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A COMPARATIVE STUDY OF THE EFFECTS OF SEVERE IONOSPHERIC CONDITIONS ON GPS RECEIVERS OPERATED IN THE SOUTHERN POLAR REGION

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A study was carried out to determine the effects of mild and severe ionospheric conditions on GPS signal tracking by different L1/L2 receiver models operating in the southern polar region. In this study, data collected by a OSU/USGS team on stations of the TAMDEF network were used together with data from Antarctic stations of the International GNSS Service (IGS) network. TAMDEF is a joint **USGS**/**OSU** project to measure crustal motion in Southern Victoria Land, Transantarctic Mountains. Ten IGS stations equipped with different L1/L2 GPS receiver models were selected, and data were evaluated for two 24-hour periods of severe ionospheric disturbance (2003/10/29) and moderate ionospheric conditions (2003/11/11). Separate tests were carried out at McMurdo Station between January 16 and February 6, 2006, where several different types of receivers were connected to the same antenna. This test was repeated with different receivers connected to different antenna types; a total of four 4-day sessions were carried out.

The UNAVCO QC software was used to carry out the analyses. Depending on the data sampling rate and mask angle, the expected number of observations per receiver/satellite were compared to the actual number of measurements collected during the ionospheric storms, with special focus on L2 data. Depending on the receiver model, epoch measurements lost during the severe ionospheric conditions ranged from 0.5 to 30%. As expected, more data were lost on the L2 channel. In addition, the number of cycle slips per number of observations as a function of receiver model was computed; it shows great variation for different hardware. The possible variability of the ionospheric conditions at some of the continent-wide sites is considered in the conclusions. The results indicate that depending on the severity of ionospheric conditions, there is a significant difference in the impact on the operations of different hardware models, particularly for older model receivers. GPS receiver selection is an important factor in assuring required data quality and continuity are met when observations may be affected by severe ionospheric disturbances.