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Interactive comment on “Detection of wetland dynamics with ENVISAT ASAR in support of methane modelling at high latitudes” by A. Bartsch et al.

Anonymous Referee #1

Received and published: 28 October 2011

This paper presents a method for detecting inundated terrain using C-band SAR back scatter. The mapping of inundation dynamics is useful for many reasons including the estimation of trends in greenhouse gas emissions in northern latitudes in response to climate change. Several, mostly passive, methods have been used in the past. SAR is an attractive alternative, although as indicated by the authors, C-band SAR is not optimally suited for wetland detection. Nevertheless, as demonstrated in this paper, useful information can be obtained. In my view, this paper makes a useful contribution. The method is rather straightforward and leads to results, which look reasonably convincing. Some further effort is needed to clarify several formulations, which currently make it difficult to understand to details of the approach. Besides the

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corrections listed below, it would be good if one of the English coauthors would have careful look.

GENERAL COMMENTS

The discussion focuses a lot on the application to methane emissions, which is not really the central topic of this investigation. In particular the detailed description of the Gedney et al. emission parameterization does not seem relevant here, other than to emphasize the link between wetland area and methane emissions. This, however, could be done in 2 sentences. Instead it would have been useful to put the results in a wider perspective. For example, I wonder how representative the results are for a more general application. As explained by the authors, the conditions were chosen such as to avoid known or expected shortcomings of C-band SAR. What are the prospects for using the proposed method in a large scale application?

In the discussion section the suggestion is made that limitations in detecting small wetland fractions are not so relevant given the limited sensitivity of satellite sensors of methane. However, even if the spatial resolution of those sensors is comparably low they may still allow quantification of regionally integrated emissions. A systematic underestimation of the role of small lakes could therefore still cause a relevant mismatch on the regional scale.

It is mentioned that the data availability is limiting. As I understand it this is because only wide swath data are used. It is clear that wide swath is desirable because it improves the coverage, but if the number of available scenes is so low then the normal swath might yield more useful data in the end. It should be explained better if the use of wide swath limits or improves data coverage.

The relationship between wind, precipitation and water fraction in Figure 7 is not very convincing. Given the variability of the meteorological patterns and the fact that the data are not collocated with the SAR data it is not clear to me if a relationship is to be expected at all.

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TECHNICAL CORRECTIONS

Abstract: 10 day update interval: In a situation where the number of data is limiting I don't understand why the update interval (=return cycle?) should be 10 days or longer. It is clear that bad scenes will stay bad for a while, but good scenes will stay good for a while.

Abstract, line 29: a comma between “constraint” and “future”

8244, line 8: “at the expense of”

8245, line 11: “in northern Eurasia”

8245, line 21: “viewed by side-looking sensors”

8246, line 4: A further problem related to the use of C-band radar is the penetration . . .

8246, line 19: “because of” instead of “due to”

8246, line 23: “because of” instead of “with regard to”

8247, line 1: “in a sensitivity analysis”

8247, line 22: Why?

8248, line 8: “, which” instead of “what”

8248, line 12: “achieved” instead of “achievd”

8248, line 14: “Variations in the difference between the maximum and minimum”

8248, line 19: It is not clear to me what is meant by “region growing”. A reference to this method would help here.

8248, line 23: “verification” instead of “description”

8248, line 24: “within 3 sigma” means “between 0 and 3 sigma”. I cannot imagine that this is what is meant.

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8249, line 21: Does this assume that all cells get inundated at least once?

8250, line 7: how do you distinguish ice from water?

8250, line 11: “there is a linear relationship between threshold value and water fraction”

8250, line 16: “during the summer period”

8250, line 17: “, which can be”

8250, line 20: if there is no bimodal distribution, then how do you know that the inundation fraction is $> 5\%$?

8250, line 20: It is unclear how these numbers (20-30 scenes) related to the previous sentence .

8250, line 23: “stations of the WMO network with wind records ...”

8250, line 26: “the covering 0.5 degree cell?” I did not understand this sentence.

8251, line 3: “times with drop” What is meant here?

8251, line 22: how can you conclude that the weather impact is significant on the basis of no data?

8252, line 20: “which correlate with the thermokarst dynamics”

8252, line 24: “it makes use of the”

8253, line 6: “produced by”

8253, line 24: “Permafrost is defined as”

Figure 1: The unit of the numbers unclear

Figure 5: seasonal change between which dates (I mean what minus what)?

Figure 6: “Differences in water fraction between different ...”

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Figure 7: + =6 am, x =3pm

Figure 9: “10 day” instead of “decadal” (a decade is 10 years). I don’t understand what is shown here. It says “>10%”, while I see values below 10%.

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