Physical Properties of the Quiet Solar Chromosphere–Corona Transition Region

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The physical properties of the quiet solar chromosphere–corona transition region are studied. Here the structure of the solar atmosphere is governed by the interaction of magnetic fields above the photosphere. Magnetic fields are concentrated into thin tubes inside which the field strength is great. We have studied how the plasma temperature, density, and velocity distributions change along a magnetic tube with one end in the chromosphere and the other one in the corona, depending on the plasma velocity at the chromospheric boundary of the transition region. Two limiting cases are considered: horizontally and vertically oriented magnetic tubes. For various plasma densities we have determined the ranges of plasma velocities at the chromospheric boundary of the transition region for which no shock waves arise in the transition region. The downward plasma flows at the base of the transition region are shown to be most favorable for the excitation of shock waves in it. For all the considered variants of the transition region we show that the thermal energy transfer along magnetic tubes can be well described in the approximation of classical collisional electron heat conduction up to very high velocities at its base. The calculated extreme ultraviolet (EUV) emission agrees well with the present-day space observations of the Sun.