Parallel Richards' equation solver - implementation and validation

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Software implementing Richards' equation was developed. Solver allows for simulation of the water flow in vadose zone. The software was implemented using application programming interface provided by OpenFOAM open source numerical library. Developed solver supports efficient parallelization using MPI (Message Passing Interface) standard. Automatic mesh refinement in regions of high soil potential gradients is also supported. Basic soil water retention models are already implemented, software allows for easy extension by additional retention models. All typically used boundary conditions are supported by the model. Software was validated against analytical solutions of the Richards' equation. Validation by comparisons with solutions provided by other vadose zone water transport simulation software (Hydrus) was also done. Results of validation confirms correctness of solver's implementation. Sample validation results and usage cases are presented.