Review Neill et al.

General comments and recommendation

The manuscript by Neill et al. presents an ecohydrological modelling study about structural changes of forest regeneration and the effect on water flux portioning, water ages and hydrological connectivity. They use the EcH_2O-iso for a small experimental catchment in the Scottish Highlands, and simulate a baseline and two land cover change scenarios, a thicket and an old-open forest.

The modelling study gives the opportunity to create an old-open forest which might be very difficult to create in a field experiment due to long time period over 100 years, and agriculture forest use (tree age around 40 years). This stage of old forest might happen if the forest harvesting stops, hence especially for stakeholders it is interesting to see the influence of such forest development. But also, the research community gets an idea about the effects of a thicket and an old-open forest to the hydrological conditions. This could help to see the field experiments with a different angle and to support information around such experimental sides.

The text is well structured with meaningful subheadings and well-structured paragraphs. The manuscript is in the scope of the HESS journal and gives new insights in the field of tracer-aided ecohydrological modeling.

I see an especially need to strengthen the text for an easier readability with less abbreviations and clear sentences. The figures and table also need some revisions for an easier readability, e.g. bigger fonts. Here I give some general comments and specific comments at the end. ("Line" is abbreviated with "L")

General comments

- Abbreviations
    - I suggest to reduce the abbreviations for easier and an undisturbed readability. Especially since some abbreviations are just used a few times (e.g. SW 4x, VWC – 6x, RZ – 7x, OLF-13x). From my point of view, I would only keep LAI and use the full words for the others. ET and GW, might be an option to keep as well, but it still interrupts the reading.
    - (As an alternative, a table with all the abbreviations could also work)
    - Some abbreviations are not introduced in the text e.g. NE (Line 286), SE (Line 463), NW (Tab1, L 385, L403)
    - Leaf area index is mentioned in L 93, but introduced in L 186, I would also suggest not to introduce the LAI in italic, or if this is really necessary only use the italic version, also for figures and tables
    - Bruntland Burn, I would suggest to keep the whole name instead of just BB

- Figures
    - In general, the figure captions are quite short, maybe some more information for the reader to understand the meaning of each figure can be added.
    - Fig. 1a:
        - the symbols should be the same for the same type of station e.g. gauging station in the river (one symbol), weather station (another symbol), ect.

    - DW abbreviations should be explained (unclear for me what it could be)
    - Map in the left corner is too small, better to use a bigger map with some parts of Europe to show persons from everywhere, where the catchment is located
    - The whole figure looks a bit unstructured and a bit chaotic, maybe it is better to split in two figures
    - 1g) Bog pine, it seems that there is no bog pine at all, is that right? Order the scaling of the vegetation fraction to undifferentiated
    - The font size of "Vegetation fraction" including number is too small, also the legend of h),
    - The font size of the headings of c) to g) could be little bit bigger
    - In Tab 2, Groundwater wells are mentioned. Maybe you can also include the location in this figure
- Fig. 2:
    - What is "Regen-baseline", better (regeneration – baseline scenario), since there is enough space to write the full text
    - Maybe it is an option to include Fig 1 c) to g) in Fig 2, to reduce the overloaded Fig 1.
- Fig. 3:
    - Please add a legend to every subfigure, starting with first observation, second spread, or the other way around.
    - b) (In $m^3 s^{-1}$), guess it is just ($m^3 s^{-1}$)
    - font size could be a bit bigger, for easier readability
    - For the caption I would suggest: a) Precipitation; b) ~~and~~ ~~of~~ observed and simulated Discharge; c) […]
- Fig. 5:
    - Discharge again (**ln** $m^3 s^{-1}$)
    - What is the brown color? The red on top of green? This is hard to see, even for a non-color-blind person (maybe you can find other colors e.g. red and green is not visible for many persons)
    - Caption maybe: c) Stream **water** …
- Fig. 6:
    - "Baseline:" It is better mentioned it in the Figure caption, but not as a heading, if it is always the same for all cases.
    - For comparison, it would be much easier to read and compare the subfigures, if the "spread"- median daily average would always be the same size. e.g. from 0 to 30 or so for the blue ones and 0 to 2.5 for the green ones.
    - I would also suggest to write groundwater instead of GW and evapotranspiration instead of ET, since it is enough space to write the full word.
    - font size should be a bit bigger, for easier readability
    - what are the brown pixels in a) and e), please explain e.g. in the figure caption
    - Caption: please define the abbreviation "L1"
- Fig. 7:
    - What are the brown pixels in a) and e), please explain e.g. in the figure caption
    - To get an easier overview I would suggest to write the month in the middle over the first and second subfigure column, and the third and fourth subfigure

column, since they are always showing the same time frame, just the scenarios are different.
        - Again, please use the same spread for all figures maybe 0.5 to -9
        - Caption: e) GW flow instead of Groundwater flow

    - Fig. 8:
        - Again, please use the same spread for all figures maybe +1 to -1
        - Again, I would suggest to write the month in the middle over the first and second subfigure column, and the third and fourth subfigure column.
        - font size should be a bit bigger, for easier readability
        - for an easier overview you might consider to include the timing, so 22 July 2013, 10 August 2014 and 30 December 2015 or dry summer period, summer wet period and 100-year return period flood, or something like this
    - Fig 9:
        - The figure caption does not fit on the same page, so the figure must be small, but it is no option to just minimize the total figure, since already now the text and numbers are very hard to read
- Tables
    - In general, the table captions are quite short, maybe some more information for the reader to understand the meaning of each figure can be added.
    - Tab 1:
        - The whole "cover" column should be left-justified, or why is only "A baseline" right-justified?
        - Instead of just "cover" maybe "proportional aerial coverage" or something like this
        - The use of italic is confusing, maybe use bold instead of italic for "Baseline", "Thicket woodland", …
        - Notes a): "pre-existing" with small letter
    - Tab 2:
        - What does "Full" stand for? Full time period? Then maybe also mention again how long this study period is or from x to x.
        - I would suggest to only use "and" or "&", not both in the same table
        - You might want to explain the A and B behind Forest and Heather
        - Where is the location of "deeper well" 1 to 4, maybe include in Fig 1.
    - Tab 3:
        - Is it really necessary to give the decimal place, full numbers are easier readable (like done in Tab 4)
        - What is the added valued to include the second columns with the differences in seasonally averaged flux totals → The table is quite confusing, so maybe it is better shorten the given information, if possible (this also applies for Tab 4)
- Words
    - please stick to one version of "old-open" or "old open" including the abstract, tables and figures
    - instead of Oct-Mar and May-Sep I would introduce the words of summer and winter or, dormant season and biological active season, beside a better readability this might also

be an improvement of the figures, if you want to stick to the month, I would suggest to write the full names like October to March.

- Introduction
  - L 95 – 99 You explain, that the soil properties are held constant, but then further describe that they might change. I guess, it would be very interesting to see the effect of soil property changes. How strong is the effect here?
  - Also, climate change has an important impact to the soil and plants, especially in a 100-year scenario. Maybe you can further explore this part in the introduction or later on.

- 3.1 The EcH2O-iso model
  - The model description part with its concept is a bit imprecise.
  - The kinematic wave model in the groundwater context (L.154 -160) is not so common, it is normally known for open channel routing. Maybe you can explain this point a bit more detailed. From the description, the term GW is maybe not the right one in L 157, maybe it is interflow? Is there an exchange of river and groundwater (in one or both directions)?

- Calibration
  - Give less references to the specific parts of the figures and table. e.g. L339 to 342 (Tab 3) at the end of the sentence is enough. There are many other places where the references to Tables and Figures can be reduced for a much easier readability, without losing information. (e.g. L345, L 346, L 355 (when the whole paragraph is about the figure introduces at the beginning it is not necessary to refer to all the subfigures after each sentence.)
  - 4.1 Baseline calibration: refer more to the Table 2, e.g. with the MAE for discharge.

- Discussion
  - Sometimes difficult to read, especially the very long sentences: L 480 – 483, L 491 – 494, L 507 – 510, L 542 – 545, L 560 – 563
  - Here you introduce the terms of dormant season and biological active season (L490 – 491), and winter and summer (e.g. L 505), but without giving the month you refer to in you catchment.

Specific comments

L 39 – 42: very long sentence, please split in two

L 82: maybe delete “which”

L 90: maybe give the catchment area in brackets, and not only call it small

L94 – 99: changes in soil properties are not included in the model, but here explained that it is very likely to happen. Why are you not including soil property changes when you think they are happening and important? I guess it needs more thoughts why you did not include them. Also, a connection from the missing soil property changes to the specific objectives of the manuscript would be helpful.

L 106: reference to Fig 1, not only Fig 1a, the whole figure gives information about the catchment

L 116: (SNH, 2016) instead of [SNH, 2016]

L 123: Maybe better: Mean annual precipitation is 1000 mm and potential evapotranspiration is 400 mm, with the […]

L 125: Maybe better: […] mean temperatures ranging between 1 °C in winter and 13 °C in summer.

L 128: please include catchment after BB, also in the other cases in the manuscript so "… BB catchment" e.g. L 197, L 210, …

L 149: please explain the soil layer L1, L2 and L3. Is the L1 the top most? How are they defined, maybe with the soil horizons? Or just with a given depth?

L 155: please give the source of the Green-Ampt model

L 168: what is meant by "spatially uniform", please describe further

L 182: better: 100 m x 100 m grid

L 183: add "in the supplementary Table S1." Or something similar, to know where to find the table, since it is not in the manuscript itself. Also, at other places when referring to the supplementary material e.g. L 185, L 190, L221, …

L 188: What kind of channel? River channel?

L 207: "to avoid over-emphasising high flows" – compared to what? Compared to NSE?

L 271: add … *periods of biological growth and dormancy in our study area*. Or something similar

L 289: model skills instead of model skill

L 291: Tables 2 and S2, since the supplementary, should just give additional more detail information, so is less important and should be mentioned as a second.

L 369: "zero" instead of "0"