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Interactive comment on “Regional analysis of groundwater nitrate concentrations and trends in Denmark in regard to agricultural influence” by B. Hansen et al.

Anonymous Referee #1

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General comments:

The paper is significant because it addresses an issue very important for society, nitrate in groundwater, as well as it presents and explains methodological approaches to cope with the complexity of this issue in the context of managing it on the macro-level. It is a challenge for research to determine the relationship between policy measures taken to reduce nitrate concentrations in groundwater and their impact. The authors do not propose a methodology to assess this whole relationship but they show an important step on the way that leads to corroborating assumptions on the effects of policies. It is important that such methodologies are discussed and shared. They also present

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an evaluation of interesting data from Denmark. The paper is overall well written. In section 2 the background and methodology is well explained, naturally needing to refer to other publications for details because of the complexity of the approach.

Comments concerning a section and figures:

Section 2.6: N-surplus based alone on livestock units: It is surely so that a rough approximation of N-surplus over this time series is better than nothing and this looks like an interesting approach to do so. I think it is necessary to mention in this section that N-surpluses can still differ substantially from this, for example, because of distribution of livestock in the regions and individual farming practices, even though on this macro-level this obviously levels out.

Fig. 2 is very small in the print out. Maybe it would be useful to reduce it? Maybe use just a. It is enough then to have numbers of upward and downward trends in the table.

Fig. 3: It is very difficult to recognize the different regions. I would reduce the lines to DK, region with highest N-surplus, region with lowest N-surplus and Nitrate in GW. The information of all the regions in this figure is not relevant for understanding and there is not much information in it concerning the trends since they have almost the same trends, just on different levels, because their differences are only dependent on the livestock units if I understand correctly. So mentioning the different regions in the text and having them in Fig. 1a should be enough.

Comments/correction concerning specific sentences:

P 5323 r 18: Surely, it is important to acknowledge the role of N fertilizer in food production. However, “The production of nitrogen fertilizers helps keep world crop productivity one step ahead of human population growth” sounds polemic to me.

P 5331 r 9: “nitrate interface” is not used in fig.1, just “redox interface”. Plus I don’t understand the sentence.

P 5332 r 7: mowing average → moving average

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P 5334 r 15: "... effect of reduced nitrate leaching on groundwater...": maybe better say: effect of N-surplus because that is the determinant you where using before. Also it is trivial that more N leaching brings more N to the groundwater. Or do you mean the effect of "slower leaching" rather than reduced leaching because you refer to the younger and older groundwater afterwards?

P 5335 r 9-11: "evidenced": The relationship between regulation and reduction of nitrate in groundwater is strongly indicated or suggested by looking at the time series. However this is no evidence in the scientific sense.

Interactive comment on Biogeosciences Discuss., 9, 5321, 2012.

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