

SuperDARN Canada Radars – Clyde River and Rankin Inlet

The SuperDARN (Super Dual Auroral Radar Network) Canada radars are part of a worldwide network of more than 35 radars that monitor space weather conditions in the earth's upper atmosphere. The Rankin Inlet and Clyde River radars are two of the five radars that SuperDARN Canada operates from our headquarters at the University of Saskatchewan in Saskatoon, Saskatchewan. The radars are designed to make a complete scan every minute, 24 hours a day, 365 days a year.

SuperDARN Canada visited the Clyde River site in January of 2020. Robert Kautuk and Malcolm Ranta from the Ilisaqsivik Society in Clyde River helped us to troubleshoot why the radar stopped operating in September of 2019. The downtime in our specialized equipment could not be solved remotely by our engineers, even with their help and several trips to the site. Two SuperDARN Canada engineers made an emergency visit to Clyde River in January of 2020 to investigate the technical failure that had caused the radar to stop operating. The engineers replaced a large portion of the radar electronics with a new radar system called Borealis, which was designed by the SuperDARN team at the University of Saskatchewan. Borealis will be installed at all five SuperDARN Canada sites, and the Clyde River radar was the third radar to be upgraded. It is a new digital radar system that replaces some of the original electronics, which contained obsolete components that were prone to failure. The Clyde River has been operating very well since the visit.

SuperDARN Canada personnel had planned to install the Borealis system at the Rankin Inlet site in the summer of 2020, but due to the Covid-19 travel restrictions we did not visit Rankin Inlet in 2020. Our local site custodian, Rick LePage, assisted with maintenance at the Rankin Inlet site. The radar has continued to operate well. When it is safe to travel, engineers will visit Rankin Inlet for site maintenance and to install the new Borealis system.

Early in the Covid-19 lockdown, SuperDARN Canada made changes in our operations to reduce our impact on the internet service in the local communities where our radars are located. The internet bandwidth that we use in Clyde River is shared with the community. We reached out to the internet provider Qiniq in March, to make sure we were not negatively impacting the community's internet service at such a critical time for internet communications. We reduced the amount of data that we transmitted back to headquarters, and the data that we did transfer was sent during off-peak hours, when most people would not be using the internet. At the end of April, we contacted Qiniq again to see if we might be able to resume our full data transfer, and they agreed. We continue to transfer data from Clyde River during off-peak hours.

The data from the Nunavut radars is shared with researchers from around the world. As of the time of writing this report, international publishers report that in 2020 researchers from 19 countries have written 37 scientific publications using SuperDARN data. With more radars coming online and with innovative upgrades like Borealis, the global SuperDARN research collaboration has been tackling phenomena like magnetic storms and other disturbances that produce both the beautiful displays of the northern lights and the detrimental effects on modern

technology such as GPS navigation, radio and satellite communication, and electrical grids. Improvements to the SuperDARN electronics enable more complex operations. This will improve the dataset for scientific studies going forward.

Funding for operating the SuperDARN Canada radars comes from the Canada Foundation for Innovation (CFI), Innovation Saskatchewan and the Canadian Space Agency (CSA). Full funding has been secured until 2023.

Since mid-March this year (2020), SuperDARN Canada personnel have been working from home due to the Covid-19 pandemic, and we will continue to do so into 2021. Working from home resulted in a shift in the facility's focus to software development. In May of 2020, SuperDARN Canada hired Dr. Carley Martin as a web programmer for our website <https://superdarn.ca/>

No changes to site operations are expected in 2021, in terms of project scope or other licensing requirements.