Pc3-4 pulsations in the polar cap

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The occurrence of narrow-band Pc3-4 waves in the polar cap is not expected by the ULF community. However, we tried to search for Pc3-4 activity using the data from the trans-Antarctic profile of search-coil magnetometers extended from sub-auroral stations BAS A80, A81 at 65^o, through P3 at 70^o and P4 at 80^o, and deep into the polar cap (P5 and P6 at 85^o). Statistics of Pc3-4 activity and its correlative relationships with the solar wind and IMF parameters have been examined. Two regions of the high Pc3-4 activity have been found: in the region corresponding to the near-noon magnetopause or cusp, and in the polar cap region corresponding to the morning flank of the magnetotail lobe. These groups of Pc3-4 emissions have different characteristics: band-width, latitudinal structure, polarization, and, probably, are related to different mechanisms.

We speculate that different channels of propagation of upstream turbulence to the ground are possible: via the equatorial magnetosphere; via the cusp; and via the lobe/mantle. In a latter case compressional disturbances directly penetrate into the magnetotail lobe and yield Pc3 activity in the polar cap. Transfer functions of each propagation channel must not coincide, and different filtering/amplification mechanisms are possible. Near-noon Pc3-4 pulsations with latitudinal maximum at 70^o are related to the penetration via the cusp. This study shows that there is an additional source of Pc3-4 pulsations in the region of the mantle/cap, in the region with open field lines, which provides maximum at latitude 80^o and higher. The occurrence of narrow-band Pc3-4 waves in the polar cap provides a challenge to the ULF physics, because so far no resonant conversion/filtering mechanism on the open field lines has been identified.