Magnetic structure of the solar transition region as observed in various ultraviolet lines emitted at different temperatures

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The structure of the solar transition region (TR) in a polar coronal hole of the Sun is studied. In particular, the detailed assocation of the coronal magnetic field (carpet) with the radiance patterns of the TR, when seen in various far ultraviolet (FUV) emission lines, is investigated. A detailed comparison is made of the coronal magnetic field, as obtained by extrapolation of the NSO/Kitt-Peak photospheric field to heights of several tens of megameters, with the radiances of many FUV lines, which are emitted by ions of various elements at different ionization stages, corresponding to different local coronal temperatures. By a correlation analysis of the emission pattern with the magnetic field (network and carpet of loops), the so-called correlation height of the emission can be determined. By its help and through a correlation analysis the magnetic nature of the emission regions and the temperature structure of the TR can be better revealed and understood. In particular, at mesocopic scales of several megameters the regions with strong emission (originating from multiple small closed loops) are found to be located at low heights, whereas weak emissions (coming from locally open, i.e. far reaching fields) appear to originate at greater heights. These findings are qualitatively consistent with similar results obtained at large scales for large-sacle loops and coronal holes. Our correlation-height analysis of the emission lines confirms the notion that plasma at different temperature can coexist at the same height. The TR is not thermally stratified but strongly nonuniform and magnetically structured.