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Semi-analytical solution of initial-value problems JAN SCHEFFEL, Fusion Plasma Physics, Alfvén Laboratory, Royal Institute of Technology, SE-100 44 Stockholm — A fully spectral weighted residual method for solution of general initial value partial differential equations has been developed [1]. All time, spatial and physical parameter domains are represented by Chebyshev series, enabling global semi-analytical solutions. The method avoids time step limitations. The spectral coefficients are determined by iterative solution of a linear or nonlinear system of algebraic equations, for which a globally convergent root solver has been developed. Accuracy is controlled by the number of included Chebyshev modes in each dimension. The computational efficiency is shown to increase through the use of sub-domains. It is shown by example that the method may be used for efficient solution of nonlinear initial value problems in fluid mechanics and magnetohydrodynamics. [1] J. Scheffel, "Semi-analytical solution of initial-value problems," TRITA-ALF-2004-03, Royal Institute of Technology, Stockholm, Sweden, 2004.

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