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The behaviour of Pc3 pulsations during low-density solar wind events. Revisiting the problem: how the Pc3 pulsation activity relates to solar wind conditions?

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Since the first satellite measurements of the interplanetary medium became available, the relation of surface geomagnetic pulsations to solar wind parameters was studied several times. The activity and occurrence rate of Pc3-Pc4 pulsations were found to be highly correlated with solar wind speed and also a connection with the interplanetary magnetic field orientation was established. These properties of Pc3-Pc4s were attributed to their upstream wave origin.

However during certain periods the modulation of Pc3 amplitudes does not follow the expected variation. To overcome this discrepancy some authors tried to refine the relationship between solar wind conditions and pulsation activity including also other interplanetary parameters (e.g. plasma number density, dynamic pressure, energy flux) in their analysis but with a limited success. Recently the disappearance of Pc3 activity during a famous low-density solar wind event (LDE) in 1999 (“the day the solar wind almost disappeared”) attracted the attention again for this unsolved problem. Although during this LDE the solar wind speed was not far from average conditions, Pc3s could not be observed nor in the magnetosphere, neither on ground.

In this work the results of a statistical analysis based on high resolution magnetometer data recorded at the MM100 meridional array (L = 1.8 – 6.1 along the 100˚ magnetic meridian) is presented. We demonstrate for the first time the dependence of ground Pc3-Pc4 amplitudes on the subsolar distance of the magnetopause and as well as on upstream Alfvén Mach number. At the light of these results we discuss the behaviour of Pc3s during LDEs. Our analysis supports, that upstream wave activity is the dominant source of mid-latitude Pc3s.