Savannah River F-Area Seepage Basins
Model domain initial and boundary conditions

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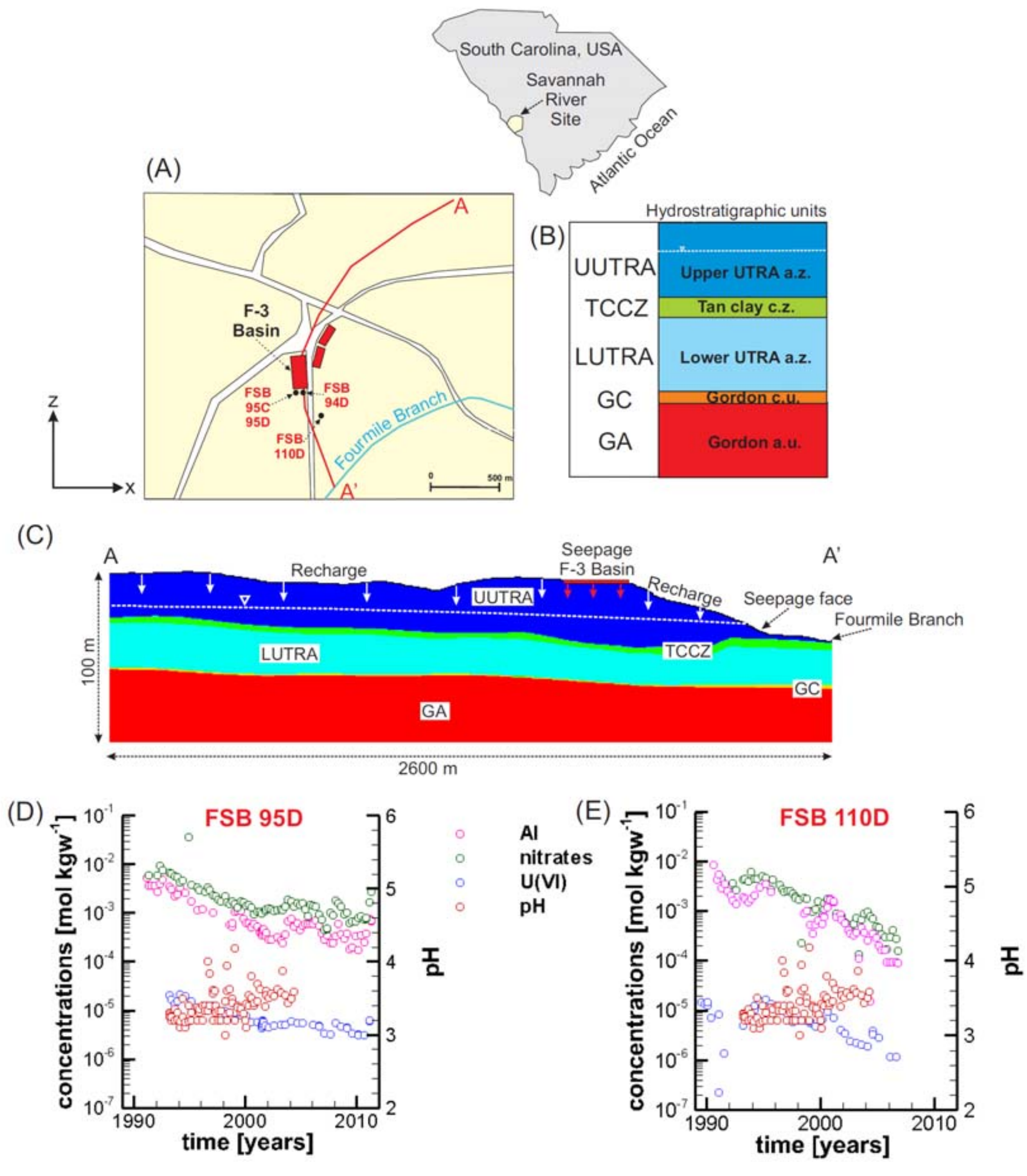

Figure 1. (A) Extension of the 3D-cross section domain for the F-Area Savannah River Site (SRS). (B) Hydrostratigraphic units identified in the F-Area. (C) 3D-cross section domain. (D) and (E) Temporal evolution of concentrations for Al, nitrates, U(VI) and pH in the boreholes FSB 95D (it is located adjacent to the main basin), and FSB 110D (located ~300 m downstream from F-3 Basin), respectively.

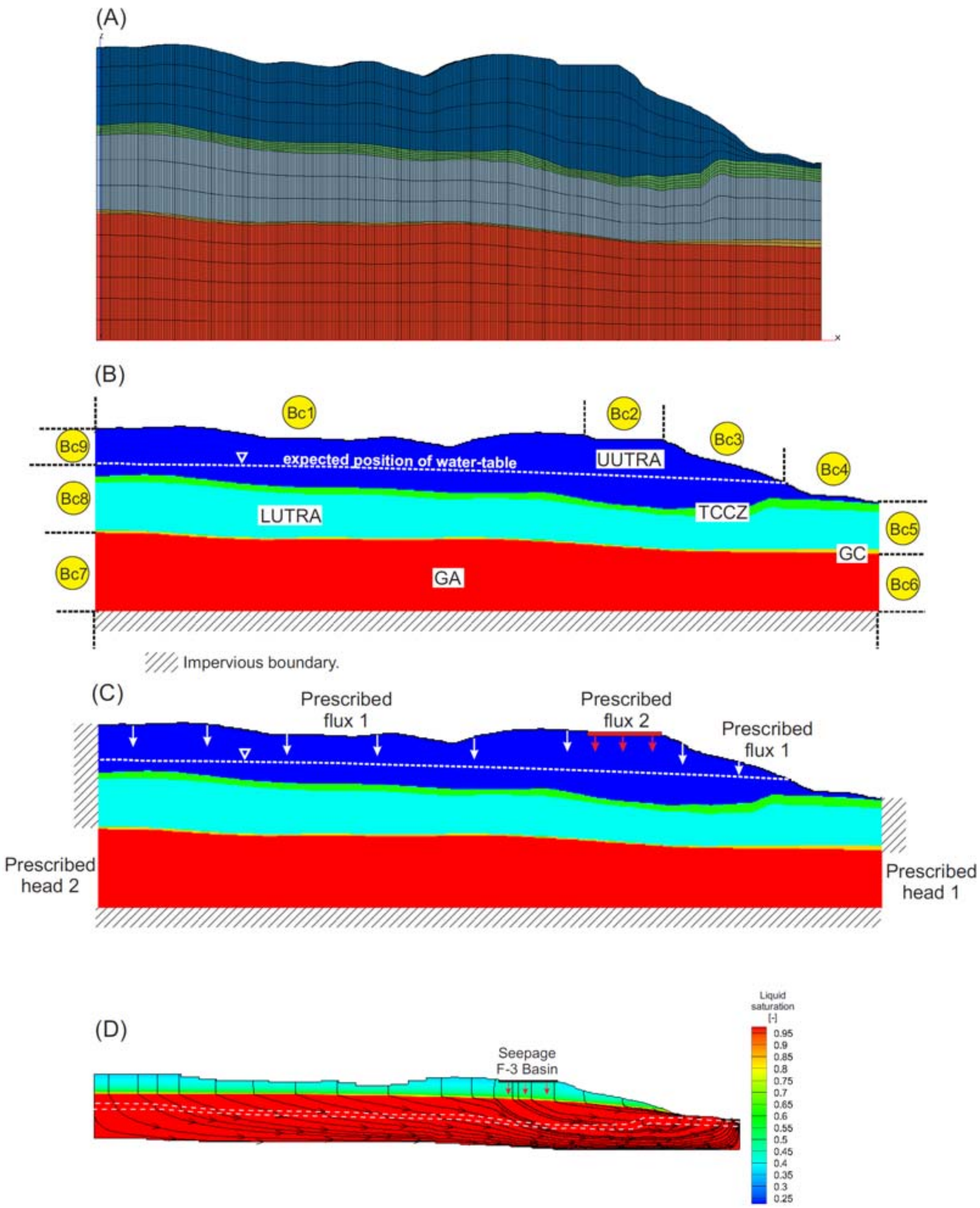

Figure 2. (A) 3D cross-section corresponding to the EXODUS mesh where (B) a total of 9 zones have been defined on it. (C) Suggested boundary conditions configuration for the F-Area SRS (see details in Table 2). (D) Expected free-water table behavior for the Upper (UUTRA) and Lower aquifers (UUTRA and LUTRA, respectively), and Tan Clay units (TCCZ). For simplicity, Gordon confining (GC) and Gordon aquifer (GA) units are omitted in this figure.

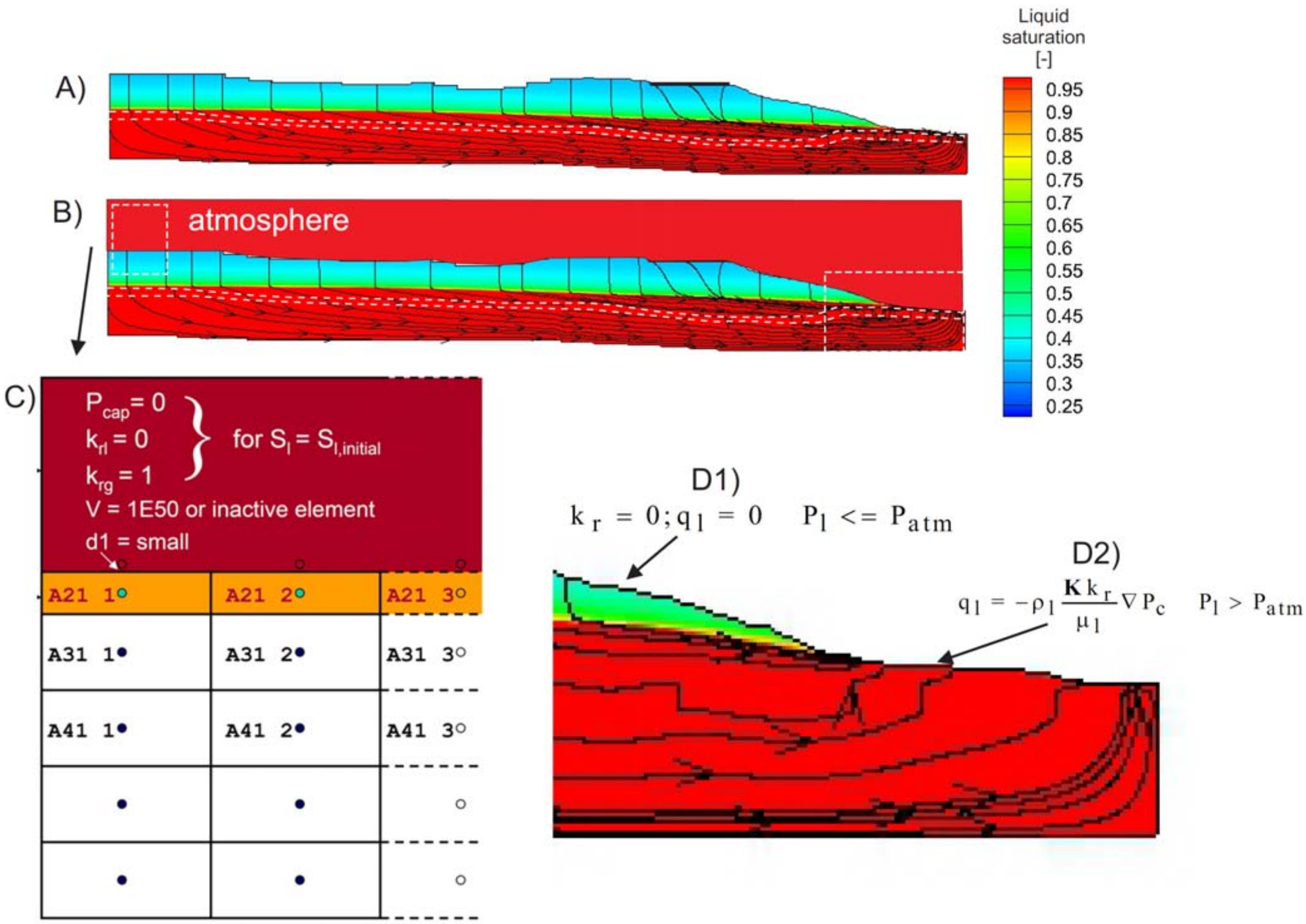

Figure 3. Simulation of the seepage face. (B) The atmosphere is included in the domain. (C) A cell that represents the atmosphere is included and it is connected with those corresponding to the topographic surface. Prescribed pressure (equal to atmospheric pressure, $P_c = 0$) is imposed in this cell, and $k_r = 0$. Seepage face can be modeled when the Darcy fluxes(q_l) are evaluated upstream (at least for k_r). (D1) Thus, $q_l = 0$ when $P_l \le P_{atm}$, whereas (D2) $q_l \ne 0$ when $P_l > P_{atm}$ (seepage face).

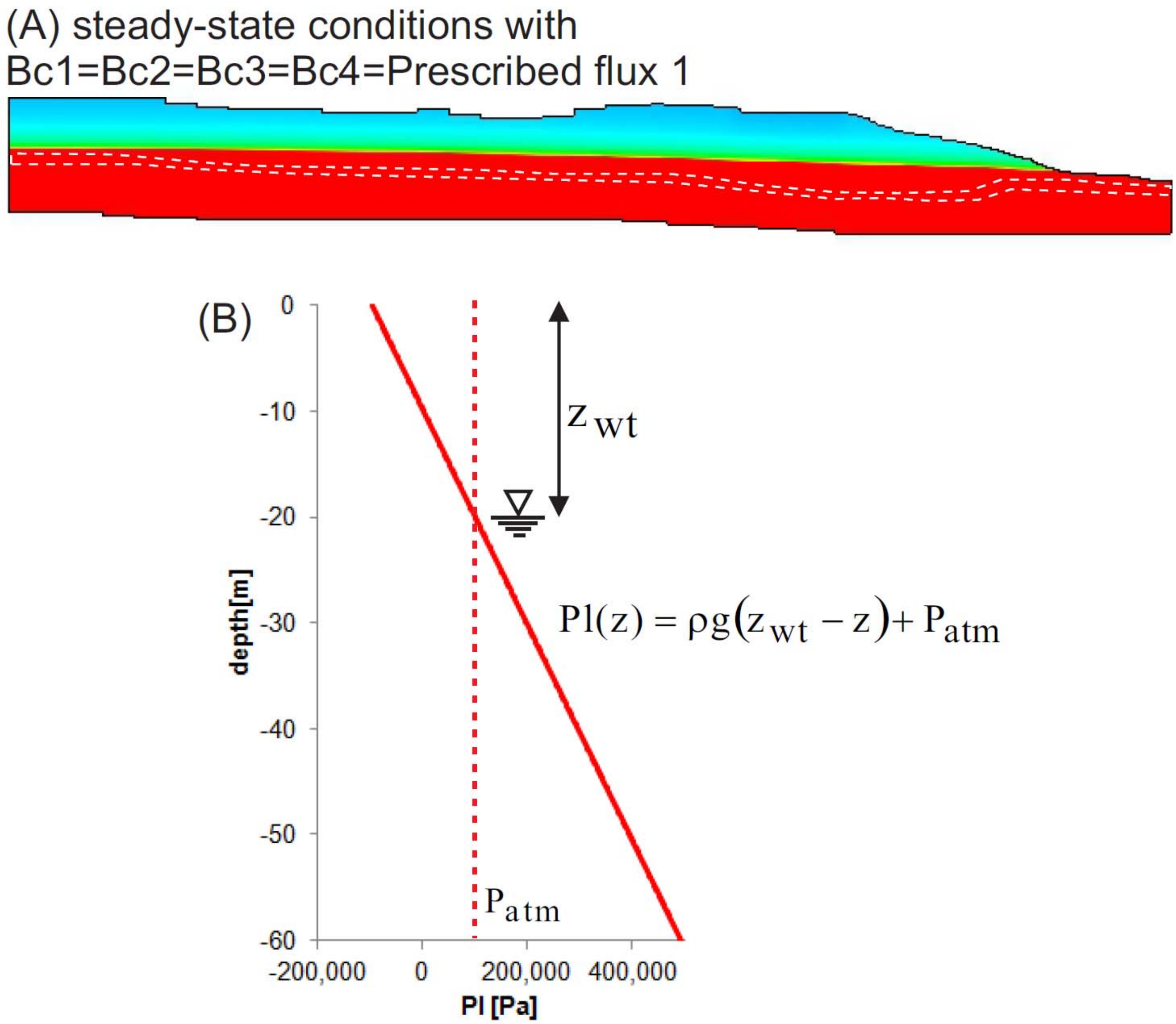

Figure 4. Initial conditions for flow. (A) Before starting the reactive transport simulations, steady-state conditions for flow are calculated. (B) Hydrostatic initial conditions ($P_l(z)$) are suggested for flow in order to obtain its steady-state (in the figure ρ is the fluid density, g is the gravity constant, and z_{wt} is the depth position of the water-table).

Table 1. Physical model parameters suggested for the ASCEM-F-Area.

Hydrostratigraphic unit	ϕ [-]	k [m^2]	α [Pa^{-1}]	n [-]	m [-]	S_{rl} [-]	l [-]
Upper aquifer (UUTRA)	0.39	$5x10^{-12}$	$4x10^{-4}$	1.37	0.5	0.18	1
Tan clay (TCCZ)	0.39	$1.98x10^{-14}$	$5.1x10^{-5}$	2	0.5	0.39	1
Lower aquifer (LUTRA)	0.39	$5x10^{-12}$	$5.1x10^{-5}$	2	0.5	0.41	1
Gordon confining unit (GC)	0.39	(1)$1.98x10^{-14}$	-	-	-	-	-
Gordon aquifer (GA)	0.39	(1)$3.3x10^{-17}$	-	-	-	-	-

(1)This information will be updated soon.

Table 2. Suggested boundary conditions for the ASCEM-F-Area.

Boundary condition	Type	Value	Unit	BC's ID
Prescribed flux 1	Prescribed flux	0.15	[m^3 m^{-2} yr^{-1}]	Bc1, Bc3, Bc4
Prescribed flux 2	Prescribed flux	(1)4	[m^3 m^{-2} yr^{-1}]	Bc2
Prescribed head 1	Prescribed head	(2)?	[m]	Bc6
Prescribed head 2	Prescribed head	(2)?	[m]	Bc7

(1)Other option is to impose transient prescribed fluxes as are described in Table 3.
(2)This information will be provided soon, and for now impervious boundaries could be assumed.

Table 3. Source for the F-Area seepage basin.

year	[(1),(2)]F-3 Basin seepage rate [$m^3\,m^{-2}\,yr^{-1}$]
1955	1.8
1956	3.6
1957	2.1
1958	1.4
1959	2.7
1960	5.4
1961	3.3
1962	6.5
1963	5.6
1964	7.9
1965	4.0
1966	4.2
1967	4.4
1968	4.7
1969	7.3
1970	7.1
1971	4.6
1972	5.7
1973	7.8
1974	4.9
1975	2.9
1976	6.3
1977	5.5
1978	5.8
1979	7.2
1980	7.2
1981	10.1
1982	4.7
1983	2.8
1984	4.4
1985	5.6
1986	6.1
1987	100.1
1988	2.9

(1) Computed from data recompiled in Flach [2001].
(2) These rates should be multiplied by a factor of 0.7 to account the evaporation processes in the basin [Flach et al. 2004].

REFERENCES

Flach, G.P. [2001]. Analysis of Tritium and Strontium-90 Migration at the F- and H-Area Seepage Basins (U). Westinghous Savannah River Company LLC. WSRC-TR-2001-00xxx. Savannah River Site, Aiek, SC 29808.

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Flach, G. P.; Crisman, S. A. & Molz, F. J. [2004]. Comparison of single-domain and dual-domain subsurface transport models. GroundWater, 42, 815-828.