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Interactive comment on "Apparent optical properties of the Canadian Beaufort Sea – Part 1: Observational overview and water column relationships" *by* D. Antoine et al.

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Q.: Page 4028 Line 10 The work of Victoria Hill should also be included in the historical observations. There is reference to her work on page 4044, but no reference is provided. It seems like Marlon Lewis also worked in the region, but I don't remember the publications.

A.: Sorry, the reference cited page 4044 was missing from the list. It is the following: Hill, V. (2008) The Impacts of Chromophoric Dissolved Organic Material on Surface Ocean Heating in the Chukchi Sea. Journal Geophysical Research (113) doi:10.1029/2007JC004119. We have not found publications by V. Hill that could ap-

propriately be cited page 4028, which is about AOP measurements. In addition, to our knowledge Marlon Lewis has never published AOP data in the Arctic. Could you please indicate if we have omitted one?

Q.: Page 4028 Line 21 Rrs does not "determine" the light backscattered, it is a "measure of" the light backscattered.

A.: Corrected as: "The latter is a measure of the light backscattered out of the water and eventually observable from a satellite ocean colour sensor"

Q.: Page 4029 Line 20 What is the distance to ice, or a description of the ice field. The presence of ice will violate the underlying principal that these measurements depend on. That is a horizontally homogeneous light field. This is part of the reason that more AOP measurements have not been reported in the past. From what I see in figure 4 the presence of ice may be contaminating the measurements and discussion of the ice edge stations should probably be removed from the paper. Page 4038 Again I think the ice edge stations should be removed from the discussion unless it can be demonstrated that ice did not violate the assumption inherent to the calculations. There is good reason to suspect that ice edge productivity will create different optical properties, but we need to know the measurements are good as well.

A.: A horizontally homogeneous light field is not required to make underwater radiometry measurements. The assumption of horizontal homogeneity is made when interpreting these measurements, not when making them. Therefore, the presence of ice may cause changes in the light field because of reflexion or attenuation. This is the way it is, and measuring it is valid. What would be invalid is deriving IOPs from these possibly perturbed measurements through equations that implicitly include the homogeneity assumption you are referring to. During our sampling we were very careful to not sample too close to the ice edge such that there could be shading or reflection perturbations. Shading would lead to an overall suppression of the measured radiances, and reflections would elevate them. In the attached figure, we show that the ice edge

stations are almost the same as the open ocean stations except at the shorter wavelengths where there is suppressed radiant flux, likely caused by the greater absorption in near-surface waters. We think it is important to report about these stations that are close to the ice.

Q.: Page 4031 Line 21. What is the variable X described in this equation? I did not find reference to it earlier in the paper, although there is another symbol similar to X used.

A.: This was a typo. The Greek symbol âĎţ should have been used as in Eq. 1.

Q.: Page 4032 Line 24 The description of solar zenith angle should be moved up to the area with the description of other field conditions. (Page 4029)

A.: Pages 4029-4030-4031 are the generic description of the processing methods, so we don't think we should have description of the actual measurement conditions during MALINA in this general description.

Q.: Figure 3 Please explain the peak at 390 seen in panels C and D.

A.: It is rather hard to control the quality of all wavelengths at the 10-5 signal level, so this might simply be indicative of some noise in the data.

Q.: Page 4040 In discussion of Kd in Figure 6 it is important to add the depth interval that used in the calculations.

A.: The processing uses two extrapolation intervals, one for the UV-green and one for the red-NIR. Both intervals start at the same depth, but the UV-green is allowed to extend deeper, because the attenuation is frequently less, as long as that part of the water column that is involved remains homogeneous. So here are the average extrapolation intervals for the Fig. 6 data, with the red-NIR having the shallowest final depth and the UV-green having the deepest.

Stn. 394 to 398 E. Mackenzie River 0.1 to 1.2–1.4 m Stn. 380 Coastal Waters 0.1 to 1.9–3.0 m Stn. 320,340,360 Open Ocean Water 0.1 to 1.0–2.7 m Stn. 460,760 Ice

Edge Waters 0.1 to 1.2–1.9 m

So the UV-green data products are obtained in the top 1.5–3.0 m of the water column, and the red-NIR data products from the top 1.0–1.9 m.

Interactive comment on Biogeosciences Discuss., 10, 4025, 2013.