

## USAP Weather Satellite Update – June 2019

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The United States Antarctic Program operates three TeraScan weather satellite acquisition systems in Antarctica. Two are located in McMurdo and one is in Palmer Station. This talk discusses the current state and future plans for these systems.

### 1. Overview

The Palmer Station antenna was installed in 1994. It is a 1.2m dish and has the ability and is licensed to capture L/S-band satellites Metop-B, Metop-C, NOAA-18, NOAA-19, and DMSP F-17 and F-18. The supporting acquisition and processing computer was updated in 2017 with 10 year old equipment from the research vessel Nathaniel B. Palmer. The acquisition system locks up about every 2 months, but otherwise operates well. It cannot capture X-band Satellites. Although the satellite antenna is way past its end of life, with some routine maintenance, it still operates well. This is due to the dry, clean climate in Antarctica. Because of its age, many spare parts are no longer available for the antenna.

The McMurdo North antenna and computer were installed in 2011. It is a 2.4m dish with X-band and L/S-band receivers. It has the ability and is licensed to capture NPP, Aqua, Terra, Metop-B, Metop-C, NOAA-18, NOAA-19, and DMSP F-17 and F-18. The system currently has problems acquiring Aqua data.

The McMurdo South antenna was installed in 2005. The processing machine was installed in 2009. The capture machine was upgraded in 2018. It is a 2.4m dish with X-band and L/S-band receivers. It has the ability and is licensed to capture Aqua, Terra, NOAA-18, NOAA-19, and DMSP F-17 and F-18. This system is licensed for Metop-B and Metop-C, but the L/S-band receiver is an old model and

cannot capture these satellites. Last year, the system was having a problem capturing Aqua, but that problem was found to be caused by interference from a nearby antenna and was fixed.

The weather data acquired by these systems is used by Naval Information Warfare Center (NIWC) for meteorological forecasting for aviation to, from, and within the Antarctic continent. NIWC forecasts are also used for safety, for science and maintenance expeditions, and for boating operations at Palmer Station. Science Project O-283-M (Principal Investigator, Dr. Matthew Lazzara) receives the raw data for AMRC research.

On average we capture 73 satellite passes a day in McMurdo. 19 passes (21%) are not captured because they conflict with other passes. Bandwidth is very restricted for sending and receiving data to and from McMurdo and Palmer Station. The average size of a day's worth of data to be sent from McMurdo to NIWC in Charleston for forecasting is 27.4 GB uncompressed. The data compresses about by 80%, so we send about 5.6 GB daily.

On average we capture 34 passes a day at Palmer Station. 132 MB of compressed data is sent daily from Palmer Station to Denver and on to NWIC in Charleston and McMurdo for forecasting.

### 2. Service Life Extension Plan

The National Science Foundation has recently funded a \$470,000 Service Life Extension Plan (SLEP) designed to bring the three TeraScan systems back to full operating capacity and to add NPP/NOAA-20 capacity in McMurdo. Where possible and needed, additional spares for the equipment is being

purchased. The SLEP is designed keep us operational for the next three years.

The McMurdo north system's X-Band will be licensed for NOAA-20. The McMurdo south system's X-Band capabilities will be upgraded and licensed to capture NPP and NOAA-20. The south system's new L/S band receiver will capture Metop-B and Metop-C.

All capture and processing computers in McMurdo and Palmer Station will be replaced by machines powerful enough to capture and process NPP and NOAA-20 data. The visualization computers used in Denver and by NIWC in McMurdo will be replaced.

We expect the new equipment to arrive in Denver by September 1, 2019. The new equipment for Palmer Station will be installed this December, 2019. The new equipment will be installed in McMurdo this fall, probably in October, 2019. The new equipment for Denver will be installed in June of this year.

### 3. TeraScan Transition and Refresh Project

A new project looking at the future needs for meteorological forecasting for the USAP has been started. It is the TeraScan Transition and Refresh Project (TTRP). The main stakeholders for this project are the NSF, NICW and ASC.

This is a two year effort to define requirements and determine what is available in the market that meets our technical, financial, and schedule needs. Our goal is to procure and implement in FY20.

All purchases made for the SLEP have been selected with the TTRP in mind, to maximize possible component reuse.