Cauchy Contour Integration based REXI methods for Climate and Weather simulations

Martin Schreiber @ (Université Grenoble Alpes, Jean Kuntzmann Laboratory, AIRSEA team), Jed Brown

R 3.07 Thu Z1 17:00-17:30

Running simulations on high-performance computers poses restrictions and therefore challenges on solving PDEs within a particular time frame. Here, disruptive mathematical reformulations which, e.g., exploit additional degrees of parallelism also in the time dimension gained increasing interest over the last two decades.

This talk targets improving the wallclock time for weather and climate simulations and starts by giving a brief overview of exponential integration methods. Then, the focus is put on rational approximations of exponential integrating (REXI) methods and its successful application to prototypes of single-layer atmospheric simulations. We will present our current work on Gaussian-quadrature Cauchy Contour integration methods and compare it to other state-of-the art time integration methods which can be posed in the REXI form (B-REXI, T-REXI, EL-REXI, CI-REXI).

(I gratefully acknowledge contributions, discussions and more with Jed Brown, Finn Capelle, Terry S. Haut, Pedro S. Peixoto and Raphael Schilling)