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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Coupling urban drainage–wastewater systems and electric smart grids during dry periods: a gain/loss framework using the relative economic value with ensemble flow forecasts to predict the switch" *by* Vianney Courdent et al.

Anonymous Referee #2

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This paper presents an interesting water management situation where an economic framework is used and takes advantage of probabilistic predictions. The decision to be taken is to switch the management objectives from one side maximizing the hydraulic capacity of a wastewater treatment plant and limit the impact of combined sewer overflow to the other side minimizing the cost of energy consumption by controlling the timing of wastewater transportation and treatment taking the energy market into account. The problem is complex and tackled with appropriate tools and data. This manuscript

is worth being published in the journal conditioned on clarifications requested in the following.

The problem is exposed as a dynamic one (e.g. P4 L25-26, P9 L27-30, P14 L21-22). However it is solved as a static one: the relative economic value is presented as a function of the gain/loss ratio. The decision threshold (i.e. the fraction of members of the ensemble of predicted discharge exceeding a discharge threshold) beyond which the manager decides to switch from energy optimization to safety of the system is deduced from the envelope of separate curves. As for the choice of a method for the post-processing of numerical weather prediction model the maximum threat method extends significantly the range towards low gain/loss ratios resulting in positive relative economic values compared with the aerial overlap method. Having these results, the methodology has still to be proven in real dynamic situation i.e. where the decision to be taken at a given time depends on the decisions already taken. What is missing in order to that? An order of magnitude of the losses in case of combined sewer overflow, a hydraulic model able to reflect the management actions? The authors are asked to make clear the scope of the paper and either add new results or add comments in the outlooks.

I missed information regarding the methodology. No lead time is specified with the results. Are all the ensembles (2 years x 4 issue hours) used at hourly time step to the forecast horizon of 54 hours (P5 L14-18)? Or 2 days (P3 L5, P12 L11-26)? How the scores are computed regarding both the issue time and the lead time? In case the forecast horizon is 2 days, how do the authors deal with the decreasing skill scores or relative economic value of the predictions with the lead time?

Specific comments

P3 L26 "spatial" instead of "special". Do you have a reference for this assertion?

P4 L1 "The radius of the neighbouring area included is used as a parameter during the decision making, in addition to fEM." should move from introduction to the methodology

section (2 Material: . . . 2.2). P11 L18, Figure 7 Results considering a radius of 6 grid cells are presented. This radius has been optimized on REV? What is the sensitivity to this parameter?

P5 L14 UTC

P6 L18 and other occurrences of “forecasted” should be “forecast”. “summing up to a total of n event assessments” : this part of the description methodology should be made much clearer (see general comments).

P7 L4 “Methodology” : section 2 involves also description of the methodology. Section 3 is more related with validation.

P10 L6 and other occurrences (e.g. Table 5, Figure 5, 8) “always optimize”, “never optimize” sounds strange because the paper is all about optimization. Find a short reference to the two objectives (like “always energy objective”).

P11 L20-29, Figure 7b, Table 4 The slightly better upper bound provided by the areal overlap method can’t be seen on the figure. How the complementarity of both post-processing approaches can be used in a real situation? Through the gain/loss ration and the decision threshold?

P12 L15-18 “can yield up to 8 €$^{'}$ what is the order of energy consumption we are dealing with? What is missing is an overall estimation of the cost of energy during the 2 years and how much is gained during the same period using the switching strategy optimized based on REV results.

P24 Figure 9(a) Add a legend for the two curves.

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