Development of Synthetic Diagnostics for use in Validation[1]

DANIELLE LEMMON, SIMON WOODRUFF, Woodruff Scientific, CARLOS A. ROMERO-TALAMAS, JOHN O'BRYAN, University of Maryland Baltimore County, DARPA SPHEROMAK TEAM — Synthetic diagnostics are reproductions of experimental measurements obtained from simulation data, taking the same spatial averages (point, line, plane or volume) as in the experiment. This reduction of data facilitates meaningful direct quantitative comparisons which then allows for validation of simulation results [1]. We demonstrate the development with data sets produced by highly spatially and temporally resolved NIMROD simulations with reference to the spheromak concept under development at UMBC. We present here results from a set of synthetic diagnostics that are scripted in Octave. Quantities such as magnetic field, temperature, and density are visually represented by color-coded graphs and movies to demonstrate how these quantities change over time. We discuss errors that enter into the computation of the quantities.

[1] Oberkampf and Roy Verification and Validation in Scientific Computing CUP (2010).

Simon Woodruff
Woodruff Scientific

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