06.09.2022

Dear Editor,
We have revised the manuscript according to the reviewer report. See the answers below for details. We would like to thank you and the two reviewers for your contribution. Your feedback has been very valuable in improving the quality of the paper.

Kind regards,
Thea Roksvåg and co-authors.

Response to the reviewer comments (report #1):

Reviewer comment:
162: What about the parameter ν?
225-233: the parameter ν is never discussed. I guess it has been set when using SPDE/INLA, but the authors should indicate it more clearly

Response: nu is often not estimated in INLA applications, but set to a fixed value. We have added an explanation on page 8, line 180.

Reviewer comment:
220 and following: I wonder why the prior on β_0 and β_1 are shown here instead of Section 4.3

Response: In INLA, beta0 and beta1 are treated as a part of the latent field for technical reasons, but you could also think of them as parameters. We have moved the beta0 and beta1 prior specifications to Section 4.3 as suggested.

Reviewer comment:
237: In response to my comment on the independence of x(u) and $\alpha(u)$, the authors have added a sentence stating that they are conditionally independent. My question is: do you mean conditionally on h(u)? Recall however that h(u) is not a random quantity, but a (deterministic) covariate that contains the simulated value generated by the process-based hydrological model. Since h(u) is deterministic, the correct wording is that x(u) and $\alpha(u)$ are independent.

Response:
They are independent conditionally on their parameters, i.e. the sigma and the range. This is now clarified on page 10, line 238.

Reviewer comment:
257:I failed to see why h(A) should be computed; We do need the values h(u) for $u \in L_A$, bu why do we need the sum h(A)?

Response: We have revised this sentence. See page 11, line 257.

Reviewer comment:
Section 4.1.1: notice that with this modelling, q(u) could also be negative (in theory; I guess it never happened in practice).
269: also true for q(u)

Response: We have added that also Equation (5) can contribute to negative runoff on page 11, line 270.

Reviewer comment:
333: ideally, s_i^{PP} should depend on the length of the series

Response:
Yes, agreed. We have now mentioned this on page 13, line 340 (in addition to be discussed in the discussion section).

Typo list:
We have corrected the typos mentioned here.