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Reduction of collisional-radiative models for transient, atomic plasmas[1] RICHARD JUNE ABRANTES, ANN KARAGOZIAN, Univ of California - Los Angeles, DAVID BILYEU, Air Force Research Laboratory, HAI LE, Lawrence Livermore National Laboratory — Interactions between plasmas and any radiation field, whether by lasers or plasma emissions, introduce many computational challenges. One of these computational challenges involves resolving the atomic physics, which can influence other physical phenomena in the radiated system. In this work, a collisional-radiative (CR) model with reduction capabilities is developed to capture the atomic physics at a reduced computational cost. Although the model is made with any element in mind, the model is currently supplemented by LANL's argon database[2], which includes the relevant collisional and radiative processes for all of the ionic stages. Using the detailed data set as the true solution, reduction mechanisms in the form of Boltzmann grouping[3], uniform grouping, and quasi-steady-state (QSS), are implemented to compare against the true solution. Effects on the transient plasma stemming from the grouping methods are compared.

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[2]Argon Atomic Data Sets. https://www-amdis.iaea.org/LANL/argon/
[3]Le et al. *Phys. Plasmas* 20, 1-19 (2013).

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