SUNDIALS

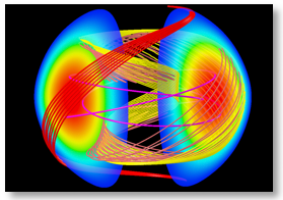
Suite of Nonlinear and Differential /Algebraic Equation Solvers

Adaptive time integrators for ODEs and DAEs and efficient nonlinear solvers
Used in a variety of applications. Freely available. Encapsulated solvers & parallelism.

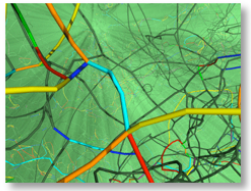
- **ODE integrators:**
  - CVODE: adaptive order and step BDF (stiff) & Adams (non-stiff) methods
  - ARKode: adaptive step implicit, explicit, IMEX, and multirate Runge-Kutta methods
- **DAE integrators**: IDA – adaptive order and step BDF integrators
- **Sensitivity Analysis:** CVODES and IDAS provide forward and adjoint sensitivity analysis capabilities for ODEs and DAEs respectively
- **Nonlinear Solvers:** KINSOL – Newton-Krylov, Picard, and accelerated fixed point
- **Modular Design:** Users can supply own data structures and solvers or use SUNDIALS provided modules
  - Written in C with interfaces to Fortran
  - Vectors modules: serial, MPI, OpenMP, CUDA, RAJA, hypre, PETSc, & Trilinos
- **Open Source:** Freely available (BSD License) from LLNL site, GitHub, and Spack. Can be used from MFEM, PETSc, and deal.II

Lawrence Livermore National Laboratory | FASTMATH | ECP | xSDK

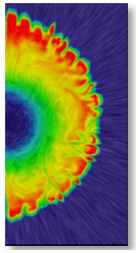
SUNDIALS is used by thousands worldwide in applications from research and industry



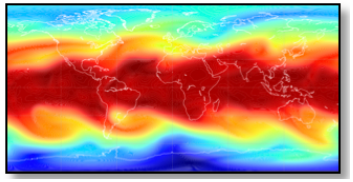
Magnetic Reconnection



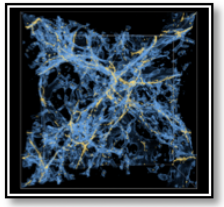
Dislocation Dynamics



Core Collapse Super-nova

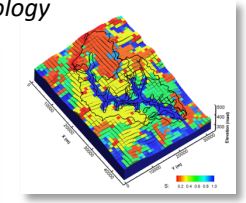


Atmospheric Dynamics



Cosmology

SUNDIALS is supported by extensive documentation, a user email list, and an active user community



Subsurface Flow

http://www.llnl.gov/casc/sundials