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Tensor product decomposition methods for plasmas physics computations D. DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory — Tensor product decomposition (TPD) methods are a powerful linear algebra technique for the efficient representation of high dimensional data sets. In the simplest 2-dimensional case, TPD reduces to the singular value decomposition (SVD) of matrices. These methods, which are closely related to proper orthogonal decomposition techniques, have been extensively applied in signal and image processing, and to some fluid mechanics problems. However, their use in plasma physics computation is relatively new. Some recent applications include: data compression of 6-dimensional gyrokinetic plasma turbulence data sets,[1] noise reduction in particle methods,[2] and multiscale analysis of plasma turbulence.[3] The goal of this presentation is to discuss a novel application of TPD methods to projective integration of particle-based collisional plasma transport computations.

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[2]R. Nguyen, D. del-Castillo-Negrete, K. Schneider, M. Farge, and G. Chen: Journal of Comp. Phys. 229, 2821-2839 (2010).
[3]S. Futatani, S. Benkadda, and D. del-Castillo-Negrete: Phys. of Plasmas, 16, 042506 (2009)

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