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Ionisation Feedback in Star and Cluster Formation Simulations

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Feedback from photoionisation may dominate on parsec scales in massive star-forming regions. Such feedback may inhibit or enhance the star formation efficiency and sustain or even drive turbulence in the parent molecular cloud. Photoionisation feedback may also provide a mechanism for the rapid expulsion of gas from young clusters' potentials, often invoked as the main cause of 'infant mortality'. There is currently no agreement, however, with regards to the efficiency of this process and how environment may affect the direction (positive or negative) in which it proceeds. The study of the photoionisation process as part of hydrodynamical simulations is key to understanding these issues, however, due to the computational demand of the problem, crude approximations for the radiation transfer are often employed. We will briefly review some of the most commonly used approximations and discuss their major drawbacks. We will then present the results of detailed tests carried out using the detailed photoionisation code MOCASSIN and the SPH+ionisation code iVINE code, aimed at understanding the error introduced by the simplified photoionisation algorithms. This is particularly relevant as a number of new codes have recently been developed along those lines. We will finally propose a new approach that should allow to efficiently and self-consistently treat the photoionisation problem for complex radiation and density fields.

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