Heat exchange between air and upper active layer of soil plays a significant role in underground temperature field forming. When describing the process of harmonic wave propagation to the depth one often simplifies this process to heat transfer in homogeneous media with a constant apparent thermal diffusivity. This model assumes that the amplitude wave vector is constant within the interval and equal to the phase wave vector. Experimental data obtained in the geothermal station at Yekaterinburg show wave vectors asynchronous change with depth even the non-conductive processes are negligible. Temperature data were investigated by harmonic analyses. Dependencies of amplitude and phase wave vectors on the depth were calculated. These dependencies allow us identify the main factors of heat transfer, e.g. thermal properties of soil, freezing and thawing of pore moisture, water filtration. Thermal properties inhomogeneity also plays a significant role in disturbance of temperature wave propagation. We have considered a model of conductive harmonic wave propagation through the inhomogeneous horizontally layered media. The main parameter which determines thermal contrast of layers is the thermal effusivity (square root of the product of thermal conductivity and volumetric heat capacity). Thermal effusivity is responsible for the wave propagation disturbances, which are usually interpreted as thermal diffusivity change. In our report we demonstrate some examples of temperature wave disturbances due to thermal effusivity variation and a method of thermal effusivity measurement.