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# CNWRA INFORMATION PROCESSING STANDARD SOFTWARE SUMMARY

01. Summary Date			02. Summary prepared by (Name and phone)			03. Summary action		
Yr.	Mo.	Day	Rachid Ababou, (512) 522-2583			New	Replacement	Deletion
						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
04. Software Date			03. Software title			Previous Internal Software ID		
Yr.	Mo.	Day	BIGFLOW (provisional)					
06. Short title						07. Internal Software ID		
BIGFLOW (provisional)								
08. Software type		09. Processing Mode		10. APPLICATION AREA				
<input type="checkbox"/> Automated Data System <input checked="" type="checkbox"/> Computer Program <input type="checkbox"/> Subroutine/Module		<input type="checkbox"/> Interactive <input type="checkbox"/> Batch <input checked="" type="checkbox"/> Combination		General <input type="checkbox"/> Computer Systems Support/Utility <input checked="" type="checkbox"/> Scientific/Engineering <input type="checkbox"/> Bibliographic/Textual <input type="checkbox"/> Management/Business <input type="checkbox"/> Process Control <input type="checkbox"/> Other				
				Specific Hydrogeologic Flow Simulation Model.				
11. Submitting organization and address					12. Technical contact(s) and phone			
CNWRA					Dr. Rachid Ababou (512) 522-2583			
13. Narrative BIGFLOW (provisional name) is an evolving Fortran 77 computer code for simulating three-dimensional Darcy-type flow in a heterogeneous porous medium. BIGFLOW is currently being modified from the 3D finite difference BIGFLO code previously developed at the Massachusetts Institute of Technology Parson's Laboratory (Author: R. Ababou; Contact at M.I.T.: Prof. L.W. Gelhar). The BIGFLO code accommodates steady as well as transient flow regimes in saturated, variably saturated, or purely unsaturated porous media with highly heterogeneous hydrodynamic properties. The evolving BIGFLOW code will contain the features of the previous BIGFLO code as a subset. A companion code (FLOPROC) will be used for data processing.								
14. Keywords								
Finite Differences; Three-Dimensional; Porous Media; Heterogeneous; Saturated; Unsaturated; Hydrogeology								
15. Computer manufacturer and model		16. Computer operating system		17. Programming language(s)		18. Number of source program statements		
NA		NA		Fortran 77		Estimated: BIGFLO: 10000-15000		
19. Computer memory requirements		20. Tape drives		21. Disk/Drum units		Estimated: FLOPROC: 1000-10000		
Adjustable (dynamic Memory Allocation)		NA		NA		NA		
23. Other operational requirements								
24. Software availability				25. Documentation availability				
Available <input type="checkbox"/> Limited <input type="checkbox"/> In-house only <input checked="" type="checkbox"/>				Available <input type="checkbox"/> Inadequate <input type="checkbox"/> In-house only <input checked="" type="checkbox"/>				
26. FOR SUBMITTING ORGANIZATION USE								

MAIN CONTACT

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SUMMARY

BIGFLO is a Fortran 77 computer code for simulating three-dimensional Darcy-type flow in a heterogeneous porous medium. It accommodates steady as well as transient flow regimes in saturated, variably saturated, or purely unsaturated porous media with highly heterogeneous or spatially random hydrodynamic coefficients. The code, as initially developed at the Massachusetts Institute of Technology (Ref. 1), is based on a 3-dimensional, 7-point centered finite difference approximation of the governing equations expressed in terms of hydraulic head for saturated flow, or in terms of moisture and pressure head for unsaturated flow (mixed form of Richards equation). The computational domain is a parallelepiped rectangle, whose axes may be inclined at an arbitrary angle with respect to the vertical. The boundary conditions, initial conditions, and linear as well as nonlinear hydrodynamic coefficients can be specified node-by-node, or on subdomains, using the companion data processor FLOPROC. Boundary conditions can be fixed head, fixed flux, or zero head gradient for gravitational drainage. Typical types of material heterogeneity used in recent applications of the code are: layered structures, piecewise constant blocks, and 3D random fields, the latter being generated independently (Ref. 2). Fast solution of the large sparse matrix systems is obtained by various preconditioned iterative algorithms based on a diagonal vector storage scheme, allowing for problem sizes on the order of a hundred thousands nodes on a Microvax-2, and one or several million nodes on the 1985-90 generation of supercomputers. A typical area of application of this code is the investigation of large-scale groundwater flow, unsaturated flow, and contaminant transport in naturally heterogeneous formations (Refs. 3,4,5).

REFERENCES

1. Ababou, R., McLaughlin, D. and Gelhar, L. W. March 1988. Three-dimensional flow in random porous media. Report No. 318. Cambridge, MA: Ralph Parsons Laboratory. Massachusetts Institute of Technology. 2 volumes. 1-833.
2. Tompson, A.F., Ababou, R. and Gelhar, L.W. 1989. Implementation of the three-dimensional turning bands random field generator, *Water Resources Research*. 25(10):2227-2243.
3. Ababou, R. and Gelhar, L.W. 1988. A high-resolution finite difference simulator for 3D unsaturated flow in heterogeneous media, in *Computational Methods in Water Resources*. Elsevier and Computational Mechanics Publications. 1:173-178.
4. Ababou, R., McLaughlin, D., Gelhar, L.W. and Tompson, A.F. 1989. Numerical simulation of three-dimensional saturated flow in randomly heterogeneous porous media. *Transport in Porous Media*. 4:549-565.
5. Tompson, A.F. and Gelhar, L.W. 1990. Numerical simulation of solute transport in three-dimensional randomly heterogeneous porous media. *Water Resources Research*. 26(10):2541-2562.

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-rw-r--r-- 1 abagtzog user 26347 Jan 27 09:50 yucca/y5/q50t/HEAD_T1.Z
-rw-r--r-- 1 abagtzog user 6068 Jan 26 03:12 yucca/y5/q50t/HB9-YM5.Z
-rw-r--r-- 1 abagtzog user 2174 Jan 26 01:14 yucca/y5/q50t/INPUT1.Z
-rw-r--r-- 1 abagtzog user 26486 Jan 27 09:51 yucca/y5/q50t/HEAD_T2.Z
-rw-r--r-- 1 abagtzog user 26512 Jan 27 09:51 yucca/y5/q50t/HEAD_T3.Z
-rw-r--r-- 1 abagtzog user 598 Feb 10 13:01 yucca/y5/q50t/H_XY_10.Z
-rw-r--r-- 1 abagtzog user 2168 Jan 26 01:12 yucca/y5/q50t/IN1-YM5.Z
-rw-r--r-- 1 abagtzog user 26538 Jan 27 09:51 yucca/y5/q50t/HEAD_T4.Z
-rwxr--r-- 1 abagtzog user 320797 Jan 23 10:59 yucca/y5/q50t/floproc-temp

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-rwxr--r-- 1 abagtzog user 319815 Jan 23 10:59 yucca/y5/q50t/floproc.ex.Z
-rw-r--r-- 1 abagtzog user 26578 Jan 27 09:51 yucca/y5/q50t/HEAD_T5.Z
-rw-r--r-- 1 abagtzog user 19774 Jan 27 09:51 yucca/y5/q50t/HEAD_T50_50.Z
-rw-r--r-- 1 abagtzog user 26567 Jan 27 09:51 yucca/y5/q50t/HEAD_T6.Z
-rw-r--r-- 1 abagtzog user 26649 Jan 27 09:51 yucca/y5/q50t/HEAD_T7.Z
-rw-r--r-- 1 abagtzog user 26696 Jan 27 09:51 yucca/y5/q50t/HEAD_T8.Z
-rw-r--r-- 1 abagtzog user 6718 Jan 30 11:20 yucca/y5/q50t/H_2.Z
-rw-r--r-- 1 abagtzog user 6716 Jan 30 11:19 yucca/y5/q50t/H_1.Z
-rw-r--r-- 1 abagtzog user 6859 Jan 27 00:42 yucca/y5/q50t/H_10.Z
-rw-r--r-- 1 abagtzog user 6824 Jan 27 00:07 yucca/y5/q50t/H_110.Z
-rw-r--r-- 1 abagtzog user 6840 Jan 27 00:05 yucca/y5/q50t/H_120.Z
-rw-r--r-- 1 abagtzog user 6866 Jan 27 00:41 yucca/y5/q50t/H_20.Z
-rw-r--r-- 1 abagtzog user 6840 Jan 27 00:39 yucca/y5/q50t/H_50.Z
-rw-r--r-- 1 abagtzog user 6861 Jan 26 16:46 yucca/y5/q50t/H_B_10.Z
-rw-r--r-- 1 abagtzog user 6841 Jan 27 00:36 yucca/y5/q50t/H_90.Z
-rw-r--r-- 1 abagtzog user 6856 Jan 30 11:21 yucca/y5/q50t/H_8.Z
-rw-r--r-- 1 abagtzog user 6843 Jan 27 00:38 yucca/y5/q50t/H_60.Z
-rw-r--r-- 1 abagtzog user 6728 Jan 30 11:21 yucca/y5/q50t/H_4.Z
-rw-r--r-- 1 abagtzog user 6806 Jan 27 00:41 yucca/y5/q50t/H_30.Z
-rw-r--r-- 1 abagtzog user 6815 Jan 27 00:08 yucca/y5/q50t/H_100.Z
-rwx----- 1 abagtzog user 327025 Jan 23 10:59 yucca/y5/q50t/floproc-new.
-rw-r--r-- 1 abagtzog user 6820 Jan 27 00:40 yucca/y5/q50t/H_40.Z
-rw-r--r-- 1 abagtzog user 6843 Jan 27 00:37 yucca/y5/q50t/H_80.Z
-rw-r--r-- 1 abagtzog user 19774 Jan 23 09:45 yucca/y5/q50t/HEAD_IC.Z
-rw-r--r-- 1 abagtzog user 2168 Jan 23 09:45 yucca/y5/q50t/IN1-YM4.Z
-rw-r--r-- 1 abagtzog user 26630 Jan 27 09:51 yucca/y5/q50t/HEAD_T9.Z
-rw-r--r-- 1 abagtzog user 6820 Jan 27 00:38 yucca/y5/q50t/H_70.Z
-rw-r--r-- 1 abagtzog user 5108 Jan 23 09:45 yucca/y5/q50t/AL6-YM4.Z
-rw-r--r-- 1 abagtzog user 11283 Jan 23 09:45 yucca/y5/q50t/BC_T50_50.Z
-rw-r--r-- 1 abagtzog user 6091 Jan 23 09:45 yucca/y5/q50t/KS5-YM5.Z
-rwxr--r-- 1 abagtzog user 5119 Dec 31 1991 yucca/y5/HB9-YM4.Z
-rwxr--r-- 1 abagtzog user 5108 Dec 31 1991 yucca/y5/AL6-YM4.Z
-rwx----- 1 abagtzog user 105647 Jan 9 14:52 yucca/floproc.f.Z
drwx----- 4 abagtzog user 0 May 21 04:24 yucca/y6
drwxr-xr-x 2 abagtzog user 0 Jul 20 08:47 yucca/y6/q0
-rw-r--r-- 1 abagtzog user 27444 Jan 28 17:08 yucca/y6/q0/HEAD_T1.Z
-rw-r--r-- 1 abagtzog user 19774 Jan 28 17:10 yucca/y6/q0/HEAD_T50_50.Z
-rw-r--r-- 1 abagtzog user 43423 Jan 28 17:05 yucca/y6/q0/OUT13.Z
-rw-r--r-- 1 abagtzog user 27506 Jan 28 17:08 yucca/y6/q0/HEAD_T11.Z
-rw-r--r-- 1 abagtzog user 27510 Jan 28 17:08 yucca/y6/q0/HEAD_T12.Z
-rw-r--r-- 1 abagtzog user 27500 Jan 28 17:08 yucca/y6/q0/HEAD_T13.Z
-rw-r--r-- 1 abagtzog user 27472 Jan 28 17:10 yucca/y6/q0/HEAD_T6.Z
-rw-r--r-- 1 abagtzog user 27444 Jan 28 17:08 yucca/y6/q0/HEAD_T14.Z
-rw-r--r-- 1 abagtzog user 27470 Jan 28 17:08 yucca/y6/q0/HEAD_T15.Z
-rw-r--r-- 1 abagtzog user 27459 Jan 28 17:08 yucca/y6/q0/HEAD_T16.Z
-rw-r--r-- 1 abagtzog user 27474 Jan 28 17:09 yucca/y6/q0/HEAD_T18.Z
-rw-r--r-- 1 abagtzog user 27491 Jan 28 17:09 yucca/y6/q0/HEAD_T19.Z
-rw-r--r-- 1 abagtzog user 27414 Jan 28 17:09 yucca/y6/q0/HEAD_T2.Z
-rw-r--r-- 1 abagtzog user 27497 Jan 28 17:09 yucca/y6/q0/HEAD_T20.Z
-rw-r--r-- 1 abagtzog user 27435 Jan 28 17:09 yucca/y6/q0/HEAD_T21.Z
-rw-r--r-- 1 abagtzog user 27427 Jan 28 17:09 yucca/y6/q0/HEAD_T22.Z
-rw-r--r-- 1 abagtzog user 27422 Jan 28 17:09 yucca/y6/q0/HEAD_T23.Z
-rw-r--r-- 1 abagtzog user 27461 Jan 28 17:09 yucca/y6/q0/HEAD_T25.Z
-rw-r--r-- 1 abagtzog user 27412 Jan 28 17:09 yucca/y6/q0/HEAD_T3.Z
-rw-r--r-- 1 abagtzog user 27420 Jan 28 17:10 yucca/y6/q0/HEAD_T4.Z
-rw-r--r-- 1 abagtzog user 27442 Jan 28 17:10 yucca/y6/q0/HEAD_T5.Z

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-rw-r--r--	1	abagtzog user	21080	Jan 28 17:10	yucca/y6/q0/HEAD_T50_0.Z
-rw-r--r--	1	abagtzog user	27463	Jan 28 17:10	yucca/y6/q0/HEAD_T7.Z
-rw-r--r--	1	abagtzog user	27455	Jan 28 17:10	yucca/y6/q0/HEAD_T9.Z
-rw-r--r--	1	abagtzog user	7272	Jan 30 12:56	yucca/y6/q0/H_10.Z
-rw-r--r--	1	abagtzog user	7249	Jan 30 12:58	yucca/y6/q0/H_100.Z
-rw-r--r--	1	abagtzog user	7272	Jan 30 12:57	yucca/y6/q0/H_30.Z
-rw-r--r--	1	abagtzog user	7280	Jan 28 17:19	yucca/y6/q0/H_500.Z
-rw-r--r--	1	abagtzog user	7301	Jan 30 12:56	yucca/y6/q0/H_20.Z
-rw-r--r--	1	abagtzog user	11235	Jan 28 07:15	yucca/y6/q0/BC_T50_0.Z
-rw-r--r--	1	abagtzog user	27536	Jan 28 17:08	yucca/y6/q0/HEAD_T10.Z
-rw-r--r--	1	abagtzog user	27463	Jan 28 17:08	yucca/y6/q0/HEAD_T17.Z
-rw-r--r--	1	abagtzog user	27538	Jan 28 17:09	yucca/y6/q0/HEAD_T24.Z
-rw-r--r--	1	abagtzog user	27474	Jan 28 17:10	yucca/y6/q0/HEAD_T8.Z
-rwxr--r--	1	abagtzog user	319815	Jan 28 13:47	yucca/y6/q0/floproc.ex.Z
lrwxr--r--	2	abagtzog user	0	May 21 04:26	yucca/y6/q50
-rwxr--r--	1	abagtzog user	320797	Jan 27 13:26	yucca/y6/q50/floproc-temp.
-rwxr--r--	1	abagtzog user	319815	Jan 27 13:26	yucca/y6/q50/floproc.ex.Z
-rwxr--r--	1	abagtzog user	27380	Jan 27 13:28	yucca/y6/q50/HEAD_T1.Z
-rwxr--r--	1	abagtzog user	27435	Jan 27 13:28	yucca/y6/q50/HEAD_T10.Z
-rwxr--r--	1	abagtzog user	27418	Jan 27 13:29	yucca/y6/q50/HEAD_T11.Z
-rwxr--r--	1	abagtzog user	27429	Jan 27 13:29	yucca/y6/q50/HEAD_T12.Z
-rw-r--r--	1	abagtzog user	24340	Feb 2 17:55	yucca/y6/q50/HEAD_T120.Z
-rwxr--r--	1	abagtzog user	27463	Jan 27 13:29	yucca/y6/q50/HEAD_T3.Z
-rw-r--r--	1	abagtzog user	27110	Feb 3 10:54	yucca/y6/q50/HEAD_T3_n.Z
-rwxr--r--	1	abagtzog user	27422	Jan 27 13:29	yucca/y6/q50/HEAD_T5.Z
-rwxr--r--	1	abagtzog user	27418	Jan 27 13:29	yucca/y6/q50/HEAD_T6.Z
-rw-r--r--	1	abagtzog user	6573	Feb 2 17:56	yucca/y6/q50/H_120_c20.Z
-rw-r--r--	1	abagtzog user	27215	Feb 3 10:54	yucca/y6/q50/HEAD_T6_n.Z
-rwxr--r--	1	abagtzog user	27515	Jan 27 13:29	yucca/y6/q50/HEAD_T8.Z
-rwxr--r--	1	abagtzog user	27461	Jan 27 13:29	yucca/y6/q50/HEAD_T9.Z
-rw-r--r--	1	abagtzog user	7110	Jan 30 00:19	yucca/y6/q50/H_10.Z
-rwx-----	1	abagtzog user	327025	Jan 27 13:26	yucca/y6/q50/floproc-new.e
-rw-r--r--	1	abagtzog user	7124	Jan 27 13:36	yucca/y6/q50/H_120.Z
-rw-r--r--	1	abagtzog user	7069	Feb 5 10:24	yucca/y6/q50/H_T120_n.Z
-rw-r--r--	1	abagtzog user	24340	Feb 2 17:32	yucca/y6/q50/HEAD_T120_c20
-rw-r--r--	1	abagtzog user	27112	Feb 3 10:54	yucca/y6/q50/HEAD_T1_n.Z
-rwxr--r--	1	abagtzog user	19774	Jan 27 13:28	yucca/y6/q50/HEAD_IC.Z
-rw-r--r--	1	abagtzog user	7123	Jan 30 00:21	yucca/y6/q50/H_60.Z
-rwxr--r--	1	abagtzog user	27510	Jan 27 13:29	yucca/y6/q50/HEAD_T2.Z
-rwxr--r--	1	abagtzog user	27423	Jan 27 13:29	yucca/y6/q50/HEAD_T4.Z
-rwxr--r--	1	abagtzog user	27465	Jan 27 13:29	yucca/y6/q50/HEAD_T7.Z
-rw-r--r--	1	abagtzog user	127319	Jan 30 02:53	yucca/y6/q50/MASS.Z
-rw-r--r--	1	abagtzog user	11287	Feb 2 17:41	yucca/y6/q50/BC_T120_c20.Z
-rwxr--r--	1	abagtzog user	320797	Jan 27 13:26	yucca/y6/floproc-temp.ex.Z
-rwxr--r--	1	abagtzog user	319815	Jan 27 13:26	yucca/y6/floproc.ex.Z
-rwx-----	1	abagtzog user	327025	Jan 27 13:26	yucca/y6/floproc-new.ex.Z
-rwx-----	1	abagtzog user	168104	Dec 30 1991	yucca/bigflo.f.Z
-rwx-----	1	abagtzog user	327025	Jan 9 15:40	yucca/floproc-new.ex.Z