resulted" REVISED

120. Page 14, Line 429 Why "most importantly"? Mean or cumulative summer NEP? REMOVED most importantly …cumulative summer NEP ($R^2 = 0.99$).

121. Page 14, Line 431 "was seen" is not very elegant. Consider simplifying the sentence, e.g. "...spring was shorter due to..." For the evergreen conifer site, spring was shorter in years with the highest annual NEP due to rapid photosynthetic development.

122. Page 14, Line 431 "Higher summer Ta". Season average or half-hourly or daily peaks? Higher mean summer Ta decreased annual NEP, highlighting the influence of limitations due to heat stress.

123. Page 14, Line 434 "relationship between RE and spring Ta". timescales? annual RE, spring RE, sums or averages? At the deciduous forest, the relationship between annual RE and spring Ta ($R^2 = 0.77$) suggested that warmer springs generally acted to decrease annual RE.

124. Page 14, Line 437 "Lastly,...", "Ultimately,..." can be omitted. Sequence of analysis irrelevant. REMOVED

125. Page 14, Line 438 They sites do not emphasize, you do. REVISED – Highlighted

126. Page 14, paragraph starting in line 439 This paragraph requires more explanation. How were the model parameters examined? The methods section is not detailed enough about this type of analysis, Table 5 is also ambiguous ("GPP:Ta" sounds like correlation analysis. Should it be f(Ta) as in eqn. 1 to denote that the scaling factor is meant?). The scaling method is very interesting, it deserves a proper explanation for others to be able to reproduce it. Added a section in the methods: 2.4 Estimating effects of meteorological variables on carbon component fluxes. This helps to better explain the modeling and parameterization of the data outlined in the paragraph and Table 5.

127. Page 14, Line 445 "Outside of Ts". Sounds strange to me. Do you mean "apart from"? Yes. Aside from Ts_{5cm}, $\theta_{0\text{-}30cm}$ impacted summer RE at both sites.

128. Page 14, Line 447 Similar response of what to what? REVISED – similar trends

129. Page 14, Line 448 What do you mean with "predicted daily rate"? The observed fluxes were the result of a prediction? I do not understand, consider clarifying. Overall, the annual fluxes were a product of the season length and the estimated daily rates of the CO_2 fluxes that were in turn influenced by seasonal variability in meteorological variables.

130. Page 14, Line 451 replace "experienced by" with "at" REVISED

131. Page 14, Line 451 Typical meteorological conditions? Introduction says air temperature was consistently above the 30-year average. The meteorological conditions at both sites during the study period were characteristic of temperate North American forest ecosystems, characterized by four distinct seasons, with cold winters and warm summers.

132. Page 14, Line 455 "certain differences were primarily influenced" is a bit vague, which difference, why primarily. What about relief position, water content or soil type? Even with similar climatic forcings (i.e. Ta) seasonal deviations in Ts_{5cm} were found, likely influenced by the opposing forest canopy characteristics

133. Page 14, Line 456 "In this case" Soil temperature is always linked to incoming radiation. REMOVED 'in this case'

134. Page 14, Line 457 Mean Ts or each half-hourly value? In all years, mean daily Ts_{5cm} at the conifer forest was higher during each summer

135. Page 15, Line 459 What does "highly clumped" mean? High compared to what? In the conifer forest, branches and needles were closely clumped... highlighting that conifer canopies show less ability to fill canopy gaps, instead driven by shape.

136. Page 15, Line 459 Minor variations in APAR? Maybe true for fPAR, looking at Figure 2 APAR seems highly variable throughout an annual course. REVISED to fPAR

137. Page 15, Line 461 "Incoming radiation was directly absorbed by the soil" All of it? What about LE etc.? Not all energy goes into ground heat flux. In the deciduous forest,

Ts_{5cm} was higher when leaves were absent and a higher fraction of incoming radiation was directly absorbed by the soil.

138. Page 15, Line 464 Incomplete sentence. "...similar trends VPD..." similar VPD trends

139. Page 15, Line 469 "species specific responses shaped the timing of phenological events" Responses to what? Isn't it obvious that species type determines phenology? REMOVED

140. Page 15, Line 480 There is only one SOS per year. How can SOS have high variability in a warm year when there is only one value per year? …variability (between years)

141. Page 15, Line 486 Seems contradictory. Either timing of senescence and soil moisture are not related ("insignificant") or the forests experienced "later senescence dates with decreased soil moisture". If the finding opposes previous studies it would be interesting to read about possible reasons (water stress?). Both forests experienced later senescence dates with decreased θ (although likely due to increased Ta). For the conifer forest, the two years (i.e. 2012 & 2016) with continued heat and drought stress saw the latest dates of senescence, while at the deciduous forest, greater mean summer θ led to earlier senescence in all years but decreased θ extended senescence.

142. Page 16, Line 496 replace "in the deciduous site occurred a month (31 days) before that of the evergreen..." with "at the deciduous site occurred one month (31 days) earlier compared to the evergreen..." REVISED

143. Page 16, Line 497 omit "experienced" REVISED

144. Page 16, Line 500 "only limited by their specific leaf strategy". **This seems to be a major argument (Title!)**. Can you expand more, why "only" limited by this strategy? … season length from prolonged autumns, limited by their specific leaf-strategy. But ultimately decided to change the title to not include 'leaf strategy'

145. Page 16, Line 503 "Ta anomalies [...] strongly determine the carbon sequestered". Check meaning. Ta determines the carbon? Maybe the amount of carbon? Are you sure the anomalies determine C uptake as opposed to the average temperature? REVISED Anomalous Ta (extreme heat or cold) and seasonal fluctuations in water availability (θ) over a predictable course of the year were shown to strongly impact the carbon sequestered in many forests.

146. Page 16, Line 505 ",... higher Ta..." Anomalies, average, min/max? higher mean Ta

147. Page 16, Line 506 "drawback" only if maximum sink strength is the goal. why judge? Conceptually, higher mean Ta will promote longer growing seasons and greater GEP, though increased RE may also be expected

148. Page 16, Line 507 typo: "differing forest[s] responses" REVISED

149. Page 16, Line 508 "season length in 2012 was the second shortest despite..." Maybe there is another factor co-controlling season length then? It's definitely possible. The determination of the phenological dates and the growing season length were modeled from GEP data, which was reduced in 2012 at both sites as a result of drought.

150. Page 16, Line 509 Maybe not "despite" but "because" high air temperatures. There could be a temperature optimum (parabolic function) for GEP. What does "record Ta" mean? Daily/Half-hourly maximum, mean, average above long-term average? At both sites, the overall growing season length in 2012 was the second shortest (behind 2014), as a result of the anomalously warm Ta experienced throughout much of the year.

151. Page 16, Line 510 Why "also"? Section already talks about outlier year 2012. REMOVED

152. Page 16, Line 512 "due to thinning performed..." Definitely! This fact is introduced too late. Such a disturbance could single-handedly be responsible for budget deviations in 2012 and override all possible reasons stated before. The disturbance must be stressed and discussed more and earlier. Introduced the thinning and management in the methods

153. Page 16, Line 513 "higher Ta and low theta" Annual/seasonal mean or each/most half hours/days? Replace "acted to enhance" with "enhanced" Additionally, higher daily mean Ta and low θ enhanced RE in the conifer forest, but significantly reduced RE in the deciduous forest.

154. Page 16, Line 525 replace "due to comparable decreases" with "due to comparably large decreases" REVISED

155. Page 17, Line 535 "very similar NEP" at both sites vs. Page 17, Line 538 "led the conifer forest [...] to have a greater magnitude of annual NEP". Is NEP similar or different? In all years the magnitude of GEP and RE were greater in the conifer forest, however, analogous reductions at the deciduous forest led the two forests to have very similar mean annual NEP (despite large annual differences).

156. Page 17, Line 543 "...some of the highest rates..." Highest single half-hourly fluxes? REVISED – highest daily rates

157. Page 17, Line 543 "especially the deciduous forest)." remove extra full stop. REMOVED

158. Page 17, Line 543 What is the definition of a "normal" year? Is this really the conclusion of Griffis et al and Gonsamo et al.? Do they use the term "normal"? Are you surprised that the forests adapted to average site conditions? Before, I read the conclusion that the deciduous forest NEP could profit from comparably dry conditions. Yes, they use the term normal, which was edited here to better explain the thought process. This suggests that both forests favor meteorologically "normal" years (comparable to the 30-year mean meteorological conditions), equivalent to the conclusion of Griffis et al. (2003)

and Gonsamo et al. (2015). Therefore, under future climates, which are predicted to be warmer compared to the current 30-year norm for the area, the carbon sequestration capacity of both forests may be reduced, although to a lesser effect at TPD.

159. Page 17, Line 548 Statement in first sentence of paragraph is trivial, omit sentence. REVISED

160. Page 17, Line 549 "With insufficient water availability annual tree growth and productivity may be limited". Seems circular to me: When you say insufficient, I suspect you implicitly have in mind that water availability is not sufficient for optima productivity? To me the sentence says then: When productivity is limited it is limited. REMOVED

161. Page 17, Line 555 "ET responds year-round" What do you mean? There is no particularly rainy season? Much like RE, ET responds year-round (with summer maxima), so warmer spring or autumn periods often lead to annual increases in ET

162. Page 17, Line 555 "...so warmer spring or autumn periods often lead to annual increases in ET" Warm summer did not impact ET? Yes it did, outside of the summer maxima

163. Page 18, Line 559 "An opposing ET response..." To what? "...was measured in the coniferous forest" Any idea why? A contrasting ET response was measured in the coniferous forest. The deciduous forest measured increased ET during the hot/dry year of 2016, but it was too dry at the conifer forest, leading to an opposite response

164. Page 18, Line 564 "...little summer and annual P removed most of the water from the system, significantly reducing ET" There is no negative precipitation, removal is the wrong term here. The process that (vertically) removes water from the soil is ET, why is ET reduced then? Please clarify. In our case, high summer Ta, the lowest $\theta_{0\text{-}30cm}$, and very little summer and annual P (input) into the system, significantly reduced ET, while RE continued to rise.

165. Page 18, Line 565 "timing of summer P" I do not understand, what is meant by timing? Is there only one rain event during summer? Do you mean a peak precipitation event? At the conifer forest, the timing of summer P events appeared to influence ET (i.e. 2013)

166. Page 18, Line 565 "...the availability of rainfall [...] led to the greatest demand for water" Sorry, I do not get it, consider revising. REMOVED

167. Page 18, Line 566 "...differing response" to what? opposing responses of ET to θ

168. Page 18, Line 574 "...to respond similarly" to what? We found the course of annual WUE of both forests to respond similarly across all years

169. Page 18, Line 577 Is there a reason you picked the forest in Ohio for comparison? The Ohio forest was used as WUE was researched in a regionally local oak-dominated forest

170. Page 18, Line 578 "..., this implies..." What does "this" refer to. I cannot follow. Assuming similar daily rates of carbon assimilation (GEP), higher WUE implies a higher evapotranspiration flux at the conifer forest (Augusto et al., 2015), which we saw.

171. Page 19, Line 610 "significant abnormalities were measured between sites" Strange wording, do you mean "differences between sites"? Yes, REVISED

172. Page 19, Line 610 "...meteorology was shown to greatly impact fluxes at both sites, though to varying degrees" Either the impact is great or it is sometimes great and sometimes minor (= varying degrees). REMOVED greatly. Summer meteorology was shown to impact fluxes at both sites

173. Page 19, Line 614 Why "Conversely"? No contradiction to sentence before (which talks about drought years), this sentence about all years. Secondly, NEP is also the result of respiration and photosynthesis at the broad-leaved forest. The annual NEP at the conifer forest was ultimately shaped by total summer NEP.

174. Page 19, Line 618 "Both sites saw average ET, but increased NEP during 'normal' years..." What is the definition of a normal year, 30-year average? What is your baseline for a "normal" NEP? Should be average NEP during average years, shouldn't it? How can NEP deviate (be increased) from the average during an average year then? Clarify. Both sites saw average ET, but increased NEP (against the 6-year study mean) during climatologically (30-year mean) 'normal' years, but only the conifer forest saw annual reductions in carbon sequestration during drought years.

175. Page 19, Line 621 "...while the response of the conifer forest remains uncertain." Sure, there is uncertainty, which is true for the projections about the deciduous forest's sink strength as well. Why not report some of the ideas about conifer forest in a future climate developed before in the discussion? We also found that drought-induced RE increases or GEP decreases may impact the overall net carbon uptake in the coniferous stand. Our study suggests that the deciduous forest will continue to be a net carbon sink under increased temperatures and larger variability in precipitation under future climate changes, while the response of the coniferous forest will continue to remain uncertain.