**"Monitoring ice break-up on the Mackenzie River using MODIS data"
by P. Muhammad et al.**

We thank the reviewer for her/his comments and suggestions. We have implemented the changes suggested. In particular, the methodology was made clearer and more concise and additional tables added as requested by this reviewer.

1. Using visual inspection of the data and manual sampling, or using intersection of the MODIS data with the river outlines and then automatic sampling? At selected points/reaches or the entire river?

Thank you very for the comments. With regards to the first major concern, MODIS data was manually sampled through visual inspection. MODIS data was collected along the river outline manually, wherever it was observable. Please refer to MODIS Processing section 2.2 (p. 8, lines 62-64) and new Figure 2 for an updated description of the methodology.

2. The SDS data could have errors, in particular over the mixed pixels over the river, consisting of water, land, and ice. The MODIS L3 algorithms might not have been designed for this type of highly variable ground cover. Some validation study is needed, for instance as part of the method section, to characterize the success and accuracy of the SDS. For instance, classifications from coincident Landsat data could be compared to MODIS SDS.

To avoid error in the SDS data collected, mixed pixels over the river consisting of water, ice and land were omitted. Furthermore, in sections of the river where pixel mixing was common as a result of smaller river widths, MODIS L1B was used. MODIS L1B with a spatial resolution of 250 m enabled to maximize data collection and minimize mixed pixel omission. It would be useful to classify Landsat images coincident to that of MODIS SDS. Although this was not explored in this paper, other have reported high correlation of ice detection when comparing high resolution Landsat to MODIS images (MOD09GQ – 250-m spatial resolution). Chaouch et al. (2012), manually and through visual interpretation, compared ice cover from Landsat images (30-m spatial resolution) to ice covered MODIS images and concluded good levels of agreement (91%). This information has been added to the revised manuscript Section 2.2.2 page 12 (lines 140-143).

During the sampling of the MODIS pixels, only ice or thereafter water pixels during the melt/break-up period were sampled. Please refer to MODIS Processing section 2.2 (p. 8, lines 62-64).

3. How do the authors use MODIS L1B under cloud cover conditions (page 2789, line 12)?

During cloud free conditions, MOD10 was used to sample data along sections of the river. Furthermore, to maximize the availability of data collected, MODIS L1B was used when cloud cover was present in MOD10 swaths. It was concluded that more data pixels were available to collect from MODIS L1B when cloud cover was present in MOD10. The MODIS snow product at 500-m spatial resolution presents a cloud mask at 1 km spatial resolution. Using MODIS L1B enabled a higher availability of recordable pixels at geographic locations, which were cloud covered in the MOD10 products. Cloud obscuration limited ice cover detection. To alleviate data omission, MODIS L1b from both Aqua and Terra satellites were used. Please refer to MODIS Processing section 2.2.2 (p. 11, lines 119-126) and figure 2.

4. Any idea to what extent the displacement of ice features as measured according to section 2.3 really reflects ice velocities? The apparent velocity of such features (measured manually or automatically?) is not necessary the velocity of ice debris. For instance a feature could be stable even if ice floes pass through it at higher speed by accumulating at the upstream side and release of ice debris at its downstream side.

Unfortunately, due to the coarse resolution and the limitation of twice daily acquisitions from two satellites (Aqua and Terra), this study would not be able to outline the ice feature measured as being the exact velocities. However, ice floe velocities from similar time periods (1-2 days) of the given year and location has been correlated to field measurements as reported in other published articles (Beltaos et al. 2012; Beltaos and Kaab, 2014), and are close to values reported in this study. Furthermore, the movement of ice floes was estimated manually.

5. Fig 7. To the referee, the correlation between air temperature and albedo seems not very obvious. How high is the correlation (e.g. R2)?

Albedo was not a variable measured in Figure 7. Ice break-up dates, air temperatures and precipitation were the only variables plotted in Figure 7.