Simple Aurora Monitor – SAM-III Note

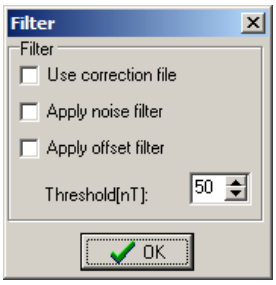
Two topics are briefly discussed:

1) The natural geomagnetic activity at higher latitudes
2) The effects of the SAM_VIEW averaging filter on displayed data, and

Introduction: Reeve Observatory is located in Anchorage, Alaska (USA) at 61.63 degrees geomagnetic latitude near the southern edge of the auroral zone. In general, the geomagnetic field is naturally more active in the auroral zone than at lower latitudes. Gakona station (Alaska Magnetometer Chain) is about 300 km east-northeast of Reeve Observatory and about 2 degrees higher latitude. The activity of the magnetic field's Y-component at Reeve Observatory generally, but not always, correlates well with Gakona station.

Field activity: The geomagnetic field was unsettled for several days prior to and on 17 December 2010 due to the magnetosphere's interaction with a solar coronal hole high-speed stream. The magnetograms from Reeve Observatory and Gakona Station showing the activity for 17 December are on page 2.

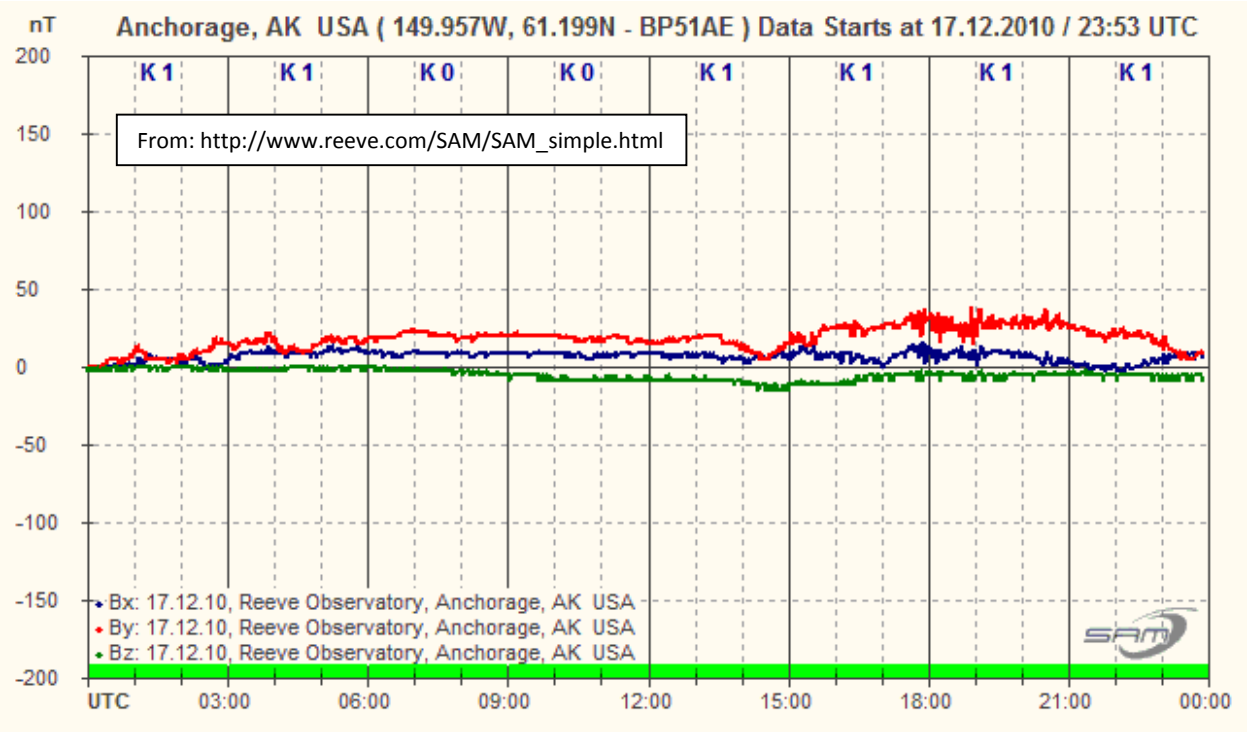
The geomagnetic field was relatively quiet until around 1330 UTC (0430 local) when a dip in the Y-component occurred. This was followed by unsettled conditions and then rapidly varying random activity during the 3-hour period 1800 to 2100 (0900 to 1200 local). Unsettled conditions continued through 2400 (1500 local). The noisy field variations were small (around ±10 nT).

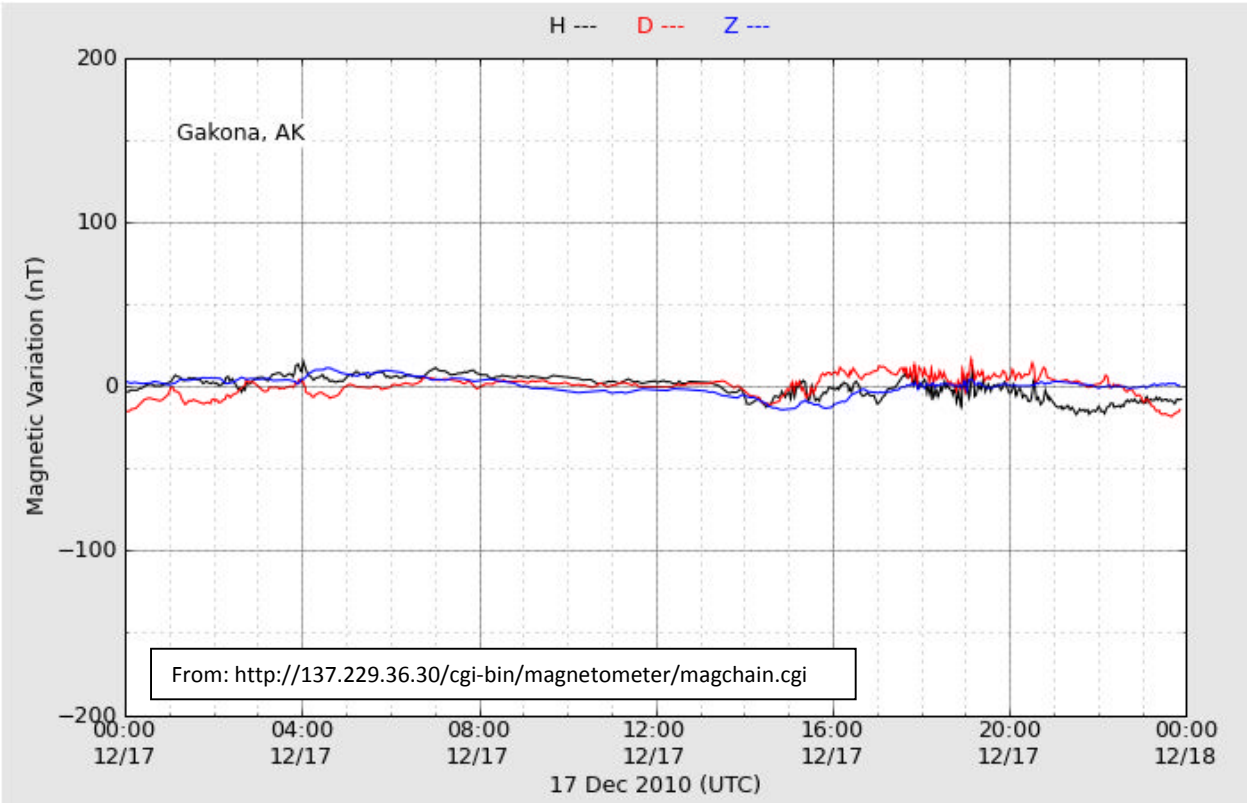


Noise filtering: The SAM_VIEW noise filter (*View – Filter – Apply Noise Filter*) is very effective at removing transients caused by man-made magnetic disturbances such as nearby automobiles and movement of ferromagnetic objects in the vicinity of the sensors. However, the noise filter also can mask the natural activity at higher latitudes. The effect of the Noise Filter function in SAM_VIEW can be seen in the two magnetograms on page 3. In the filtered magnetogram most of the natural activity has been removed. Note: Not all noise shown in the unfiltered magnetogram is due to geomagnetic field activity – some is caused by internal system noise.

Coordinate systems: The 3-axis SAM-III at Reeve Observatory uses the geographic coordinate system (reference to true north) and measures the X-, Y- and Z-components. The coordinate system for H and D used by Alaska Magnetometer Chain is unknown. Z is vertical in all coordinate systems.

The upper magnetogram for Reeve Observatory shows X (red), Y (blue) and Z (green) components and the lower magnetogram for Gakona station shows H (black, N-S component – approximately equivalent to X), D (red, E-W component – approximately equivalent to Y) and Z (blue).





SAM_VIEW images from 17 December 2010. No Noise Filter (upper) and Noise Filter (lower)