

Geomagnetic Disturbance Report – Reeve Observatory

Event Type: Co-Rotating Interaction Region

Background: The solar wind speed depends on many factors associated with the sunspot cycle. During the descending and minimum phases of the sunspot cycle, the solar wind is dominated by coronal hole high-speed streams, with speeds in the range of 500 – 800 km/s. The solar wind also has a denser low-speed component with a speed of around 300 km/s associated with the equatorial coronal streamer belt. The overall average speed is in the vicinity of 470 km/s.

The high- and low-speed components form alternating streams in the solar wind flow. They move outward into inter-planetary space in a spiral due to the Sun's rotation. As the streams travel away from the Sun, the high-speed streams overtake the slow-speed flows and create regions of enhanced density and magnetic field called *co-rotating interaction regions* (CIR). When these regions encounter the Earth, they can trigger geomagnetic disturbances and storms that recur with a 27-day period.

Activity: The magnetograms on page 2 show the geomagnetic field activity over the 3-day period 23 – 25 December 2010. The first two days are relatively quiet and the third day indicates slightly more activity at approximately 0800 and 1430. The source of the elevated activity at 0800 is unknown but could have been related to interaction of a recurrent coronal hole high-speed stream with the magnetosphere or the magnetosphere's natural frequent activity near local midnight (or both).

The 1430 event was likely related to the Earth's encounter with a co-rotating interaction region (CIR). The Space Weather Prediction Center reported for 25 December: "Observations from the ACE spacecraft indicate a co-rotating interaction region signature, in advance of a coronal hole high speed stream, around 25/1430Z."

Supporting data: Magnetograms from the Alaska Magnetometer Chain, Gakona Station, and GOES are provided on page 3.

Equipment: 3-axis Simple Aurora Monitor (SAM-III) located at geomagnetic coordinates: 61.63 °N : 262.89 °E. For equipment description and real-time magnetogram – <http://www.reeve.com/SAMDescription.htm>

Resources:

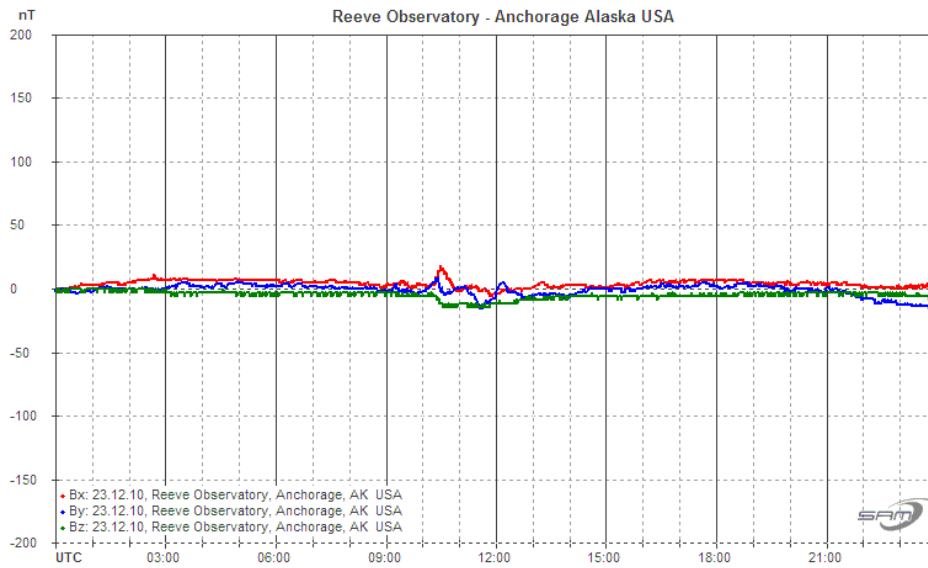
Alaska Magnetometer Chain – 137.229.36.30/cgi-bin/magnetometer/magchain.cgi

Geostationary Operational Environmental Satellites – www.swpc.noaa.gov/rt_plots/mag_3d.html

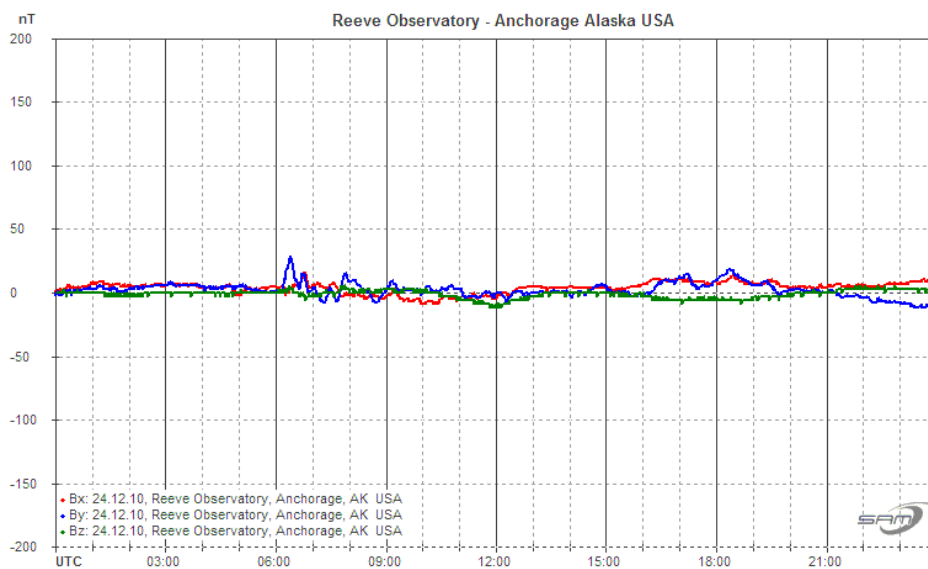
Space Weather Prediction Center – www.swpc.noaa.gov/

Geomagnetism Tutorial - <http://www.reeve.com/Documents/SAM/GeomagnetismTutorial.pdf>

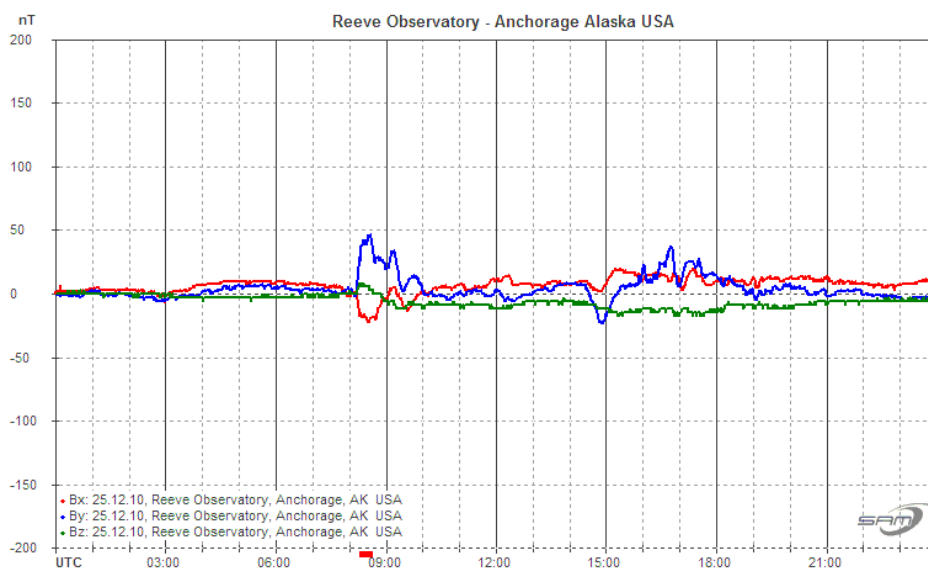
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23 December 2010
Relatively quiet day



24 December 2010
Relatively quiet day



25 December 2010
Encounter with co-rotating interaction region around 1430

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