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Sensitivity of solar off-limb line profiles to electron density stratification and the velocity distribution anisotropy

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The effect of the electron density stratification on the intensity profiles of the Hi Ly-α line and the Ovi and Mgx doublets formed in solar coronal holes is investigated. We employ an analytical 2-D model of the large scale coronal magnetic field that provides a good representation of the corona at the minimum of solar activity. We use the mass-flux conservation equation to determine the outflow speed of the solar wind at any location in the solar corona and take into account the integration along the line of sight. The main assumption we make is that no anisotropy in the kinetic temperature of the coronal species is considered. We find that at distances greater than 1 R from the solar surface the widths of the emitted lines of Ovi and Mgx are sensitive to the details of the adopted electron density stratification. However, Hi Ly-α, which is a pure radiative line, is hardly affected. The calculated total intensities of Ly-α and the Ovi doublet depend to a lesser degree on the density stratification and are comparable to the observed ones for most of the considered density models. The widths of the observed profiles of Ly-α and Mgx are well reproduced by most of the considered electron density stratifications, while for the Ovi doublet only few stratifications give satisfying results. The densities deduced from SOHO data result in Ovi profiles whose widths and intensity ratio are relatively close to the values observed by UVCS/SOHO although only isotropic velocity distributions are employed. These density profiles also reproduce the other considered observables with good accuracy. This result suggests that the need for a strong anisotropy of the velocity distribution (i.e. a temperature anisotropy) is not so clear cut as previous investigations of UVCS data suggested.