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TOUGH2 USER'S GUIDE, VERSION 2.0

Karsten Pruess
Curt Oldenburg
George Moridis

Earth Sciences Division, Lawrence Berkeley National Laboratory
University of California, Berkeley, California 94720

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ABSTRACT

TOUGH2 is a numerical simulator for nonisothermal flows of multicomponent, multiphase fluids in one, two, and three-dimensional porous and fractured media. The chief applications for which TOUGH2 is designed are in geothermal reservoir engineering, nuclear waste disposal, environmental assessment and remediation, and unsaturated and saturated zone hydrology. TOUGH2 was first released to the public in 1991; the 1991 code was updated in 1994 when a set of preconditioned conjugate gradient solvers was added to allow a more efficient solution of large problems.

The current Version 2.0 features several new fluid property modules and offers enhanced process modeling capabilities, such as coupled reservoir-wellbore flow, precipitation and dissolution effects, and multiphase diffusion. Numerous improvements in previously released modules have been made and new user features have been added, such as enhanced linear equation solvers, and writing of graphics files. The T2VOC module for three-phase flows of water, air and a volatile organic chemical (VOC), and the T2DM module for hydrodynamic dispersion in 2-D flow systems have been integrated into the overall structure of the code and are included in the Version 2.0 package. Data inputs are upwardly compatible with the previous version. Coding changes were generally kept to a minimum, and were only made as needed to achieve the additional functionalities desired.

TOUGH2 is written in standard FORTRAN77 and can be run on any platform, such as workstations, PCs, Macintosh, mainframe and supercomputers, for which appropriate FORTRAN compilers are available. This report is a self-contained guide to application of TOUGH2 to subsurface flow problems. It gives a technical description of the TOUGH2 code, including a discussion of the physical processes modeled, and the mathematical and numerical methods used. Illustrative sample problems are presented along with detailed instructions for preparing input data.

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