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Interactive comment on "MODIS observed increase in duration and spatial extent of sediment plumes in Greenland fjords" *by* B. Hudson et al.

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Thanks for your thoughtful comments on this paper. All responses are italicized

The manuscript in review presents a retrieval algorithm developed to use MODIS reflectance to measure suspended sediment concentration from river plumes terminating in fjords in Greenland. The algorithm utilizes suspended sediment concentration data collected during the melt season from 2008, 2010, 2011 and 2012 in three fjords (5 plumes). The paper is fairly well written and presents some interesting result utilizing an interesting method that has good potential for future studies. The interpretations are sound and the data treatment appropriate. I therefore recommend publication.

Some comments. The paper would benefit from a read-through in order to present the

background and discussion more clearly in order to convey the scientific results to a broader audience. As it stands now the concept of using MODIS pictures for mapping SSC is presented in a very informative way, however the concept of using SSC data in melt water plumes for tracking Greenland Ice Sheet run off is not well presented.

Some more detailed background theory on the processes influencing sediment on its pathway from underneath a glacier till it is recorded in a plume – perhaps even with a conceptual figure – would provide substance to the data and their interpretation.

A new figure (now Fig. 1) provides a conceptual walk through that is also discussed in the text. We also have added a concise background discussion on glacial erosion processes, and now better describe the pathway melt water takes to the ocean.

As it is now, discussion of these highly important issues is scattered around and Fig 1 is not of any help. Considering that the conclusion of the manuscript exactly righteously highlight that these processes are highly dynamic and complex a more coherent presentation of these would improve the manuscript.

Along the same lines I find that the influence of fjord-oceanographic processes on the plume extension (and thus sediment distribution within it) is not well discussed. To what extent is water mass stratification influenced by shelf processes and to what extent simple estuarine flow? The influence of synoptic scale meteorological variability? The in situ measurements were conducted on more or less sporadic dates (in the melt season).

A section was added providing a discussion of fjord processes that may alter a plume. Unfortunately, our research budget precluded long term monitoring of the fjord necessary to answer the larger questions the reviewer asks about oceanographic processes. As such we can merely introduce oceanographic factors that may influence plumes. Fjord process undoubtedly also play a role, but unfortunately, without a substantial increase in fjord monitoring we cannot constrain their importance.

TCD
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A lot of the figures are not referenced in the text. Could fig. 6-8 be merged to one large?

All figures that were not referenced have now been referenced in the text.

Interactive comment on The Cryosphere Discuss., 7, 6101, 2013.