

3D Photoionization Models: the Bipolar PN IC 4406

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A three-dimensional (3D) self-consistent photoionization code is developed in order to build more realistic models for asymmetrical and/or inhomogeneous photoionized nebulae. With these models the assumption of spherical or plane-parallel symmetry can be dropped and models with various geometries can be treated. The gaseous region is divided into numerous cubic cells, and the physical conditions in each cell are obtained taking into account the effect of the other cells in the optical depth and their contribution into the diffuse radiation. A model for IC 4406, which is a typical example of bipolar planetary nebula is presented. The model assumes a torus of dense material around the central star, as suggested in the literature. Its presence is confirmed by the model, in particular by the shape of the theoretical $H\alpha + [NII]$ isophotal map. The chemical abundances required to explain the observed line intensities indicate that the chemical properties of this bipolar nebula are not characteristic of type I planetaries. A detailed paper will be published in *Ap.J.* (FAPESP, CNPq)