Astronomy Reports 1996 vol.40 N5, pages 723-729

Atmospheres and spectra of X-ray illuminated stars: A nongray model

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Abstract

We continue to study illuminated stellar atmospheres with radiative transfer. A method for computing X-ray irradiated blanketed model atmospheres is described. The heating function of such atmospheres has been found to be complicated and to have a minimum at the depth of continuum formation. We have established that the normalized heating function does not depend on the intensity of the incident radiation and atmospheric parameters. The heating of only deep layers is shown to decrease sharply with increasing angle of incidence of the irradiative flux. The effect of the soft and hard X-ray emission components on the formation of the heating function is explored. A sharp decrease in the heating of chromospheric layers when allowing for line blanketing has been ascertained. The gray model is shown to be valid, to a good approximation, for describing illuminated atmospheres. The cooling function is computed over the ranges Teff = 3000-200 000 K and log Pg from -2.0 to 8.0, and the possible existence of temperature instabilities in the chromospheres of irradiated atmospheres has been revealed.