InterFrost spread sheet for participant's code information

File is code related, if you use more than one code please provide one file per code …

Aims: 1°) provide pieces of information that will probably be essential to understand possible differences in the results or performances, 2°) provide info that will be essential to improve the codes from a "best practice" perspective.

Name of the code GEOAN

Participant laboratory Golder Associates

Participant name(s) Johan Holmén

Is the code used or developed by the team? Developed (and used) by Johan Holmén

Numerical scheme, order of the numerical scheme Finite differences/Finite volumes

Time discretization strategy (fixed time steps / if adaptative, provide further information)

Fixed or adaptive time steps. In addition automatic local time stepping at cells with large Courant numbers.

Spatial discretization

- 2D / 3D 3-Dim
- external/internal mesh generator Internal mesh generator.
- structured or unstructured grids, what kind of polyhedral mesh (tetra ? hexa ?)
  Structured 3-dim grid that can be deformed.
  (Double grid- double porosity is also available with different geometry)

Treatment of non-linearities?

- Method used (Newton, Picard …) Picard iterations
- Convergence criterion expression and threshold value Depends on type of analysis.

Resolution of linear systems

- Linear solvers
  Iterative linear solvers. Adaptive solution method, dependent on grid-Peclét numbers and Courant numbers. Local time stepping etc.
- pre-conditioner No preconditioner, because of the adaptive solution method.

How is the TH coupling managed?

- Sequential resolution / iterative process / simultaneous inversion?
  Sequential resolution or iterative process

List of available boundary conditions options in the code A large number of conditions are available, including coupled conditions.

Sources of averaging (under relaxation, spatial averaging on variables …)

A large number of different methods are available.

Constitutive laws implemented

- Saturation curve Yes
- Permeability as a function of temperature Yes
- Viscosity as a function of temperature

  Also full coupling between transport of salt and heat, for thermohaline simulations.

  Etc.

What kind of averaging for the properties (depending on water, ice, bulk parameters)?

Several different methods are available.

Is (massively)parallel resolution implemented?

Yes, parallel processing via OpenMP* API compiler directives (Intel Fortran).

- Which approach (domain decomposition, loop decomposition).
  Iterative solvers with dynamic allocation of amount of work for each thread, based on the adaptive solution method and status of system studied.
- Indicative number of processors For the moment using 48 processors.

Papers / reports / web siteproviding (further) information.

Geoan user's guide and manual is available on request.

Further pieces of information?

In Geoan, the system of equations can be established based on several different methods, which can be combined during a simulation dependent on different parameters, e.g. Péclet numbers, or temperatures, etc.

- Split operator. Using implicit or explicit methods for the diffusion. Explicit, implicit or Crank-Nicolson for the advection.

Fully coupled explicit methods (Lax-Wendroff).

Fully coupled implicit and semi-implicit methods, Crank-Nicolson, etc.