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A Numerical Treatment of Heat and Mass Transfers in Cometary Nuclei Models

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Cometary nuclei models using the finite difference method may present intrinsic problems of mass and energy flux conservation when these bodies are close to perihelion along their orbit. In some circumstances, the calculated production rates of volatile species released by the nucleus can even be affected by errors of the same order of magnitude, as a result of the employed numerical method. In order to avoid these shortcomings, we present a one-dimensional cometary nucleus model that uses the finite volume method, thus allowing us to study the evolution of a nucleus owning the characteristics of Halley's comet. Our results are then compared to those derived from models of Espinasse et al. (1989) and Orosei et al. (1999) that are both based on the finite difference method.