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Historical observations of solar wind effects on the high latitude geomagnetic field.

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The interplanetary magnetic field (IMF) significantly influences the diurnal variations of the high latitude geomagnetic field with an increased (decreased) horizontal field intensity when the IMF is directed from (towards) the Sun to (from) the Earth.

Magnetic observatories at high latitudes were non-existent before the 1920s, but glimpses of the IMF before that time may be extracted from the magnetic observations of Roald Amundsen, who overwintered for two years in the high Canadian arctic to locate the north magnetic dip pole.

New analysis of Amundsen's high-quality geomagnetic recordings from 1903 to 1905, yields information about the Earth magnetic field and the solar wind 50 years before it was known to exist. When the H component from the mean diurnal variation is plotted as a function of time for each of the Carrington rotation periods No. 677, 678 and 679 (May, June and July, 1904) the IMF is clearly seen to change direction four times with each 27.3 day rotation.

When the days with IMF toward and away from the Sun are separated, a skewed diurnal distribution of the magnetic elements illustrates the overwhelming effect of the IMF during the summer months.

Thus, the interactions of the magnetosphere by the solar wind 100 years ago are consistent with the magnitude and variations observed during the space age. In addition, the high latitude diurnal geomagnetic variations support the view that the Svalgaard-Mansurov Effect is associated with the Earth's magnetospheric convection, driven mainly by IMF By. The geomagnetic field (the H-component) is increased when IMF By is positive, but significant reduced when the By-component change direction.