
```cpp
thermo.correct();
rho=thermo.rho();
mu=thermo.mu();
Cp=thermo.Cp();
alphaP=thermo.alphaP();
betaT=thermo.betaT();
```

2.7 Numerical schemes

Since the numerical evaluation of the divergence and gradient terms in the governing equations has great influence on heat and mass transfer, a suitable solution strategy regarding discretization and linear solver schemes need to be chosen to ensure accuracy, robustness and stability. In the presented solver HydrothermalSinglePhaseDarcyFoam, the discretization and interpolation scheme of the primary fields \((T,p)\) can be defined in the simulation configuration files. In the following benchmark tests (section 5), the advective discretization scheme is set to upwind to ensure consistency with HYDROTHERM. It should be noted that all of the basic numerical schemes of OpenFOAM are also valid for HydrothermalSinglePhaseDarcyFoam solver.

3 Description of toolbox components

The organization of the HydrothermalFoam toolbox is shown in Figure 3. The toolbox contains 5 parts: HydrothermalFoam solver, thermophysical models, boundary conditions, cookbooks and manual.

- HydrothermalSinglePhaseDarcyFoam: this block compiles the solver (an executable file) that solves the seafloor hydrothermal convection equations described in subsection 2.1. It can be used to simulate single-phase hydrothermal circulation in an isotropic porous medium.

- ThermoModels: this block compiles the libHydroThermoPhysicalModels library containing the EOS of pure water, which is used to formulate the used thermophysical model - see subsection 2.5.

- BoundaryConditions: this block compiles libHydrothermalBoundaryConditions library containing four customized boundary conditions explained in subsection 2.4. The example usage of each boundary conditions can be found in cookbooks and manual in GitLab repository (https://gitlab.com/gmdpapers/hydrothermalfoam).

- benchmarks: input files of all the benchmark tests (see section 5) presented in this paper.

- cookbooks: this block contains some example cases of parallel computing, user defined boundary conditions, and post processing.