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Line mixing and collisional broadening in the thermal radiation of the lower Venus atmosphere

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The Lorentzian form-factor at high pressure of the Venus atmosphere is no longer valid so that the absorption in the far wings of spectral lines is several orders of magnitude lower. We employed a theory of far-wing spectral line profile [2] which resulted in estimates of the thermal radiation fluxes in the lower atmosphere. However due to strong broadening exceeding typical rotational energy shift, spectral lines cannot be considered as isolated and the interference of states has to be accounted for [3,4]. In the current work we combine the two approaches and compare results with ground-based observations. A simple and elegant way to take into account the effect of state interference on the rotation-vibration band is proposed in [3] by assuming a relaxation time parameter , common for all states forming the band. The estimate of the relaxation time is based on the empirical data of line broadening under normal pressures, averaged over the band. It is important that the calculations be done over P, Q, R-branches of each vibration band separately. In spite of technical simplicity of the above model, its implementation for Venus atmospheric absorption is complicated by a priory unknown validity field. NIR transparency windows in the Venus atmosphere give us a chance to test theoretical radiative transfer models versus observations.

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