MACKENZIE DELTA AND BEAUFORT COAST SPRING BREAKUP NEWSLETTER

Report **2018-02**
May 14, 2018 (Monday)

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Welcome to Breakup 2018

Welcome to the 2018 Mackenzie and Beaufort breakup season! We are now into our 13th season of the breakup newsletter, which was started by Steve Solomon in 2006. Each year we think will be the last, but the feedback is positive and the annual spectacle of breakup is hard to resist. We hope this year will be good to everyone, without too much flooding. We will try to keep you posted on events as they unfold. As always, photos and on-the-ground reports are the really interesting pieces and we'll try to pass on any you can send us as we watch the gauges and the satellite imagery.

This year will the third breakup season for the Mackenzie-Beaufort Breakup group on Facebook https://www.facebook.com/groups/1745524288993851/ Over time we hope this forum hosted in the ISR will take over as the main place to share observations and experience during breakup in the Delta and the coastal communities of the region. We need to start thinking about how observations can be archived to add to our collective knowledge of breakup timing and processes and there may be roles for many partners in doing this.

The original purpose of the newsletter was to document flooding over the outer Mackenzie Delta in support of various research programs. Over recent years, we have expanded the scope to consider all aspects of breakup and spring flooding in the ISR region and Gwich'in communities in and near the Delta. Funding for our current breakup monitoring activity is

from the Climate Change Geoscience Program of the Geological Survey of Canada, Natural Resources Canada.

This year, in addition to sharing the newsletter to our mailing list of 390 addresses, we expect to post the newsletters on the CACCON (Circum-Arctic Coastal Communities KnOwledge Network) and will provide further details shortly.

Please let us know if you do not wish to receive these reports (contact info above) and we will take you off the list. Also, if you have a change of e-mail address and can let us know, we will be pleased to adjust our mailing list. We hope you will feel free to pass this on to others and if they contact us we can add them to the list. For those of you living in the north, we welcome any observations of timing of events, extent of flooding, evidence of breakup, or anything out of the ordinary, and we thank you for all of the feedback received so far.

For those interested in conditions further south, we recommend that you contact Angus Pippy (Water Survey of Canada) in order to receive his very useful High Water Report: contact Angus at 867-669-4774 or angus.pippy@ec.gc.ca.

Water level data presented in our newsletters are courtesy of Environment Canada (Water Survey of Canada) and are derived from their real-time hydrometric data website at http://www.wateroffice.ec.gc.ca/index_e.html, which we acknowledge with thanks. Particular thanks to colleagues in Inuvik for keeping so many of the delta gauges operating through the difficult breakup season. Weather reports and forecasts are also from Environment Canada (Meteorological Service of Canada) at http://weather.gc.ca. Ice road conditions are from the GNWT Department of Transportation road reports and travel alerts (@GNWT_DOT). Daily MODIS imagery is courtesy of NASA Worldview at https://earthdatnasa.gov/labs/worldview/.

Water levels

The water level at Norman Wells became erratic late on May 10 and then on the 11th rose very rapidly from 7 to 11 m, presumably in response to an ice jam, which released very late in the day (Figure 1). The level then dropped rapidly through the morning of the 12th to below 9 m in the middle of the day, when it began to rise again, probably as a function of channel hydraulics with rising discharge. Jen Lam posted a great video taken May 12 on final approach to Norman Wells, showing the ice running in the river at that time (Figure 2). The water level peaked again above 10 m very late on the 12th and has been falling quite at a fairly constant rate with slight decereration since then, now standing just above 7 m, down 1.97 m over 24 hours as of 04:30 MDT.

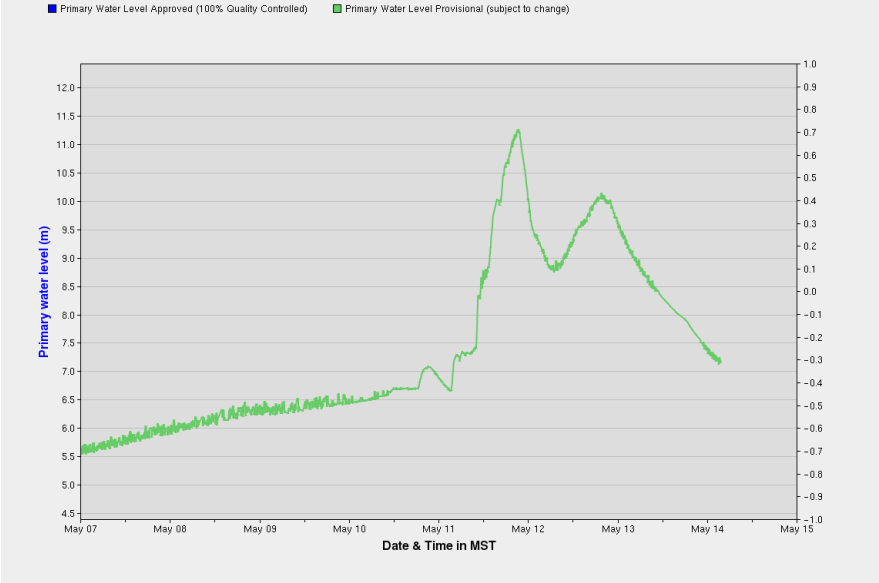

Figure 1. Provisional water level for Mackenzie River at Norman Wells (10KA001) since May 7 (courtesy Water Survey of Canada). Note ice jam peak late on May 11, probably discharge peak late on May 12, and recession underway since then.

Figure 2. Screen capture from a video showing the ice conditions on the Mackenzie at Norman Wells on May 12. Posted on FB by Jen Lam.

Figure 3. An older image (May 8, 2018) provided by Rod Smith (GSC-NRCan), showing the breakup of the Liard River as it empties in the Mackenzie. Aerial image taken looking NW from Fort Simpson

Closer to the delta, water level at Tsiigehtchic (WSC 10LC014) has continued rising and accelerated over the weekend to above 6.5 m as of 04:30 MDT this morning, up 84 cm over 24 hours (Figure 4). The provisional discharge almost doubled over the weekend to 15,000 m^3/s. Over the past 12 hours, there is some irregularity in the record, suggesting ice disturbance (Figure 4). The irregularity in the water level record late Thursday appears to be related to an ice jam release in the Arctic Red River, as George Lennie pointed out on the Mackenzie-Beaufort Break-up Facebook page.

Figure 5 shows the water levels in Arctic Red River near the mouth (10LA002) since May 3. These began to accelerate on May 7 and increased rapidly from about 3.0 m to over 7.0 m over about three days, then dropped very fast in response to the jam release late on May 10, at the same time that the subtle surge and irregularity in Mackenzie River water level occurred (Figure 5). Following release of the jam, the water level in Arctic Red River dropped below 4.0 m and then continued to rise, accelerating on May 12 (Saturday) to a peak just over 5.0 m late yesterday. As we await further developments, it is possible that this represents the peak snowmelt discharge in the Arctic Red River basin for 2018.

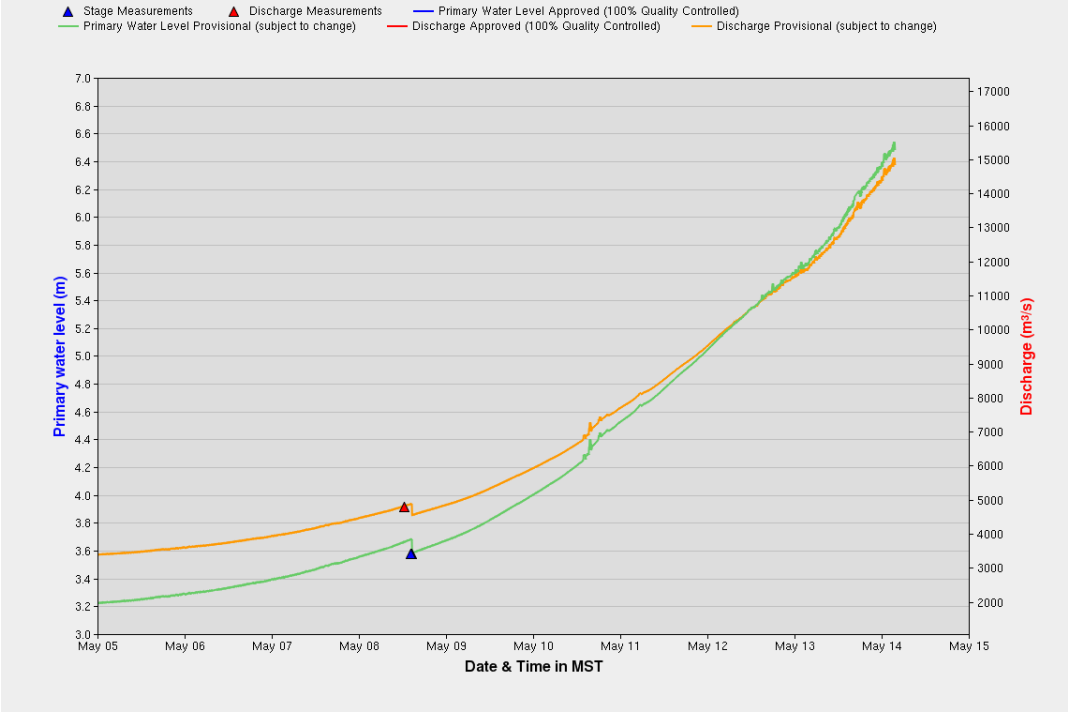

Figure 4. Provisional water level and discharge data for Mackenzie River at Tsiigehtchic (10LC014) since May 5 (courtesy Water Survey of Canada).

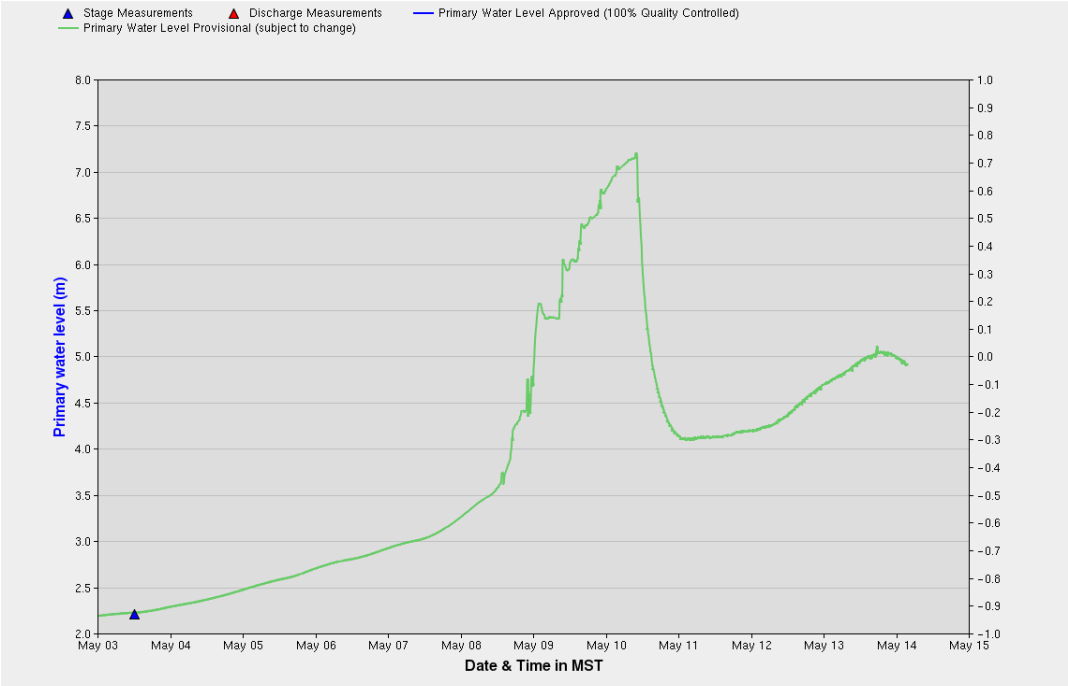

Figure 5. Provisional water level data for Arctic Red River at the mouth (10LA002) from May 3 (courtesy Water Survey of Canada). Note ice-jam peak on May 10 and apparent snowmelt peak discharge on May 13.

Water levels are continuing to rise in East Channel at Inuvik and Peel Channel upstream of Aklavik. As of 03:30 MDT, the level at Inuvik (10LC002) was up 21 cm over 24 hours (Figure 6). Comparison of cumulative water levels at Tsiigehtchic (Figure 7) show that the rise in water level is similar to that of 2017, but about a week behind where they were at in 2016 and 2015. The same trend can be said about Inuvik (Figure 8).

Christian Haas proved a great overview shot of the Mackenzie Delta just North of Inuvik, position 69.6865 N, -134.2791 W. A great shot of the initial water overflow happening at the boundary of floating and bottom fast ice along the channel edges creating nice parallel patterns along the shores of the river arms (Figure 9).

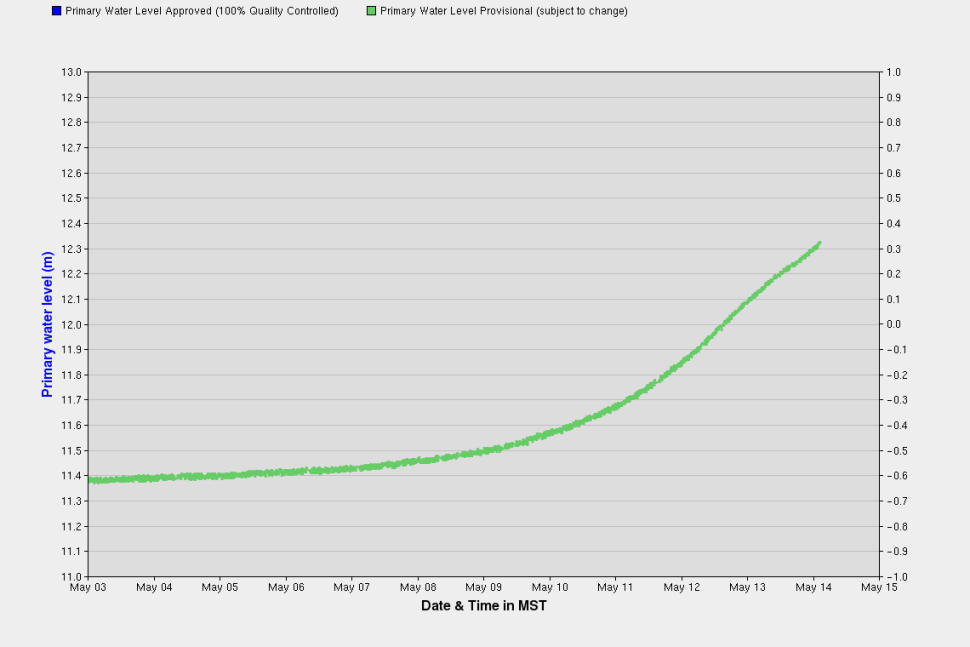

Figure 6. Water level in East Channel at Inuvik (10LC002) since May 3 (courtesy Water Survey of Canada).

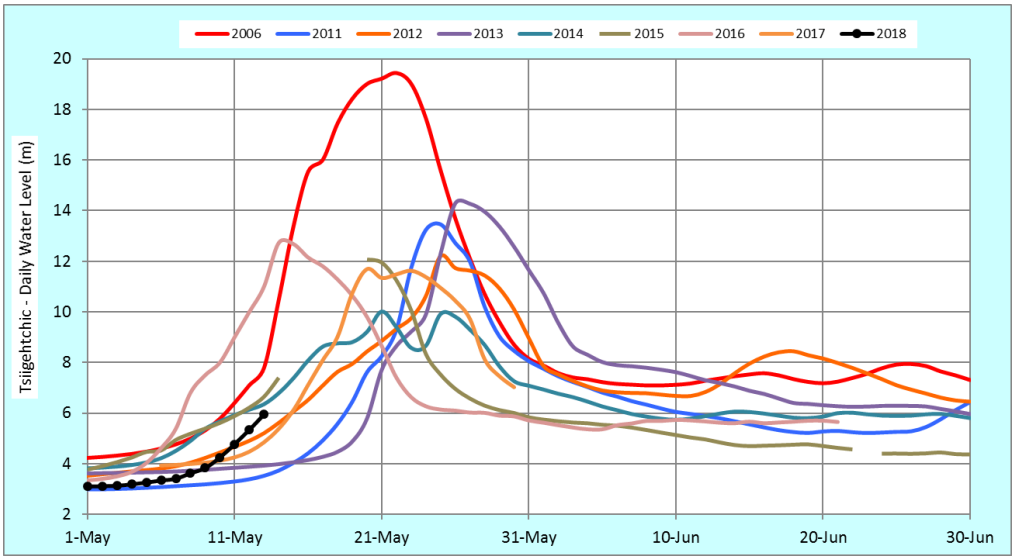

Figure 7. Daily mean water levels in Mackenzie River at Tsiigehtchic (10LC014) in 2006 and years this decade, with 2018 levels in black.

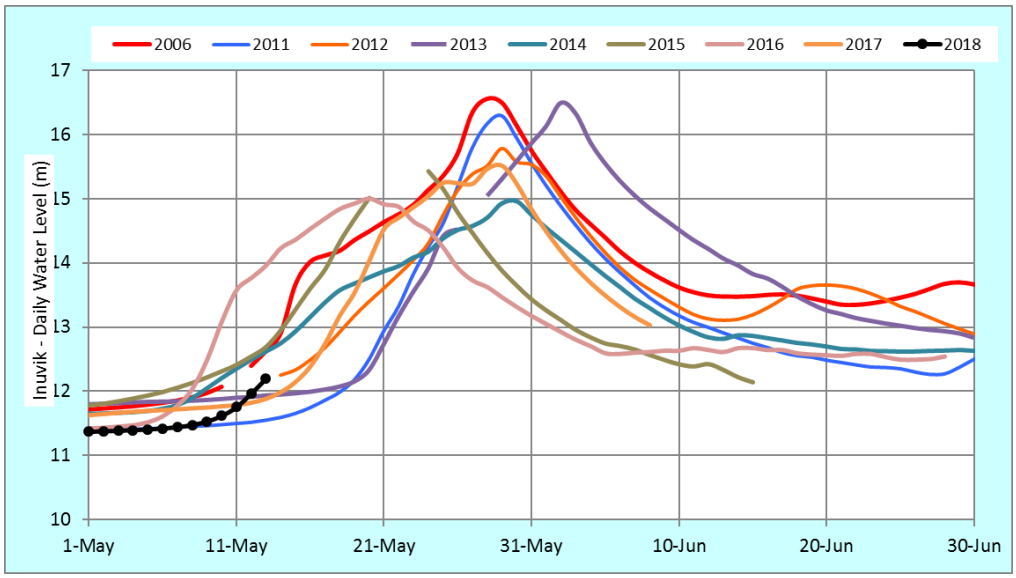

Figure 8. Daily mean water levels in East Channel at Inuvik (10LC002) in 2006 and years this decade, with 2018 levels in black.

Figure 9. Photo from the Mackenzie Delta, just North of Inuvik on May 12. Visible overflow along the channel edges. Thank You Christian Haas, York University.

Figure 10. Photo from the town dock in Inuvik looking downstream taken on May 14 by WSC staff.

Satellite imagery

MODIS imagery is obscured by cloud today so instead we are going to highlight a near real-time flood detection product that is available free online. Satellite data products from the VIIRS sensor (visible infrared imaging radiometer suite) ice cover products provide data for the automated detection of ice and near real-time flooding (Figure 11). Developed by George Mason University this data uses change detection algorithms to compare individual pixels from VIIRS satellite data over short timescales. Using this method, they produce maps showing changes in land cover and snow/ice conditions. In Figure 10 you can see that pixels displayed as purple (labeled as SI in the legend) show areas of melt or overflow along the Mackenzie at Tsiigehtchic, Shallow Bay and Sitidgi Lake. Open water in the Arctic Red River is shown in blue (labelled WA (water) in legend).

This data is available at https://re.ssec.wisc.edu/s/KNuMk. This provides valuable information and we will refer to these automated flood products throughout the breakup season.

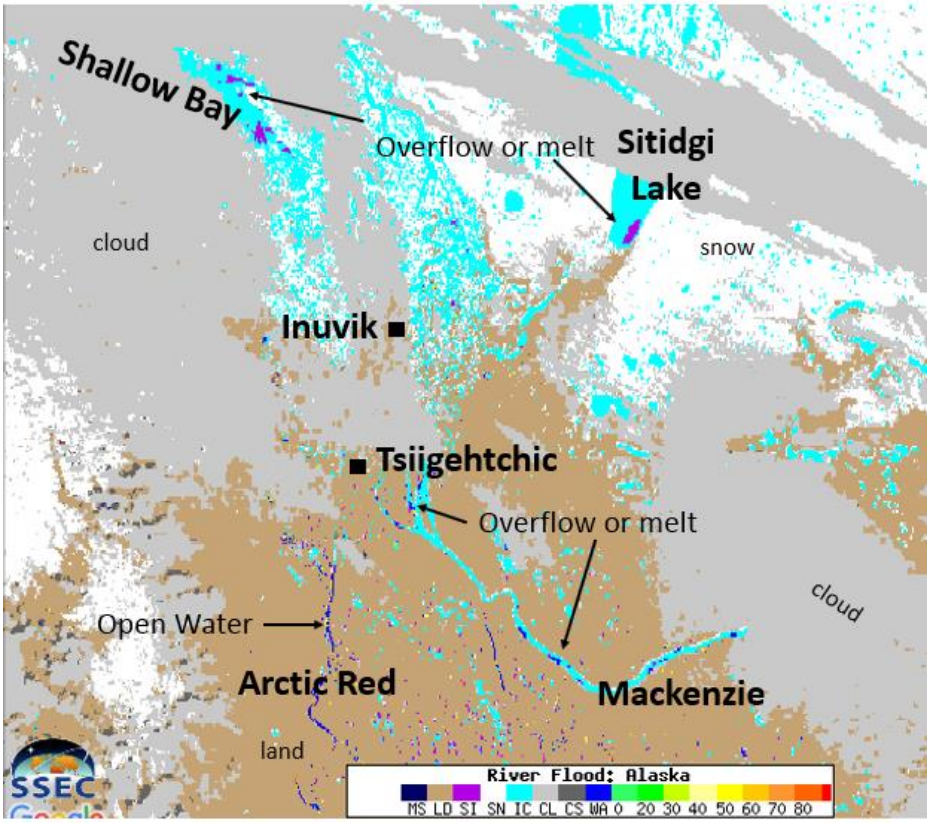

Figure 11. Derived flood mapping product for May 14. This information is available online on a near real-time basis at https://re.ssec.wisc.edu/s/KNuMk.