

PACKAGE ID - 001352IBMPC00 FACT2.0

KWIC TITLE - Subsurface Flow and Contaminant Transport

AUTHORS - Aleman, S.
WSRC, Aiken, SC (United States)

LIMITATION CODE -COPY **AUDIENCE CODE** - LIM

COMPLETION DATE - 04/24/2000 **PUBLICATION DATE** - 04/01/2000

DESCRIPTION - FACT is a transient three-dimensional, finite element code for simulating isothermal groundwater flow, moisture movement, and solute transport in variably and/or fully saturated subsurface porous media. Both single and dual-domain transport formulations are available. Transport mechanisms considered include advection, hydrodynamic dispersion, linear adsorption, mobile/immobile mass transfer and first-order degradation. A wide range of aquifer conditions and remediation systems commonly encountered in the field can be simulated. Notable boundary condition (BC) options include, a combined recharge and drain BC for simulating recirculation wells, and a head dependent well BC that computes flow based on specified drawdown. The code is designed to handle highly heterogeneous, multi-layer, aquifer systems in a numerically efficient manner. Subsurface structure is represented with vertically distorted rectangular brick elements in a Cartesian system. The groundwater flow equation is approximated using the Bubnov-Galerkin finite element method in conjunction with an efficient symmetric Preconditioned Conjugate Gradient (PCG) ICCG matrix solver. The solute transport equation is approximated using an upstream weighted residual finite element method designed to alleviate numerical oscillation. An efficient asymmetric PCG (ORTHOMIN) matrix solver is employed for transport. For both the flow and transport equations, element matrices are computed from either influence coefficient formulas for speed, or two point Gauss-Legendre quadrature for accuracy. Non-linear flow problems can be solved using either Newton-Ralphson linearization or Picard iteration, with under-relaxation formulas to further enhance convergence. Dynamic memory allocation is implemented using Fortran 90 constructs. FACT coding is clean and modular.

PACKAGE CONTENTS - Media Directory; Software Abstract; Media Includes User's Guide, Executable Module;

SOURCE CODE INCLUDED? - No

MEDIA QUANTITY - 1 CD Rom

METHOD OF SOLUTION - Bubnov-Galerkin finite element method with Preconditioned Conjugate Gradient (PCG) ICCG matrix solver for flow. Upstream weighted residual finite element method PCG (ORTHOMIN) matrix solver for solute transport.

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COMPUTER - IBM PC

OPERATING SYSTEMS - Microsoft Windows 32 bit OS (9x/nt), IRIX 6.4 (SGI UNIX OS)

PROGRAMMING LANGUAGES - na

SOFTWARE LIMITATIONS - Isothermal conditions; constant density; porous (non-fractured) media; solute contamination; linear, equilibrium sorption; linear, first-order degradation. Mesh size limited by computer storage and run-time considerations.

SOURCE CODE AVAILABLE (Y/N) - N

UNIQUE FEATURES - A unique feature of FACT version 2.0 is the ability to simulate solute transport using a dual-dominion (dual-porosity), mobile-immobile) formulation in a variably-saturated (unsaturated and/or saturated) medium. FACT also contains unique boundary condition (BC) options including, a) a combined recharge and drain BC that automatically defines seepines, b) a combined injection and extraction BC for simulating recirculation wells, and c) a head dependent well BC that computes flow based on specific drawdown.

OTHER PROG/OPER SYS INFO - FACT source code should compile with little or no modification on other computer platforms. FACT writes graphics files in Tecplot (R) format.

HARDWARE REQS - PC, SGI workstation, or comparable platform.

TIME REQUIREMENTS - Problem dependent.

ABSTRACT STATUS - Released AS-IS 9/21/2000

SUBJECT CLASS CODE - Z

KEYWORDS -

COMPUTER PROGRAM DOCUMENTATION
F CODES
TRANSPORT
GROUND WATER
SIMULATION
FINITE ELEMENT METHOD

EDB SUBJECT CATEGORIES -
990200

SPONSOR - DOE

PACKAGE TYPE - AS - IS