Heat balance of turbulent magnetospheric plasma above the auroral ionosphere

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The electron component of intensive electric currents flowing along the geomagnetic field lines excites turbulence in the thermal magnetospheric plasma.
The protons are then scattered by the excited electromagnetic waves, and as a result the plasma is stable. As the electron and ion temperatures of the background plasma are approximately equal each other, here electrostatic ion-cyclotron (EIC) turbulence is considered.
In the nonisothermal plasma the ion-acoustic turbulence may occur additionally. The anomalous resistivity of the plasma causes large-scale differences of the electrostatic potential along the magnetic field lines. Owing to these differences both heating and acceleration of the thermal and energetic auroral plasma are present. The investigation of the energy and momentum balance of the plasma and waves in the turbulent region is performed numerically taking the magnetospheric convection and thermal conductivity of the plasma into account.
As shown for the quasi-steady state, EIC turbulence may provide differences of the electric potential about of 1 – 10 kV at altitudes of 500<h<10000 km above the Earth's surface. In the turbulent region, the temperatures of the electrons and protons increase not more than a few times in comparison with the background values.