The experimental results demonstrate influence of the geoeffective interplanetary electric field (GIEF) on atmospheric processes in the central Antarctica, where the large-scale system of vertical circulation takes place during the winter seasons. The interplanetary electric field influence is realized through acceleration of the air masses, descending into the lower atmosphere from the troposphere, and formation of cloudiness above the Antarctic Ridge, where the descending air masses enter the surface layer. The cloudiness results in the sudden warmings in the surface atmosphere, because the cloud layer efficiently backscatters the long wavelength radiation going from ice sheet, but does not affect the process of adiabatic warming of the descending air masses. The altitudinal profiles of temperature, varying in the opposite manner under influence of the southward and northward IMF, indicate that the cloud layer formation occurs at \( h = 8 \sim 10 \) km. The acceleration of the descending air masses is followed by a sharp increase of the atmospheric pressure in the near-pole region, which gives rise to the katabatic wind strengthening above the entire Antarctica. As a result, the circumpolar vortex around the periphery of the Antarctic continent decays and the surface easterlies, typical of the coast stations during the winter season, are replaced by southerlies. It is suggested that the resulting invasion of the cold air masses into the Southern ocean leads to destruction the regular relationships between the sea level pressure fluctuations in the Southeast Pacific high and the North Australian-Indonesian low.