

Interactive comment on “A 50 % increase in the amount of terrestrial particles delivered by the Mackenzie River into the Beaufort Sea (Canadian Arctic Ocean) over the last 10 years” by D. Doxaran et al.

Anonymous Referee #2

Received and published: 17 February 2015

The Arctic region is changing rapidly due to global warming, triggering rapid social and economic changes and impacting both terrestrial and marine ecosystems. Using a combination of satellite ocean color observations and field measurements, this manuscript addresses changes in export of total suspended particulate matter from the Mackenzie River to the Beaufort Sea over the past decade. The authors report a more than 50% increase in the export of suspended particles, and they also discuss changes in cloud-cover and sea-ice conditions and extent over the studied 11-year period (2003–2013). This is a well written and well-organized paper. The analysis,

C236

results and discussion presented would be of interest to the terrestrial and ocean biogeochemistry communities, as well as the ocean color community particularly given the challenges in remote sensing of high latitude waters.

Major comments:

1. Given the need for high spatial resolution images in the area (highly dynamics and spatially inhomogeneous coastal waters and river delta), it would be good if the authors could provide some brief discussion in the paper on whether they explored using the MODIS high resolution bands (combination of 555 nm and 645 nm) for TSS retrievals particularly in the case of moderately turbid waters (no saturation).
2. Regarding the SPM retrieval, the authors mention that "the semi-empirical relationship was established based on field measurements collected during the 2009 summer period. It is assumed here to be valid for the entire period of satellite observations (2003–2013)." Changes due to warming temperatures are expected to influence not only the amount but also the quality and composition (source) of particulate matter in the Arctic, which in turn affects the bio-optical retrievals and relationships between Rrs, absorption, backscattering and SPM concentrations. In addition to long term changes, there are seasonal changes and year-to-year variability in quality and composition. It would be good if the authors could discuss implications for estimates of SPM fluxes in their manuscript.

Detailed comments:

3. The authors mention that the SPM algorithm "was established based on field measurements collected during the 2009 summer period". The field measurements were measurements of total suspended solids on water samples collected from surface waters or integrated to a certain depth? It is not clear. The details are probably discussed in Doxaran et al (2012), but it would be good to include a brief sentence in this manuscript as well.

C237

4. Where was the freshwater discharge measured?
5. Figure 9a: change "SPM flux" to "SPM concentration".
6. It is not clear where the assumption of "a constant SPM organic content of 1.8%" is based on; it would be good to provide some additional information here and what variability would be expected over the June-September period and along the transects studied in the manuscript.
7. Page 327, line 3; " within the superficial layer of the water column", replace by "within the upper layer of the water column measured by the ocean color sensor"

Interactive comment on Biogeosciences Discuss., 12, 305, 2015.