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**A Space/Time Dynamically Adaptive Method for Multiscale Problems** TEMISTOCLE GRENGA, ZACHARY ZIKOSKI, SAMUEL PAOLUCCI, University of Notre Dame, MAURO VALORANI, "La Sapienza" University of Rome — Systems of partial differential equations (PDEs) describing problems that are multiscale in space and time are computationally very expensive to solve. In order to overcome the challenges related to both thin spatial layers and temporal stiffness we propose the use of a wavelet adaptive multilevel representation (WAMR) in space and an adaptive model reduction method (G-Scheme) in time. The multilevel structure of the algorithm provides a simple way to adapt computational refinements to local demands of the solution. High resolution computations are performed only in spatial regions where sharp transitions occur, while the G-Scheme is an explicit solver developed for stiff problems which is built upon a local decomposition of the dynamics in three subspaces involving slow, active and fast time scales. Only the modes in the active subspace are integrated numerically, the others are approximated asymptotically. Subsequently, the original problem not only becomes substantially smaller, but more importantly non-stiff. Combining the WAMR technique with the G-Scheme yields a time accurate solution of a prescribed accuracy with a much smaller number of space- time degrees of freedom. While the computational scheme can be used to solve a wide class of stiff PDE problems, we will illustrate its use in the solution of the Navier Stokes equations in reactive flows.

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