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# Seismic Monitoring in Canada During COVID-19

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CTBT Science & Technology 2021

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# Background

- Seismic monitoring for Canada conducted by Canadian Hazards Information Service (CHIS) of Natural Resources Canada
- 2 current primary roles:
  - Earthquake monitoring for Canada - ~180 seismic stations across Canada: Canadian National Seismic Network (CNSN)
  - Operation of 11 seismic, infrasound and hydroacoustic IMS stations in Canada, including Yellowknife array
  - *(From 2024 – operation of Canadian National Earthquake Early Warning System)*
- 3 operations centres:
  - OTT – eastern and central Canada, eastern Arctic, CTBT NDC
  - PGC – western Canada
  - YKA – western Arctic and Yellowknife array

\*TBD if migration can be done over one weekend

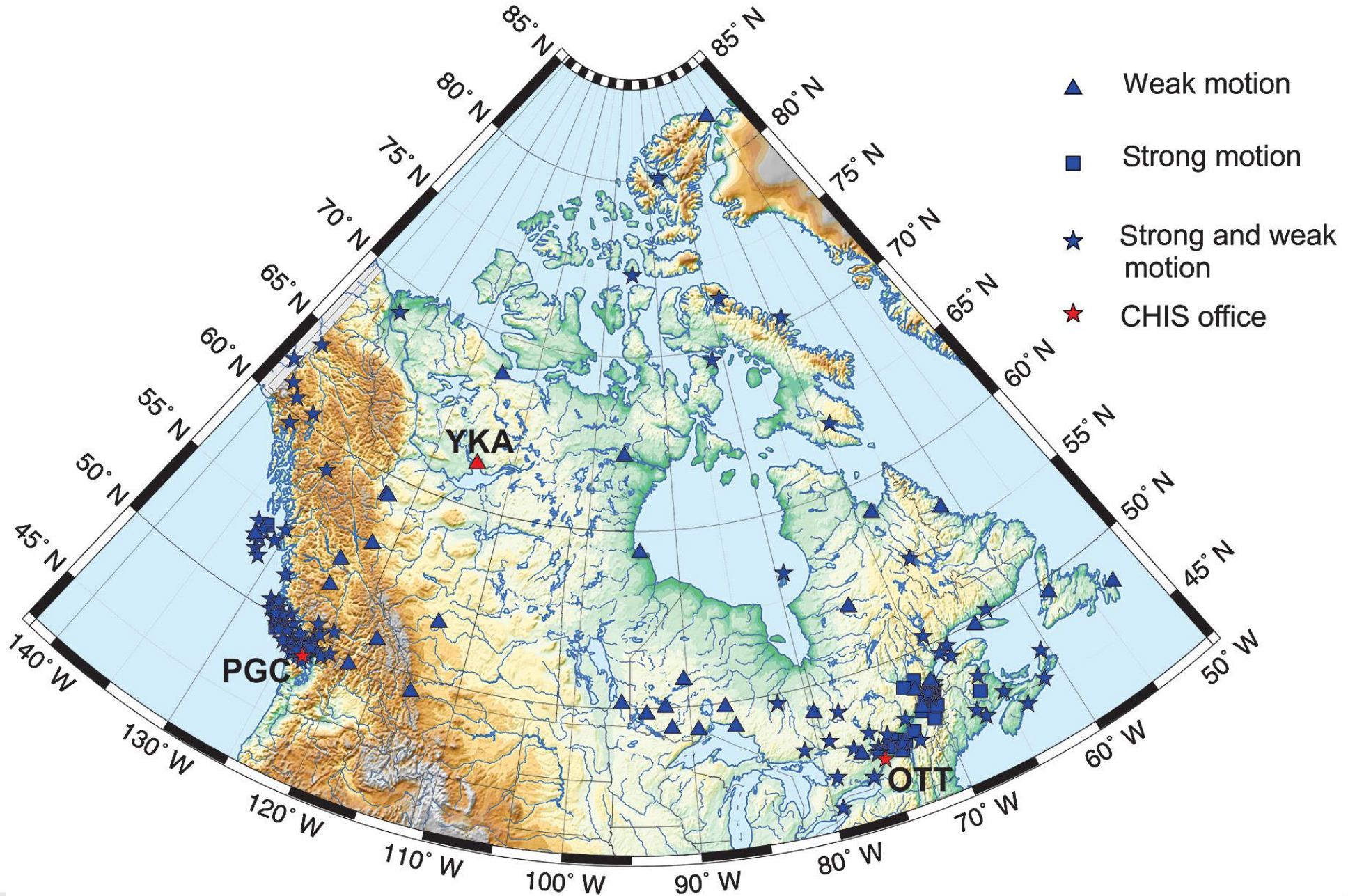


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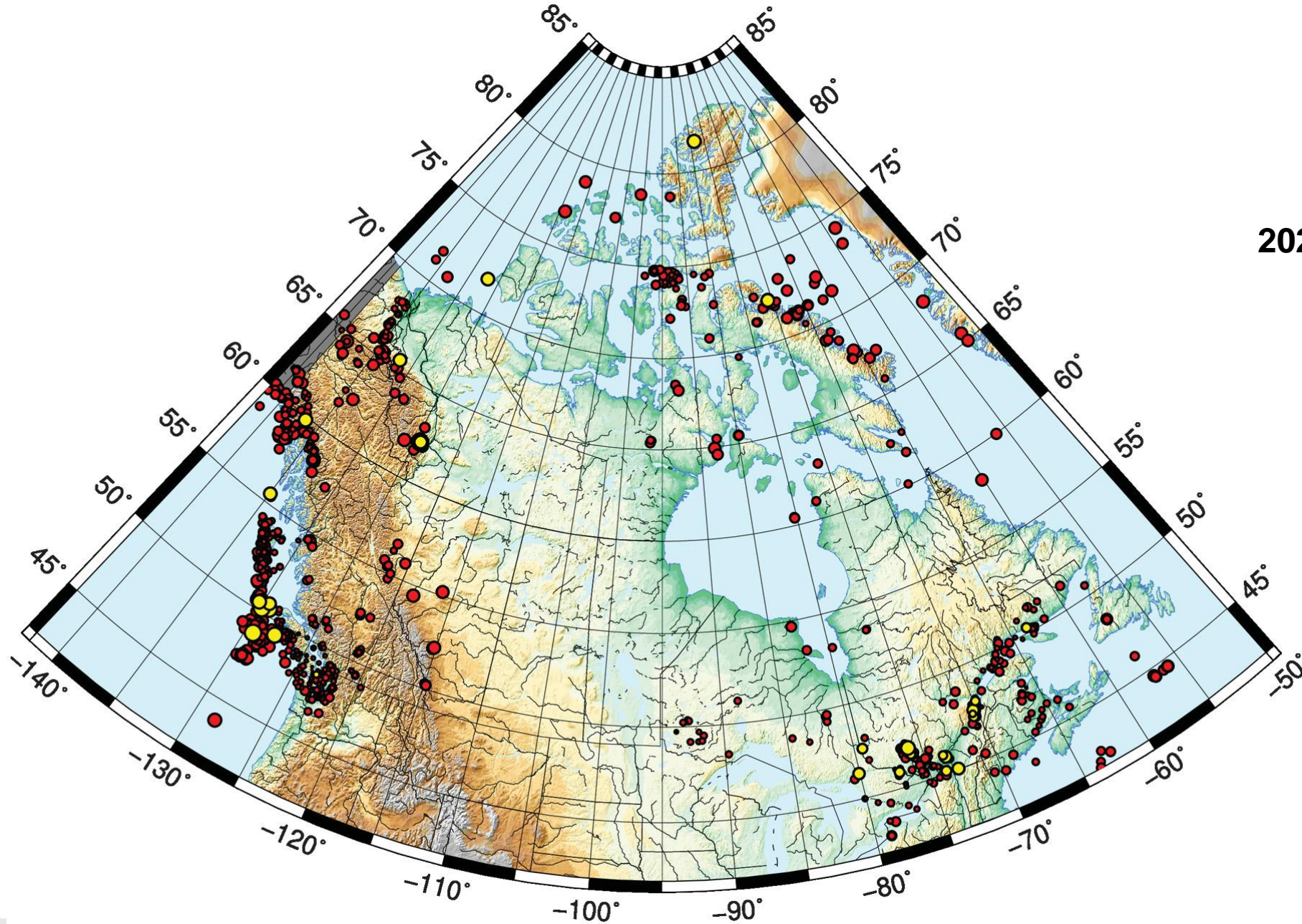
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## 2020 Seismicity



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# Pre-COVID Earthquake Operations Situation

- 24/7 on-call monitoring and response
  - *Staff were already equipped to respond to issues remotely from home*
- Regionalized operations
  - *Staff were trained to be interoperable*
- Maintenance mode driven by problem identification
  - *Many stations, travel especially in Arctic is very expensive, relatively few techs*
  - *Few preventative maintenance visits*
- Significant business-continuity planning following SARS & H1N1
- We had just finished a major renewal of the CNSN (2014-19) so almost all of the hardware (sensors, digitizers) is early in its life-cycle





# Initial COVID Impacts & Responses

- Most staff sent home full-time immediately (still in place)
- Restrictions and closures on internal borders within Canada
- Many domestic flights cancelled
- Lockdowns
- Field staff 50%/50% to enable lab-based work to continue with extreme social distancing (no interaction)
- Focus on using regional staff, particularly staff already based in the Arctic
- Switching to alternative transport modes
- Designation of essential staff



# COVID field travel



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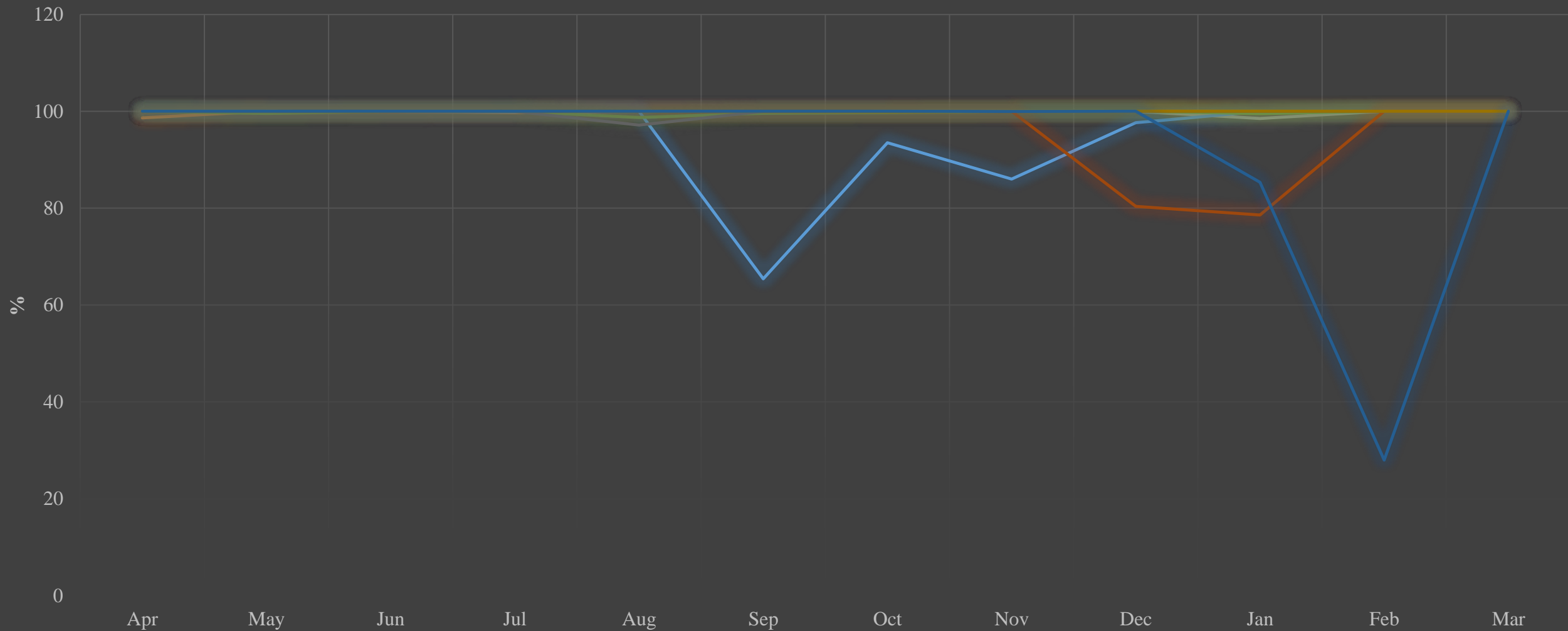
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# IMS Data Availability 2020-21

8

PS08(ULM) PS09(YKA) PS10(SCHQ) HA02 I10CA AS012(FRB)  
AS013(DLBC) AS014(SADO) AS015(BBB) AS016(RES) AS017(INK)



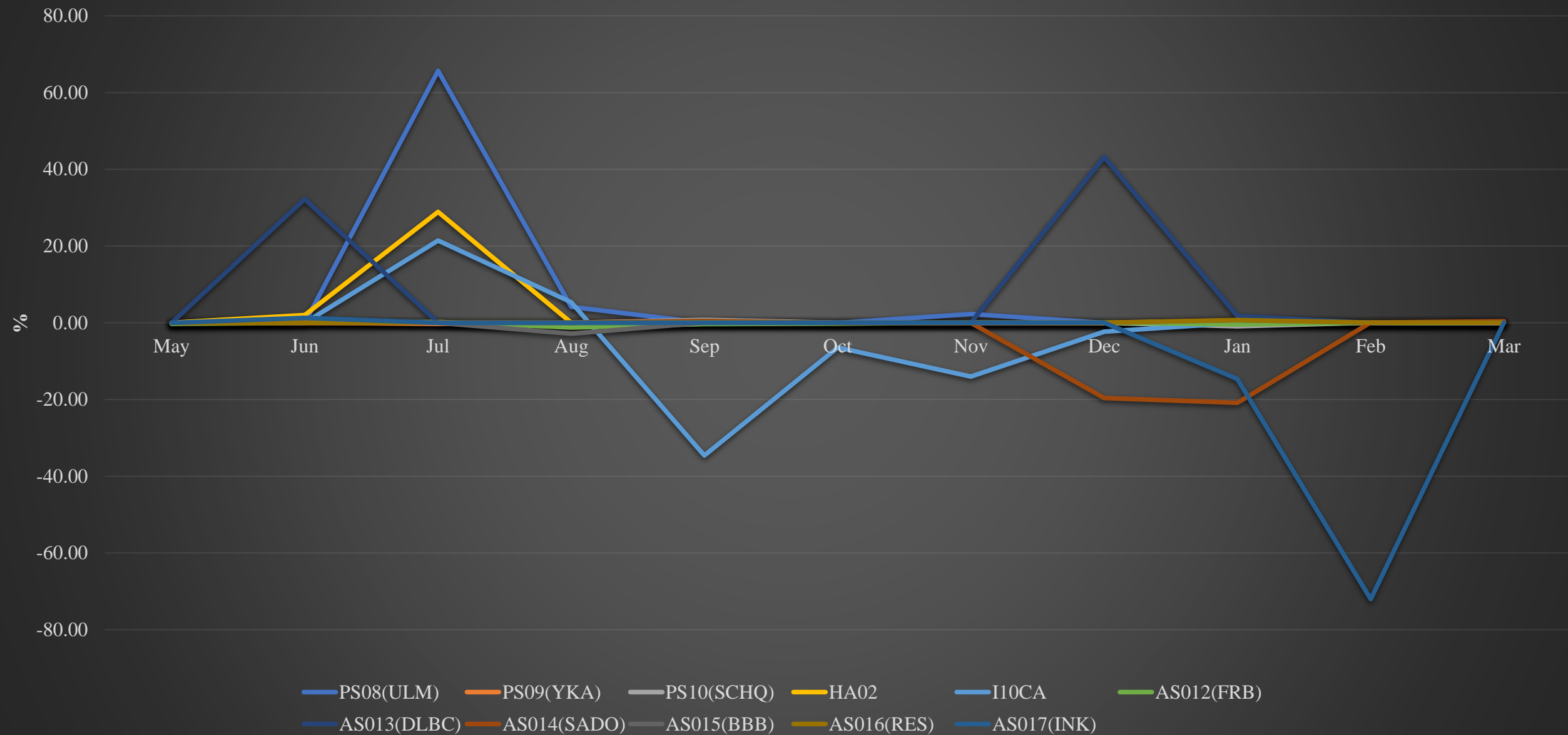
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# IMS Data Availability 2020-21 versus 2019-20



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# Summary of Findings

- 98.41% (2020) vs 98.20% (2019) for Canadian IMS but over 3 major outages vs 5
- Insignificant difference, but average downtime significantly longer, due to a combination of complexity arranging contractors and tendency to spend more time on remote troubleshooting.





Nothing ever goes *exactly* as planned



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# Questions?

- Further reading:

McCormack, D. A., A. L. Bent, R. Van Brabant, and L. McKee (2020). A Critical Assessment of Canadian Earthquake Monitoring and Alerting Practice versus the Initial Challenges of the 2020 COVID-19 Experience, *Seismol. Res. Lett.* **XX**, 1–7, doi: [10.1785/0220200281](https://doi.org/10.1785/0220200281).



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