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Pc1 waves in the system of solar-terrestrial relations

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The report is devoted to Pc1 waves, which are the electromagnetic waves of space origin with the frequencies of about one hertz. These beautiful and mysterious waves attract the attention of many researchers all over the world as an essential element of the space physics. After 70 years of explorations the geophysicists and space physicists have acquired substantial data which show that the Pc1 play an important role in the system of solar-terrestrial relations. The interaction of the solar wind with the Earth's magnetosphere creates a complex mosaic of the Pc1 wave fields that correlate closely with geomagnetic storms, aurora, ionospheric perturbations, acceleration processes and other space weather phenomena. In this report we make an attempt to tie together the numerous properties of Pc1 across a wide time scale, from the fast transient phenomena during the interaction of interplanetary blast shocks of the solar flares origin with the geomagnetic field, to the quasi-periodic variation of Pc1 wave activity associated with the 11 years solar cycle. The theoretical and experimental problems are considered taking into account their informational and energy aspects. Much attention is paid to a number of physically important relations describing the impact of solar wind on the Pc1 generation. The Ðñ1 activity on the ground is most closely related to the density of interplanetary plasma, and this dependence is found from low (L = 2.3) up to high (L = 6.1) geomagnetic latitudes. One of the most interesting result is to observe Pc1 at high latitudes after sporadic penetration of solar plasma into the magnetosphere. This result allows us to link the problematics of Pc1 waves and one of the key common problems of the solar-terrestrial physics, and it opens a new opportunity to understand the essence of close relation between the Pc1 and the density of interplanetary plasma. An extrapolation of the results to the wave dynamics of more remote celestial objects is considered.