Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Automatic Level-Grouping of Complexity-Reduced, Radiative Atomic Kinetics.[1] RICHARD JUNE ABRANTES, National Research Council, DAVID BILYEU, ROBERT MARTIN, Air Force Research Laboratory — High-fidelity plasma simulations involving atomic kinetics requires state-space completeness often accompanied by many types of atomic transitions. The computational expense associated with this requirement drove the development of a collisional-radiative (CR) modeling package simulating reduced-order atomic kinetics through an automatic level-grouping process. Starting from the novel Boltzmann grouping methodology devised by Le et al.[2], spectral clustering techniques taken from machine learning automated the construction of appropriate level groups for time-dependent simulations. While the results from these simulations captured global plasma evolution well for various plasma conditions[3], obtaining accurate radiative spectra remained problematic throughout the investigation. Further refinement of the clustering methodology to better account for spectral accuracy is therefore needed. In this work, a preliminary investigation adapting the clustering method to better capture these radiative effects will be introduced to facilitate the rapid development of automatically-reduced CR models that better approximate radiative effects for a wider range of plasma regimes.

[1]Distribution A: Approved for public release; Distribution is Unlimited, PA (Public Affairs) Clearance Number 20304
[2]Le et al. *Phys Plasmas* 20, 1-19 (2013)
[3]Abrantes et al. *J Comput Phys* 407, (2020)

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Date submitted: 10 Jul 2020 Electronic form version 1.4