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Can time-spectral methods improve turbulence modelling? JAN SCHEFFEL, Fusion Plasma Physics, KTH Royal Institute of Technology, Stockholm, Sweden — In computational fusion physics, the widely separated time and space scales often demand extremely long computer simulations and vast memory resources, using finite time steps. Gyrokinetic turbulence modelling at high Reynolds or Lundquist numbers may be allocated millions of CPU hours for parallel processing on supercomputers. It is thus worthwhile to explore new avenues that may alleviate requirements on computer power. Indeed, time-stepping may be completely avoided for initial-value problems. In the recently developed Generalized Weighted Residual Method GWRM [1], temporal, spatial and parameter domains are all handled using a solution ansatz in the form of a sum of Chebyshev polynomials. The coefficients of the ansatz are determined using a weighted residual method for which a new efficient equation solver has been developed [2]. In addition, the temporal and spatial computational region has been successfully treated using subdomain methods in a number of test problems, more efficiently than relevant finite difference methods. The GWRM, however, relies on solution of linear systems of equations in each subdomain, and memory requirement is an issue. In this presentation we will discuss recent subdomain approaches for efficient and convergent modelling of drift-wave turbulence.

[1] Scheffel J, Partial Differential Equations: Theory, Analysis and Applications (Nova Science Publishers) p 1-49, 2011.
[2] Scheffel J and Håkansson C, Appl. Numer. Math. 59(2009)2430.

Jan Scheffel
Fusion Plasma Physics, KTH Royal Institute of Technology,
Stockholm, Sweden

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