Observations by Mid-continent Magnetoseismic Chain (McMAC) and their use in space weather research

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The Mid-continent Magnetoseismic Chain (McMAC) consists of nine magnetometer stations that line up across the U.S. and Mexico along the 330th magnetic meridian. These systems sample at 2 Hz and monitor the fluctuations of the geomagnetic field caused by space weather phenomena, and they are always on the Internet to allow rapid access of data. The McMAC stations can connect to the Fort Churchill Line of the CARISMA Array and two IGPP-LANL stations at the same longitude and form a long magnetometer chain that spans the L-value range from 1.3 to 11.7, the greatest latitudinal coverage in all meridians. One of the main advantages of this magnetometer chain is its close separation between adjacent stations, enabling the use of the gradient technique to identify field line resonance (FLR) frequencies and to further estimate the plasma mass density in the magnetosphere. The observations of FLR and the derived density can always be collected in the daytime and occasionally in the nighttime as well. In this paper we present the observations by the newly completed McMAC and jointly by the CARISMA and IGPP-LANL Arrays. The observed plasma density and its wide coverage in L-value can benefit space weather studies, such as on magnetosphere-ionosphere coupling and on the wave-particle interaction for modeling the radiation belts. Also discussed are other applications of the McMAC observations in space weather research, including possible joint observations with satellite missions.