# Solar wind driven periodic radar echoes and Pc 5 oscillations observed during the magnetic storm on 14 December 2006

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In this study we examine on the relationship between ULF Pc 5 waves and periodic radar echoes observed at King Salmon (KSM) of a SuperDARN station during a period of a magnetic storm occurred on 14 December 2006. The storm began from a storm sudden commencement (SSC) at 14h14m UT on 14 December 2006, which was caused by a high speed solar wind shock accompanied with a magnetic sheath structure with high frequency interplanetary magnetic field (IMF) oscillations. The storm showed a relatively long lasting initial phase followed by a large Dst disturbance. The initial phase of the magnetic storm was caused by long lasting northward IMF succeeding to the oscillating magnetic field. The main phase was brought by a large amplitude IMF Bz oscillations started from 22 UT on 14 December 2006, which was associated with large amplitude density variations also. The periodic radar echoes at King Salmon was observed during the initial phase of the magnetic storm corresponding to the interplanetary condition showing large solar wind density fluctuations and strong northward IMF Bz. The period of radar echoes was about 4 min, which was observed coherently over the latitude range from 63 to 67 CGM. and showed a westward propagation from the noon to the dawn. Associated with these periodic radar echoes Pc 5 oscillations of the magnetic field were observed with a period of about 4 min on the ground covering from the high to low latitudes extending to the magnetic equator. It is very important to note that the radar echoes and associated Pc 5 oscillations appeared coherently in phase with the solar wind density fluctuations. Therefore, we can conclude that the oscillations observed in the radar echoes in the ionosphere and in the Pc 5 oscillations on the ground were directly driven by the solar wind density variations and associated IMF variations. Further they induced a large scale electric field(current) oscillations in the ionosphere and the resultant very coherent Pc 5 oscillations from the high to low latitudes, extending to the magnetic equator.