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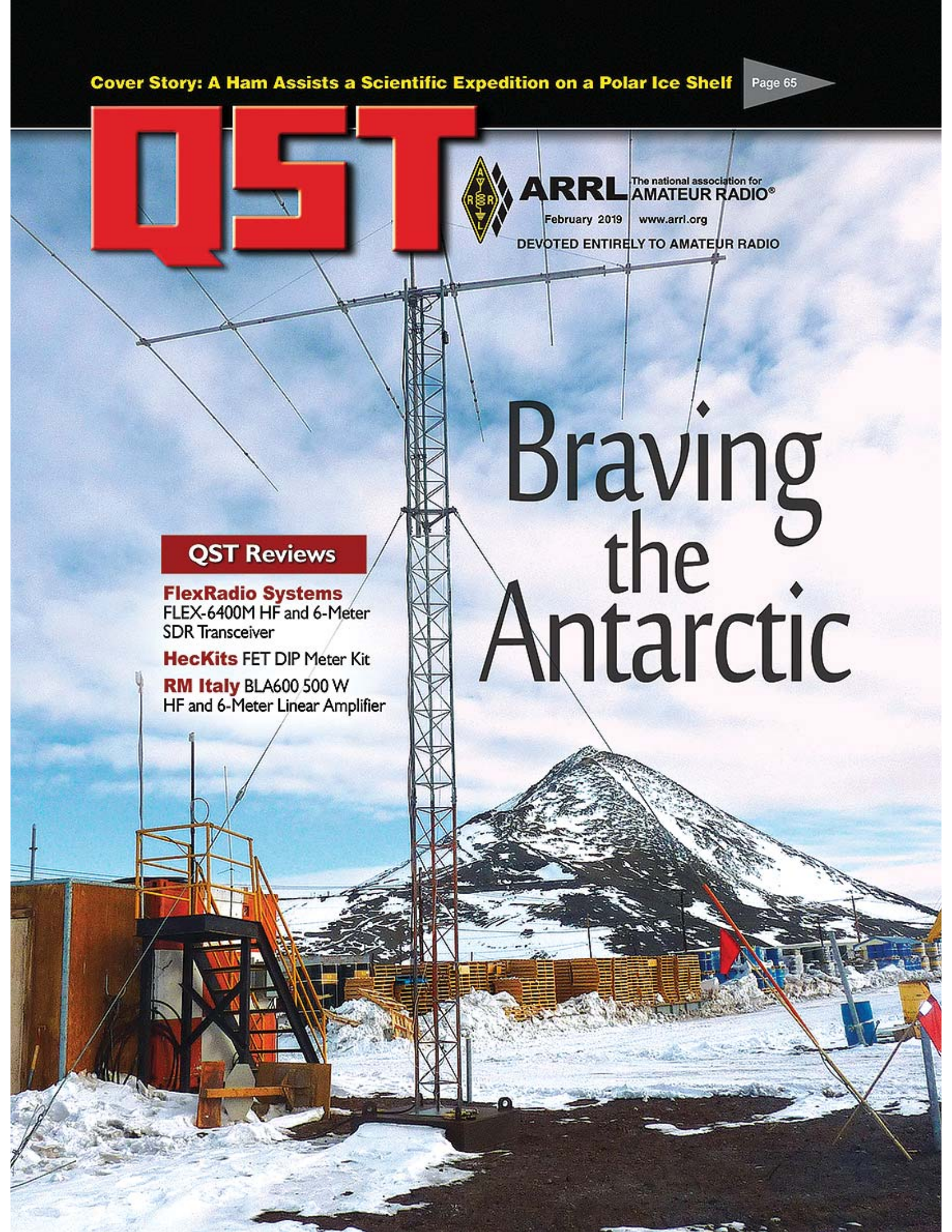
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Amateur Radio from Antarctica

Reinhard E. Flick, PhD, K6REF,
and Peter D. Bromirski, PhD

When Peter Bromirski asked me to spend 5 weeks in Antarctica to help install seismometers while camping on the Ross Ice Shelf, I immediately replied, “Can I bring my ham radio?”

He’d asked a year before the October 2014 departure, giving my 66-year-old brain time to overcome my concerns about the polar conditions and my camping inexperience. Despite my doubt and anxiety, I was excited about the rare opportunity to assist on an Antarctica research expedition and to operate from McMurdo Station, KC4USV, and Yesterday Camp on the Ross Ice Shelf (RIS) as KC4/K6REF, which would check off my seventh continent. I was pleased that ham radio could provide public outreach for the National Science Foundation (NSF) Polar Programs-sponsored research project (<https://scripps.ucsd.edu/centers/iceshelfvibes>).

Science in Brief

The Ross and Ronne-Filchner Ice Shelves in West Antarctica — each almost the size of Texas — are the two largest floating ice masses in the world (see Figure 1). They are 600 – 2,000 feet thick and slow the discharge of the 2-mile-thick West Antarctic ice sheet flowing downhill toward the Pacific and Atlantic oceans like frozen rivers. Because ice shelves float, their mass has already made its contribution to sea level rise. However, they are a crucial impediment to the flow of land-bound ice that does raise sea level. If all West Antarctica ice wound up in the ocean, global sea level would rise 11 – 16 feet. This makes the evolution of ice shelves a focus of oceanographic and polar research.



A ham is asked to be part of a scientific expedition to the bottom of the world.

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A typical seismic station during installation with the battery and data logger box, the “lampshade” solar panel array, and the connecting cables. [Reinhard Flick, K6REF, photo]

Several smaller shelves along the Antarctic Peninsula (see Figure 1) have already partly or wholly disintegrated. The Larsen C Iceberg made news in 2017, when a 70-mile-long fracture led to calving of a Delaware-sized iceberg. Meanwhile, the more southern RIS is relatively healthy and stable, making this a good time to make baseline measurements.

Our mission was to install 34 high-data-rate broadband seismometer stations over the 500-mile-wide RIS (see lead photo and Figure 2). The central portion was log-periodic.¹

These measurements provide the first comprehensive data on spatial, mechanical, and elastic response of ice shelves to wave forcing, crucial to understanding ice-shelf evolution and fragmentation processes. We reached station locations on snowmobiles with sled trailers for distances less than 15 miles and Twin Otter aircraft for longer hauls.

Logistics

The US Antarctic Program outfitting occurs in Christchurch, New Zealand, where the most important business is obtaining personal “extreme cold weather” (ECW) gear. This includes overalls, hats, gloves, socks, boots, goggles, balaclavas, and the ubiquitous Canada Goose “Big Red” jacket. There is also training, especially for first-timers on the ice, including the requirement to wear your ECW gear on the ice flight from Christchurch to McMurdo.

¹Seismologists use log-periodic arrays for noise reduction and beam forming, which are the same reasons they are popular in acoustics and radio.



Figure 1 — Map of Antarctica. Gray shading delineates floating ice shelves. [Graphic courtesy of Wikimedia]

McMurdo sits on a narrow peninsula at the southern tip of Ross Island by the western edge of the RIS, just over 800 miles from the South Pole (see Figure 1). The fact that it's on an island is generally not obvious, being surrounded by permanent ice shelf and seasonal sea ice until February or March, when large ships dock to resupply. Camping and safety gear are issued at McMurdo, where days are spent acclimating to cold, preparing equipment, training in preventing and recognizing frostbite, and learning about snowmobile operation and precision recycling.

KC4USV McMurdo Operations

The McMurdo ham shack is a small, red-and-white-checked shipping container, probably salvaged from a nearby airfield, but now situated in a large service yard. Like most structures in Antarctica, it has a vestibule forming the double-door entrance. The inside entry is a conventional freezer door mounted backwards keeping cold out, not in. Ross Island is designated IOTA AN-011, grid square RB32, with shack coordinates 77.855° S, 166.678° E.

The cozy shack has good heat, a telephone, internet connection, and a spectacular view of the Transantarctic Mountains. The main rig is a 150 W Kenwood TS-480. I also made contacts with my 100 W Yaesu FT-847. I operated without an amplifier through a Hy-Gain TH-7DX beam. Unfortunately, the Yagi was bolted in place, oriented east-west, after the rotor was damaged by extreme winds in a previous winter.

McMurdo Communications Operations (MAC-OPS) controls all communications, including Amateur Radio, which uses call sign KC4USV. MAC-OPS houses high-skill, dedicated professionals, several of whom are also hams. Jakob Conner, AK4NP, held the shack keys during the 2014 – 2015 season.

RIS Seismic Arrays

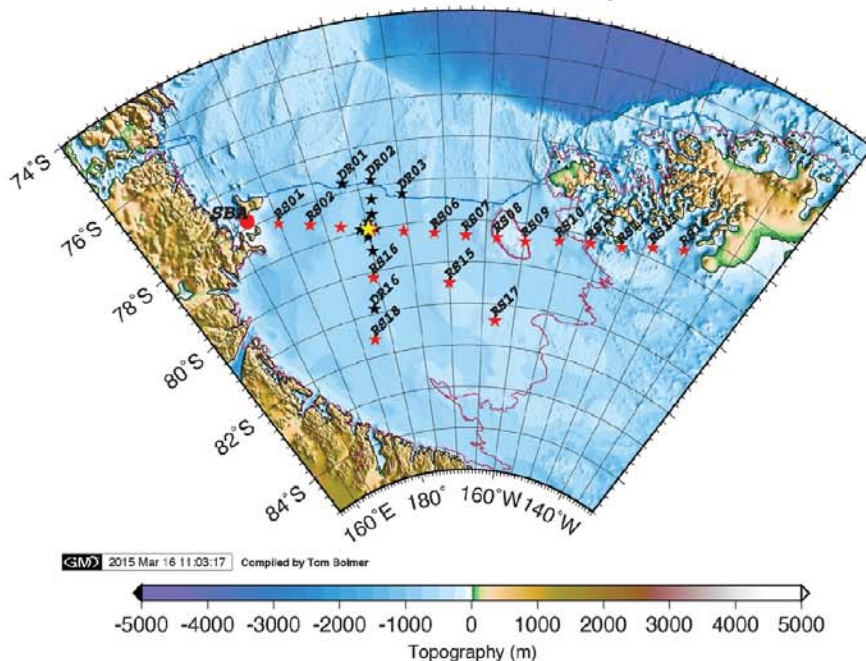


Figure 2 — An array of 34 seismometer stations (red stars) across the Ross Ice Shelf, with McMurdo Station on Ross Island ("SBA," left). Yesterday Camp is at the array center (gold star). The blue line indicates the approximate ice shelf edge, with the grounding line in red. [Tom Bolmer, graphic]

I operated KC4USV from November 5 – 13, 2014, logging 427 contacts. Of these, 401 were unique, including 330 from 42 US states and St. Croix. The other 71 were from 21 countries, including seven Canadian provinces, and counting Asiatic and European Russia as two countries. Contacts were from every continent, except Africa, and included Mike Fokin operating RI1ANT from the Russian Mirny Base, which was 1,600 miles away on the Indian Ocean side of Antarctica. Other highlights involved three QRP contacts: AE9F in California and WA2TP in Massachusetts, both transmitting 5 W, and W8FHF from Ohio, who was transmitting 1 W. Also notable was the contact with Lilly and Tom Service, KG4SNA, operating maritime mobile on their 44-foot sailing vessel *Tiger Lilly* near Tonga. All QSLs for McMurdo were efficiently handled by Larry Skilton, K1IED (SK).

Amateur Radio operations have occurred since the first days the US Navy opened McMurdo base, KC4USV, in February 1956. Hams provided crucial communication links, especially phone patches to the US for decades before reliable satellite links were available. Unfortunately, ham operations at McMurdo apparently stopped for a time after Christmas 2014, but *DX News* reported that it was back on the air in October 2017, with W2EMT, AF7DJ, and WY7AA operating, and as of December 2017, the station is on ARRL's Logbook of The World (LOTW).

KC4/K6REF Yesterday Camp Operations

On November 15, 2014, we departed McMurdo's Willy Field skiway (planes have skis, not tires, in Antarctica) in an LC-130 and arrived at Yesterday Camp (78° 57.35 S, 179° 53.19 W) in the middle of the RIS, which is a huge, flat, and cold stretch of ice. The site is about 1.5 miles from the International Dateline, so a moderate walk takes you into "yesterday." Actually, to avoid confusion, all of Antarctica maintains New Zealand time by international convention.



Figure 3 — Yesterday Camp's science tent and ham shack, with a 20-meter dipole strung between three poles in the background. [Reinhard Flick, K6REF, photo]

We slept at Yesterday Camp in cozy mountain tents and "50-below" sleeping bags for 19 days. Nights were spent watching the sun — which never set — travel in an ellipse above the horizon. We had several larger tents for working, cooking, and eating. These were warmed with propane stoves to about 40 °F — the temperature inside a normal refrigerator. The outside temperature was -13 °F when we arrived, gradually warming to a balmy 14 °F as we left on December 4, 2014.

I operated from the science tent (see Figure 3) at Yesterday Camp as KC4/K6REF from November 18 – 30, and from my mountain tent on December 3, 2014, making about 150 contacts in 27 countries and 23 US states. My Yaesu FT-847 was on the ice with a simple wire dipole mounted on three 8-foot bamboo flag poles. The operation was powered with a 12 V golf cart battery and a small battery charger hooked to a Honda generator. Unfortunately, it produced so much RF interference that reception was not possible while it was running. Operating from my mountain tent was less than ideal because it was too low for me to sit up.

Conditions at camp were often frustrating because propagation was commonly one-way. Still, there were pileups, especially from European

stations eager to log a once-only Antarctica ice shelf contact.

We packed up and departed Yesterday Camp in a great flurry of snow, spent 2 nights in McMurdo (in actual beds), then flew back to Christchurch to drop off gear. We headed home on December 7, 2014, and arrived 23 hours later the same day, after crossing the dateline once more.

Acknowledgments

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