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INFRARED EMISSION OF THE AGN DUSTY TORUS: RADIATIVE TRANSFER MODELING WITH SKIRT

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We investigated the infrared emission of a toroidal structure of gas and dust (the "dusty torus") surrounding the central regions of the AGNs. We introduced a new model of the the dusty torus as a clumpy two-phase medium, with high-density clumps embedded in a low-density interclump dust. To obtain spectral energy distributions and images of the torus at different wavelengths, we employed the 3D Monte Carlo radiative transfer code SKIRT. We calculated a grid of models for different parameters, analyzed the properties of infrared emission and compared them to the properties of the corresponding sets of clumps-only models and models with a smooth dust distribution. We found that the most striking feature of the two-phase model is that it might offer a natural solution to the common issue reported in a number of papers — the observed excess of the near-infrared emission. Namely, a torus model with the dust distributed in a two-phase medium has a more pronounced ('hotter') emission in the $2 - 6$ μm range while displaying, at the same time, an attenuated 10 μm silicate feature.