

## ***Interactive comment on “High resolution monitoring of nutrients in groundwater and surface waters: process understanding, quantification of loads and concentrations and management applications” by F. C. van Geer et al.***

**F. C. van Geer et al.**

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We are grateful for the valuable general comments and the many detailed comments given in the annotated manuscript. We have in the revised manuscript followed the suggestions for shortening of the manuscript by deleting repetitions and being more precise in the wording of sentences. We have also followed the suggested strengthening of the connection to the application of high frequency monitoring to land and water management. In specific we have revised the manuscript according to the following: ‘The paper is an introduction to a special issue. As such it needs to introduce the sub-

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ject of the special issue, state its relevance, and indicate how the special issue came to be. These aspects are all covered in the paper. That being said, it takes some effort for the uninitiated to grasp some elements of the paper. Jargon from applied water quality research is used freely. While the terminology within that context is quite clear, the various buzzwords have very different meaning in other contexts, and I would like to see this source of ambiguity removed by making the phrasing more precise and specific.’ We have checked the text throughout the paper, defined terms in the context and rephrased where necessary. ‘I think the paper can be shortened quite a bit. There is some repetition in there, and the information density is low in some sections, with filler words used to start sentences, and text devoted to state the obvious. Particularly the Aristotelian categorizing in section 2 was tedious to read. This is not to say the list should go entirely, but probably it can be presented more concisely.’ We have made the section 2 more concise in the revised manuscript. ‘I like the very explicit connection to the applications of the science, and would even advocate for strengthening that by more clearly identifying the stakeholders and the main actors in the areas of land and water management and legislation that are going to be the main users of this research.’ We have identified stakeholders and actors in land and water management in the introduction of the paper. ‘All in all, substantial rewriting is needed in my opinion, but nothing that cannot be managed with some effort. I am attaching a file with some detailed comments that hopefully offer some useful suggestions. Please also note the supplement to this comment: <http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-169/hess-2016-169-RC1-supplement.pdf>’ P1. L0: Sometimes, paragraphs are separated by white lines, and in other cases the next paragraph starts on the next line (without indentation or white line). Please check the format guidelines and make everything consistent. We have checked the guidelines and made everything consistent.

P1. L0: The reference list seems to break up last names: van der Velde becomes ‘Velde, van der’, for instance. In the text this is then referred to as Velde. This is very confusing - please keep last names in tact, spaces and upper/lower case included. We have checked all references and made them consistent.

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P1. L0: For a paper that introduces a special issue there are a lot of self-citations. The main references in the list are contributions to the EGU sessions “Monitoring Strategies: temporal trends in groundwater and surface water quality and quantity”. We have to cite all relevant abstracts from these sessions. P1. L12: The abstract requires some inside knowledge to be comprehensible. It could use a few more elaboration about what exactly is meant since several terms (‘management’, ‘monitoring’, ‘mitigation’, to name a few) are meaningful in many contexts, and could be misleading for those readers who are familiar with these terms from other backgrounds. We have checked the terms throughout the whole text and have tried to define them in this context. P1. Line 20: management of what? ...land and water management...? See previous reply. P1. L24: scales of what? We have added: ‘of nutrient dynamics’ P1. L24: I presume those relates to high-frequency monitoring of nutrients. Yes. We have added this to the text. P1. L27: plural vs singular. I think plural is better here. Agreed – we have changed accordingly. P2. L2: This is awkward - it reads like the reversal is adverse. Please rephrase. We have rephrased in the revised manuscript. P2. L2: are concerned Agree- we have changed accordingly. P2. L7: skip, it is implied in the remainder of the sentence Agreed – done in the revised manuscript. P2, L.18: Later in the text you say there are 10. Should be 10 – we have checked for that in the revised manuscript. P2, L23: Please be specific Minutes to weeks P2.L24: Donald Trump talks a lot about management too. What is being managed, and by whom? We have defined management in this context. P3.L6: This tandem of terms appears a few times in the paper but is never really specified. I can guess what it refers to, but that’s only because I am reasonably well versed in the field. The link to EU directives for instance is never made very explicitly, and the rest of the paper does not refer to national legislation or regional (ground-)water authorities at all. In fact, the only stakeholder that have been mentioned explicitly so far are scientists. We have defined management and policy in this context (see previous point) P3. L13: If F.C. Geer in the reference list is the same person as the first author, what happened to ‘van’? We have made the references consistent. P3. L15: ‘depend on’ ? Might be better. We have changed it accordingly.

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P3. L17 – 20: This is very useful! Thanks! P3. L24: I do not think this is a word. Increase of the concentration

P3. L29-30: ...physically-based sensors and measurements with time intervals that are constant or inversely proportional to the flow rate. Agree, Changed accordingly.

By the way: what is a physically-based sensor? Are they not all? In contrast to chemical analysis. P4, L1: This selection has a lot of lists, which makes it tedious to read at times. This can probably be shortened or otherwise be made more appealing. The information density is not always that high. We have shortened the text and tried to make it more to the point. P4. L13. All this sounds quantitative, very hydrological. Yet in the next sentence you bring in solute concentrations. How are these sentences linked? High frequent monitoring is relevant for understanding quantitative flow as well as nutrient transport. We have clarified in the revised manuscript. P4. L13: of what? Of fluxes and concentrations P4. L22: van der Velde. See previous reply. P4. L25: to what? To rainfall events, water management measures and other driving forces. P4. L25: I do not think ground waters should be plural. Perhaps replace by ‘surface and groundwater bodies.’ Agree. P6. L1 What does this mean? Source identification. P6.L18: plural Agree. We have changed it accordingly. P7. L6-7: Is this not obvious? We have skipped this sentence.

P7, L9-10: Repetitive We have skipped this sentence P7. L13: Filler words - can be skipped. Agreed P7. L14: Phrased like this, one wonders how it could be otherwise - why would one prefer a time series with a low resolution over one with a high resolution? What we mean to say is that high resolution time series open new possibilities that are also useful for longer term monitoring objectives. We have changed the text to make this more clear in the revised manuscript. P7. L26: high-pass filter? Yes, we will add this term. P8. L10: Typo. We have corrected this in the revised manuscript. P8. L12: Confusing, please rephrase. We have rephrased in the revised manuscript. P8. L13: low-pass filter? This creates a nice contrast with 3.1 (high-pass filtering), but you do not at all highlight this. On first reading I even thought it was repetitive.

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Yes, we have added the term low pass filter in the revised manuscript. P8. L21: Filler words, shorten or skip. Agree. We have skipped it in the revised manuscript. P8. L24: You just list them in Table 2. Changed to 'list' P9. Table 2: Change accordingly. We have changed in the revised manuscript. P9. L4: Indeed 10 papers. Agree. P10. L19: explain abbreviations. Agree P10. L26: Is it not the other way around? We have rephrased to make it more clear. P10. L28 -29: These are stakeholders that can be identified (along with others) earlier in the paper. and This is the first time in the paper that the term management receives a clear qualification. This needs to be done much earlier in the paper. We have defined earlier in the introduction section about meaning of management.

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