

# Soviet exchange scientist at Byrd Station, Antarctica, 1971: preliminary research results

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In 1971 the U.S.-U.S.S.R. exchange of antarctic scientists, a tradition with both countries, continued. The author spent a year as an exchange scientist at the U.S. Byrd Station; his program covered the physics of the ionosphere and radio wave propagation. The author was mainly concerned with the study of abnormal events of radio wave absorption that are characteristic of high geomagnetic latitudes.

In 1971 significant high latitudinal ionospheric disturbances occurred; they also were recorded at Byrd Station. These were polar cap absorption (PCA) events. A riometer and other instruments recorded such phenomena as auroral effects, cosmic noise absorption, low frequency emissions of the ionosphere, and visual aurora.

The Byrd Station riometers recorded three PCA events. One of them, which occurred January 24-29, when the ionosphere was continuously sunlit, was rather significant. The absorption started to intensify on the 24th at 2030 UT, reaching maximum (12.7 decibels at 30 megaHertz) on the 25th of January at 2030 UT.

Comparing these data with riometer records made at other antarctic stations reveals the latitudinal inhomogeneity of the absorption, which seems to be associated with the inhomogeneity of the solar cosmic ray flux that causes this radio wave absorption. The table shows maximum absorption values at 30 megaHertz at antarctic stations.

Two zones of enhanced absorption are well marked: one is in the vicinity of the geomagnetic pole (Vostok Station) and the other in the vicinity of the auroral zone (Byrd Station). In between is a zone of decreased uniform absorption. It should be noted that the indicator of frequency dependence of the absorption (riometers at 30 and 50 megaHertz) at Byrd Station turned out to be 1.1-1.2, while at McMurdo Station it was 1.6-1.8.

It can be assumed that the cause of this uneven latitudinal absorption is a so-called hard type of the energy spectrum of solar cosmic rays. Data on the latitudinal distribution of absorption during PCA events, together with the estimated paths of solar cosmic rays, are important for improving knowledge of the shape of the magnetosphere.

Interesting results on the solar cyclic variations of the auroral type absorption were obtained.

This report would not be complete without mentioning the spirit of friendly cooperation that existed at Byrd Station during the whole period. The author would like to sincerely thank all the members of the National Science Foundation's Office of Polar Programs staff for the interest they took in his work and needs. Their arrangements for the author's visit to the United States on his way home are greatly appreciated.

**Maximum absorption values (at 30 megaHertz) at four antarctic stations during the January 24-29, 1971, polar cap absorption event.**

Station	Invariant lat. (S.)	Maximum absorption at 30 MHz (db)	(UT) Time of maximum absorption (on Jan. 25)
Byrd	68.8°	12.70	2200
Mirny	76.8°	9.95 (32 MHz)	1200
McMurdo <sup>a</sup>	80.0°	11.00	1800
Vostok	84.3°	20.00	1200

<sup>a</sup> Riometer observations by McDonnell Douglas Astronautics Company.