SAMG MODFLOW

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SAMG FOR GROUNDWATER SIMULATION: MESH-AGNOSTIC YET FAST

Now supports MODFLOW 6

Key features of SAMG:

- State-of-the-art AMG performance – applicable for structured and unstructured meshes
- Optimized solver control including automated-setup-reuse and switching between different solvers
- Supports both multi-core and multi-node systems

Advantages for MODFLOW:

- Usable as black box
- High resolutions: Allows increased modeling accuracy for both structured and unstructured models (as in MODFLOW-USG), while keeping computing times low
- Handles strongly heterogeneous and unstructured models where standard solvers have problems

User Comments

SAMG

Algebraic
Multigrid Methods
for Systems

SAMG is a very efficient core solver library for accelerating industrial applications. SAMG is based on algebraic multigrid (AMG) and supports both serial and multi-core computations on single PCs, workstations or compute nodes.

LMG is an interface linking the SAMG library to MODFLOW. There are three versions of LMG: LMG-2kx supports **MODFLOW-2000** and **MODFLOW-2005**, LMG-USG supports **MODFLOW-USG** and LMG-6 supports **MODFLOW 6**. An LMG version for transport codes like MODFLOW-USG-Transport is currently being evaluated.
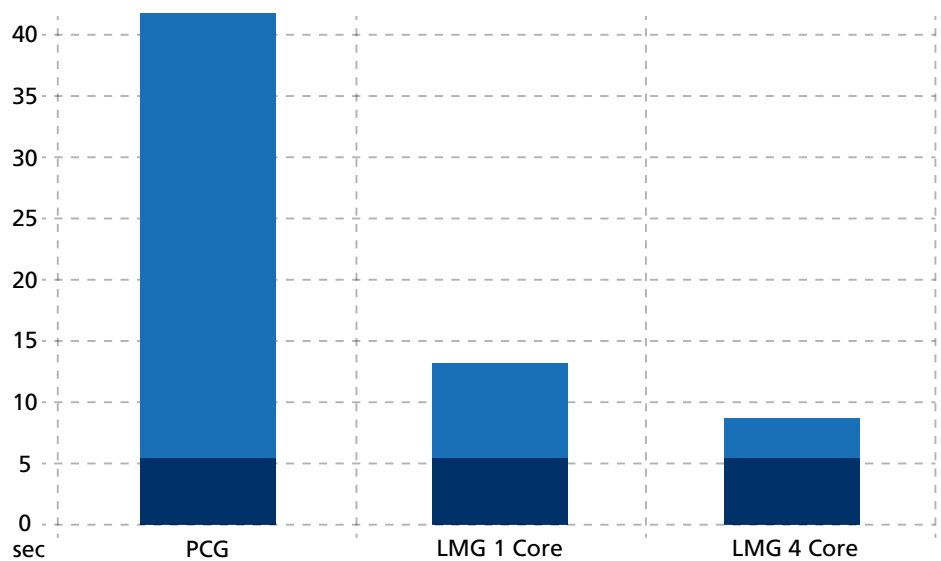
Commercial references:

The following companies offer SAMG in their groundwater simulation software:

• Aquaveo LLC
• DHI-WASY GmbH
• Environmental Simulations Inc.
• ITASCA Denver Inc.
• Waterloo Hydrogeologic
• HydroAlgorithmics

The graph shows computing times for the MODFLOW 6 model test007_751x751 with roughly 600,000 grid-cells. While PCG is very sensitive to the relaxation factor used, LMG does not need additional parameters set by the user. LMG achieves a speed-up of 5.1 on a single core and a speed-up of 11.8 on 4 cores compared with PCG. Hence, the total runtime with LMG is reduced by a factor of 3.4 on a single core and a factor of 5.1 on 4 cores compared with the total runtime using PCG. The runtime of SAMG grows only linearly with the number of equations. For this reason, the speed-up of LMG compared to PCG will increase for bigger models.