

**ESF Project „Establishment of interdisciplinary scientist group and modelling system for groundwater research”**

# Sensitivity of hydrogeological model to the surface roughness and spatial variability of hydraulic conductivity

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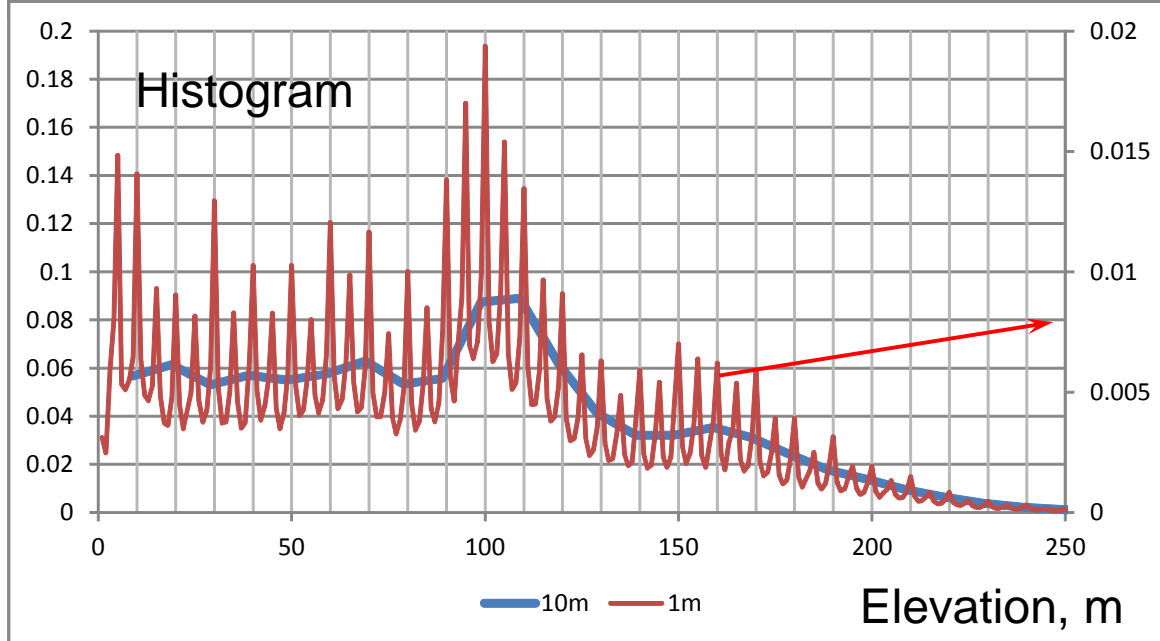
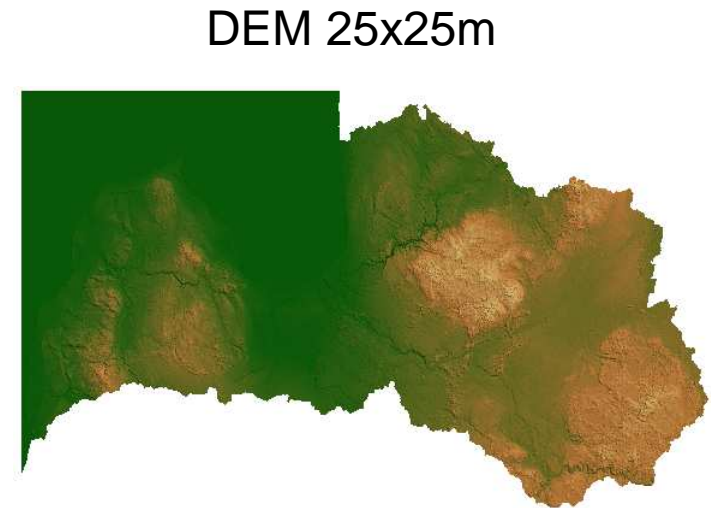
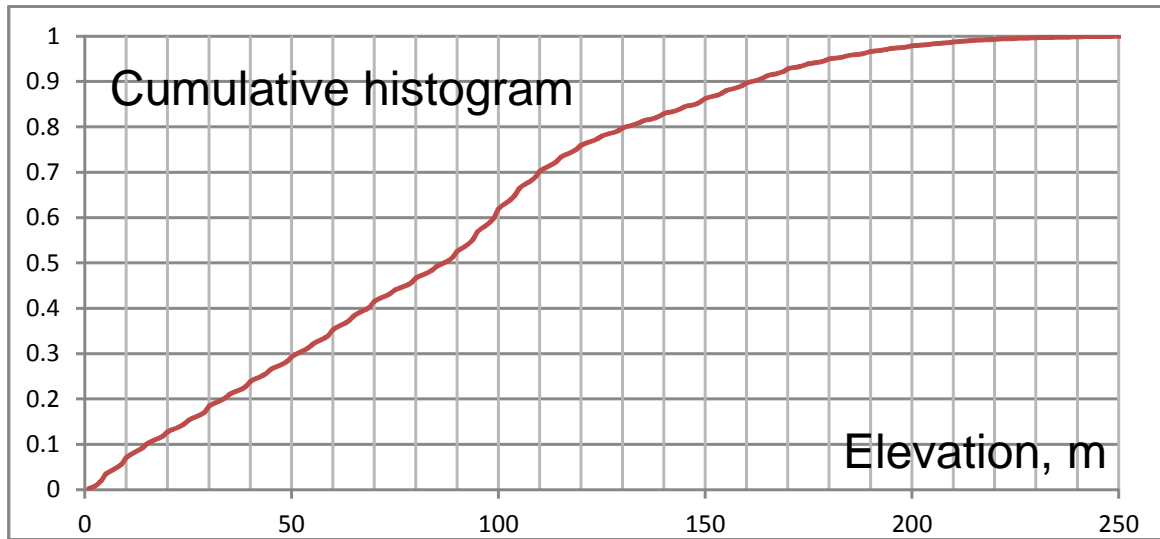
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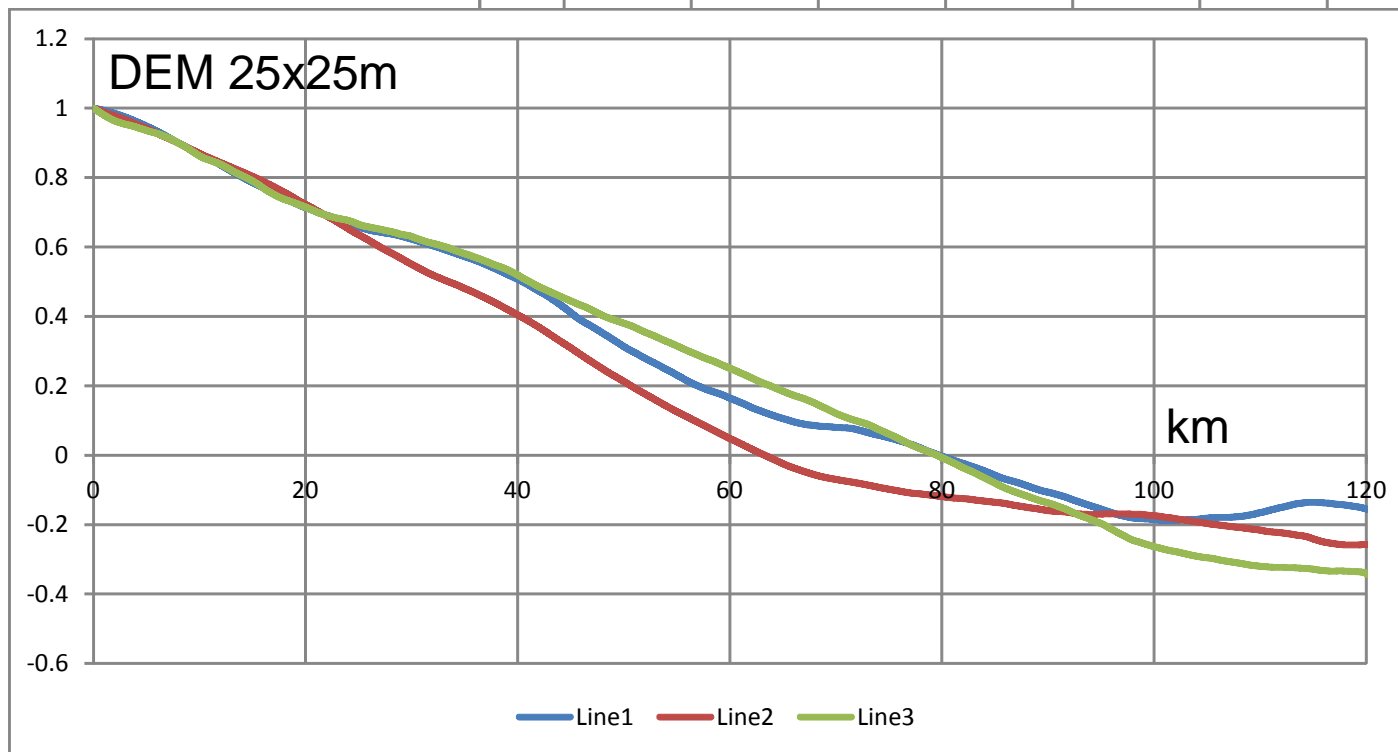
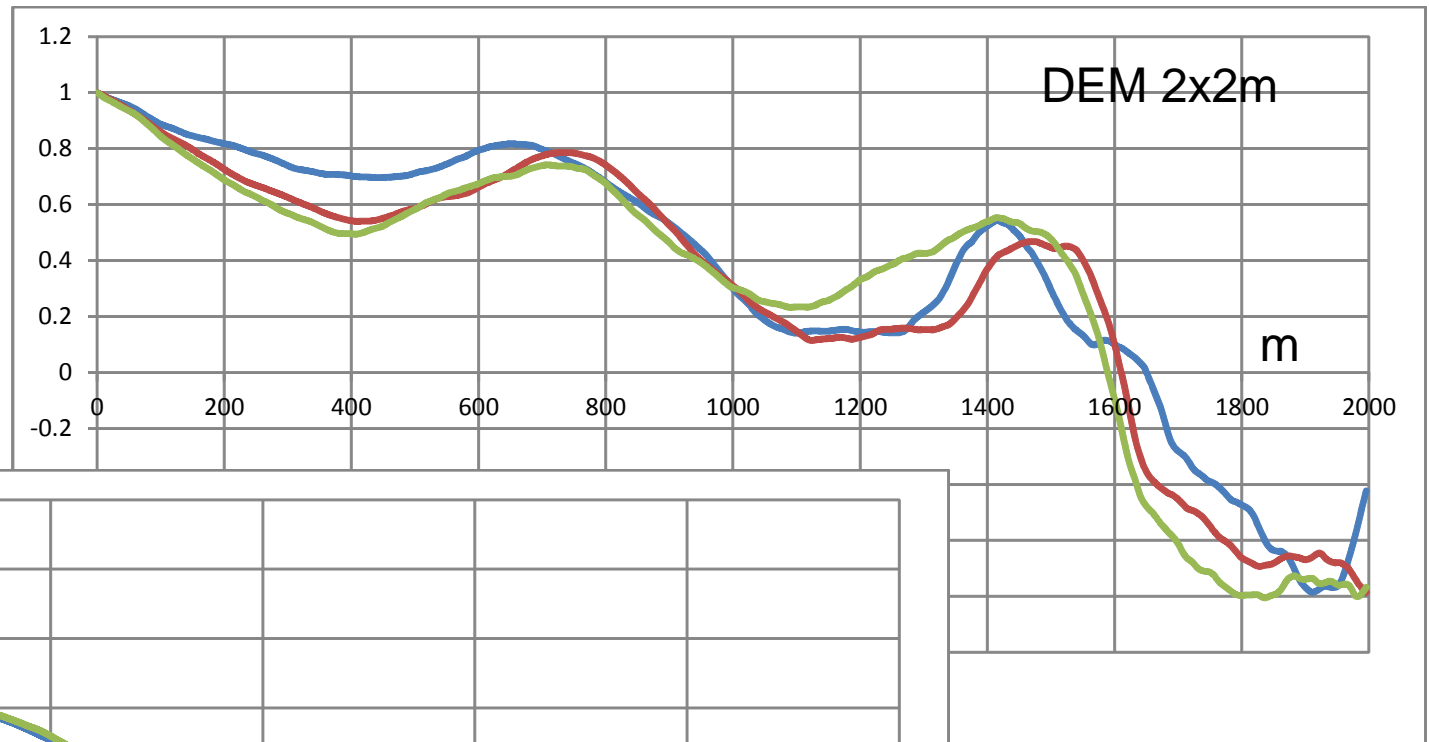
Project Nr. 2009/0212/1DP/1.1.1.2.0/09/APIA/VIAA/060

# Surface statistics

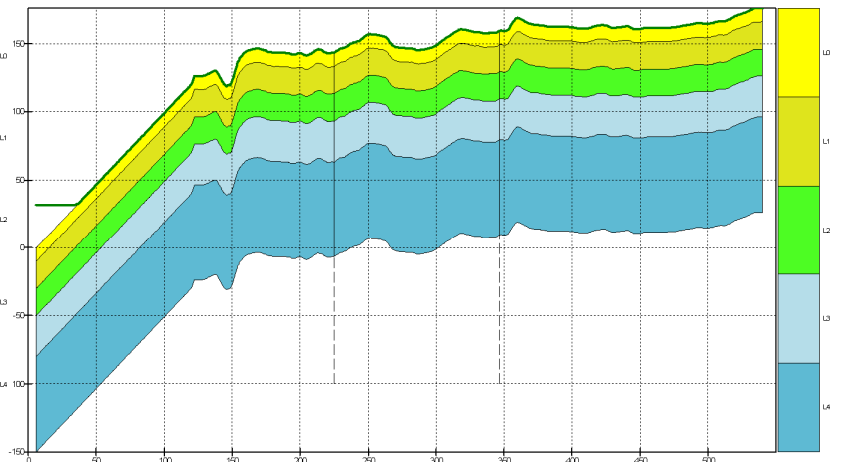
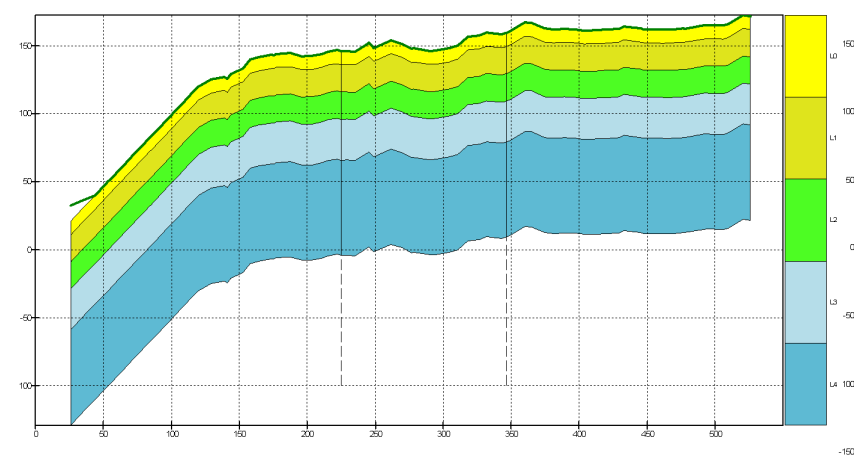
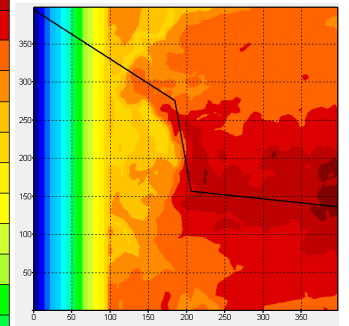
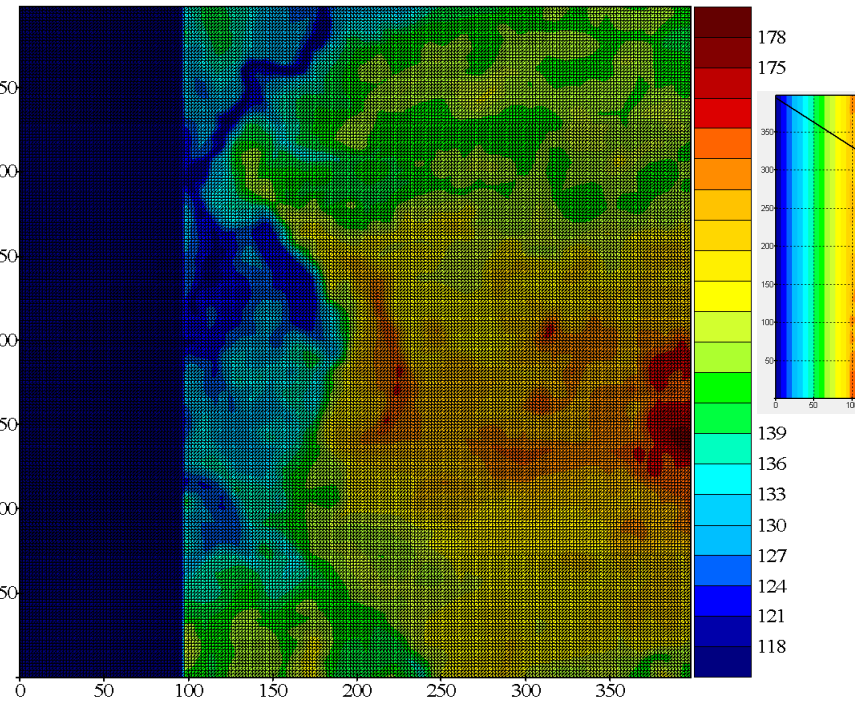
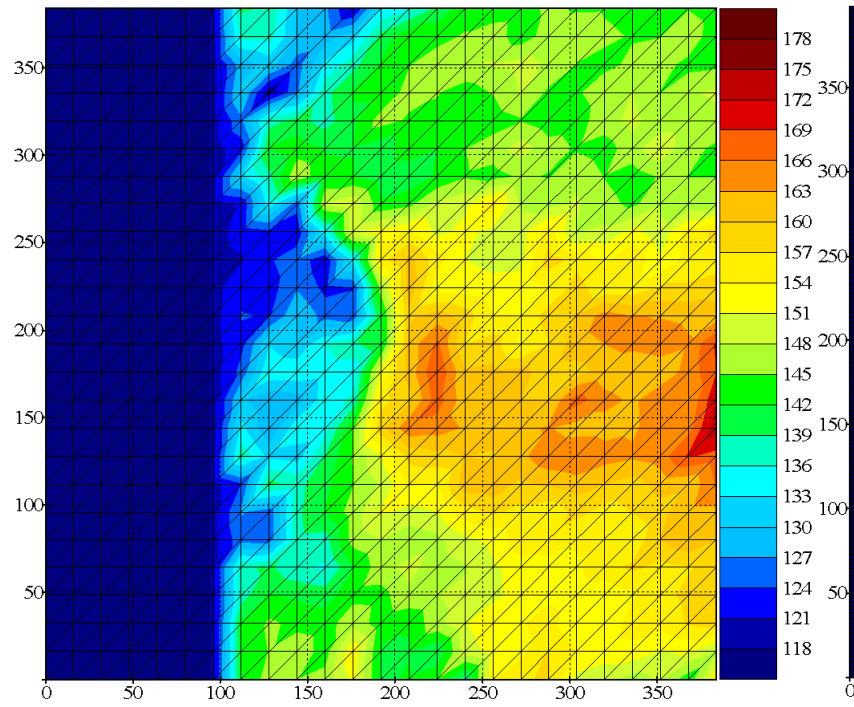


mean 86.7m  
standard deviation 53.3m

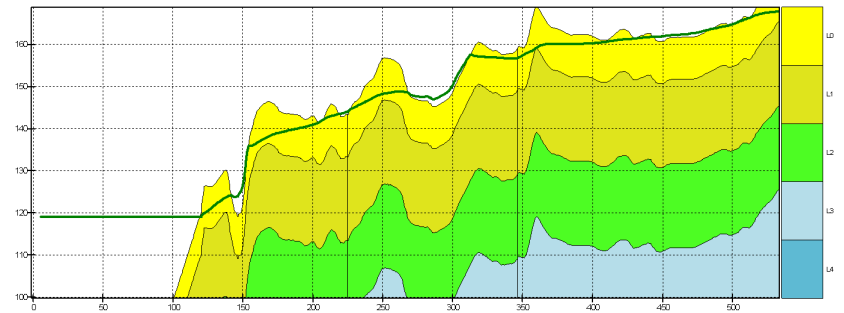
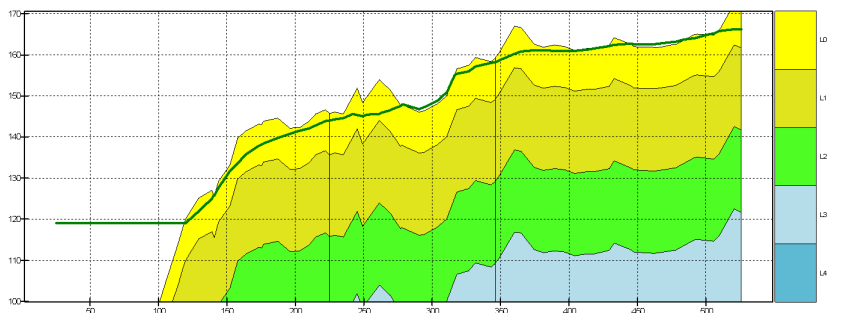
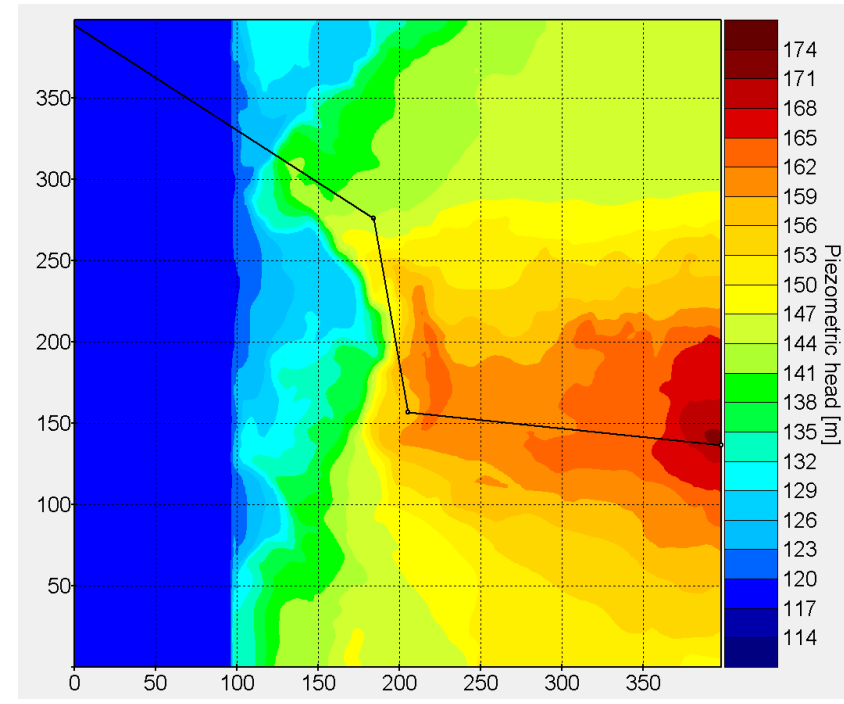
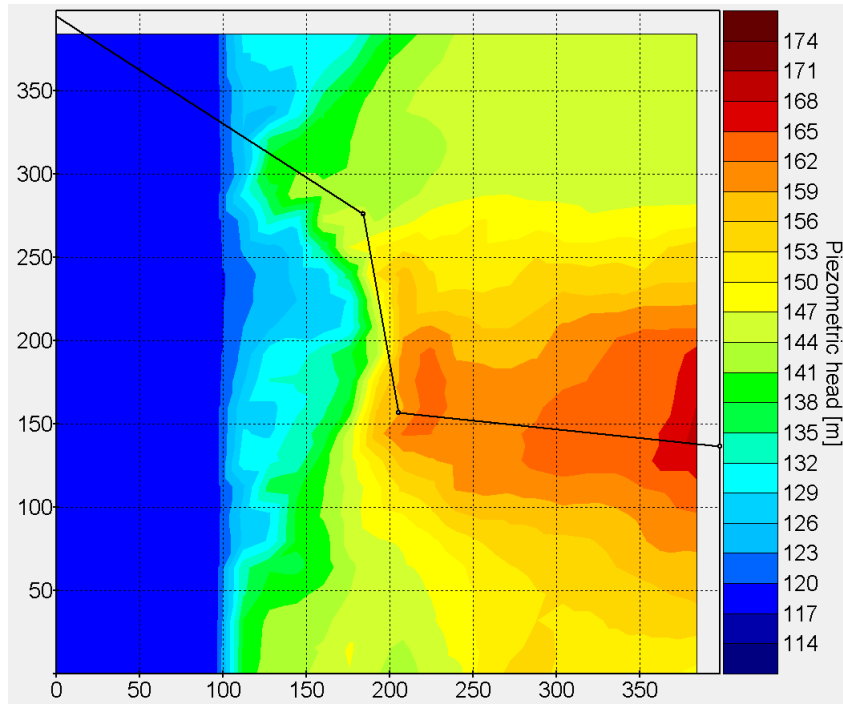
# Autocorrelation function



# Groundwater table



# Groundwater table



# V0 sensitivity

Target function

$$M = \sum_{i=1..N} \frac{1}{N_i} \left( w_i^s \sum_{j=1..N_i} w_j^t w_j^l \left( \rho_i p_j^{obs} - p_j^{mod}(X) \right)^2 \right)$$

$p_j^{obs}$  is observed piezometric head in the layer  $i$  and at the position  $(x_j, y_j, z_j)$

$p_j^{mod}$  is calculated piezometric head in the layer  $j$  and at the position  $(x_j, y_j, z_j)$

$w_j^l$  is spatial dependent weight

$w_j^t$  is time dependent weight

$w_i^s$  is layer dependent weight

# V0 sensitivity

Horizont name	Fickness, m	Volume, km <sup>3</sup>	Area, km <sup>2</sup>	conductivity XY, mm/s	conductivity Z, mm/s	$\Delta M/\Delta$	$\Delta M/\Delta h$
Q	48.2	23426.8	485794.8	2.23E+0	2.23E-1		
Pg	26.1	61.4	114307.9	4.21E+0	4.21E-1	5.22	98.60
K	540.2	61802.4	115930.2	4.66E+0	4.66E-1	0.00	97.40
J	148.0	17159.6	108385.7	2.22E+0	2.22E-1	0.08	101.44
J**	14.7	1597.0	129886.6	7.75E+0	7.75E-1	0.19	185.68
T1	250.7	32568.8	114315.9	7.77E+0	7.77E-1	0.42	97.19
P2	440.1	50306.7	114315.9	2.39E+0	2.39E-1	1.40	1671.62
P2**	19.9	1662.9	83450.3	1.42E+0	1.42E-1	-22.92	303.71
C1	29.3	134.3	4585.9	7.87E+0	7.87E-1	-2.81	92.86
C1*	1.9	10.4	5355.1	3.71E+0	3.71E-1	-9.62	93.08
D3 fm	84.3	2243.6	26619.3	7.18E+0	7.18E-1	-1.35	106.21
D3 st-el	35.4	997.2	28180.8	2.48E+0	2.48E-1	15.37	93.82
D3 og-kt	43.5	2008.1	46115.3	4.32E+0	4.32E-1	-0.71	826.78
D3ogkt*	2.0	93.8	47243.8	1.69E+0	1.69E-1	6.33	96.29
D3 pl-dg	52.2	4606.1	88265.1	6.39E+0	6.39E-1	2.06	1244.54
D3pldg*	2.0	178.0	89267.2	2.91E+0	2.91E-1	16.09	89.14
D3 gj-am	88.5	12366.3	138859.8	3.71E+0	3.71E-1	14.30	2526.84
D3gjam*	2.0	277.5	177333.7	5.45E+0	5.45E-1	-44.72	92.13
D2 ar-br	89.9	15938.6	185288.0	2.01E+0	2.01E-1	-1.15	110.61
D2 nr	98.0	18158.3	194645.5	1.62E+0	1.62E-1	-4.68	95.18
D 1-2	119.5	23254.8	194645.5	1.11E+0	1.49E-1	-0.60	777.53
O-S2	48.2	2561.3	396270.2	1.13E+0	1.13E-1	-20.75	90.92
O-S	607.7	240814.0	472094.9	2.95E+0	1.47E+0	2.28	95.40
Cm	140.9	66522.7	5	0	0	-0.01	2264.99

# V1 sensitivity

Horizon t name	Ficknes s, m	Volume, km <sup>3</sup>	Area, km <sup>2</sup>	conducti vity XY, m <sup>2</sup> /E-	conducti vity Z, m <sup>2</sup> /E-
Q	12.94	5564.37	477430.25	3.00101	7.20201
Q2	13.78	6579.95	479555.55	5.73001	5.73000
Q3	11.64	5584.07	422748.48	3.42002	3.42002
Q4	13.29	5620.38	466158.28	4.65700	4.65701
PgNg	36.74	149778.29	2939.80	1.85000	1.85001
K	460.99	10559.0	109250.0	5.05807	5.05807
J	170.26	31000.0	110210.0	5.20002	5.20001
J*	2.00	31000.0	127205.55	1.92004	1.92004
T	248.35	72300.2	147103.03	1.93306	1.93306
P2	492.04	9	109034.0	1.50400	1.50401
P2*	1.99	33.81	7	2.08400	2.08400
C	27.71	197.32	7120.08	2.47903	2.47903
C*	1.96	15.71	892.49	1.89301	1.89302
D3jnsk	83.38	2387.36	51058.4	5.54504	5.54504
D3stel	39.71	1256.23	46942.6	1.97001	1.97002
D3ogkt	30.01	1468.80	50305.4	5.18205	5.18205
D3ogkt*	1.99	100.05	59603.0	2.27402	2.28003
D3dg	15.56	927.70	67553.0	1.73002	1.73005
D3slp	14.47	977.38	67639.9	2.49001	2.49002
D3pl	27.27	2395.77	69324.8	3.27109	3.27109
D3pl*	1.99	178.12	10120.5	2.11001	2.11002
D3am	25.91	2622.30	102030.0	2.62007	2.62007
D3am*	1.99	204.71	124068.8	4.77000	4.77001
D3gj	73.57	9129.69	124905.5	4.24405	4.24405
D3gj*	2.00	249.63	140423.8	5.29001	5.29002
D2br	48.58	7113.12	146340.0	5.60505	5.60505
D2br*	1.99	295.76	109045.0	7.54001	7.54002
D2ar	57.28	9889.54	169570.5	1.09108	1.09108
D2ar*	102.33	23515.3	195400.0	1.13001	1.13000
D2rzpr	119.28	44057.4	121020.0	1.13003	1.13005
S4pr	367.17	40524.2	19309.8	1.13000	1.13001
S3ld	240.96	31524.0	209100.0	1.13003	1.13005
S2vn	117.11	21702.0	32393.6	1.13000	1.13001
S1ln	67.18	23962.0	34700.0	1.13002	1.13003
O3	69.04	21898.0	30880.0	1.13000	1.13001
O2	59.38	15490.1	39110.5	2.04006	1.02308
O1	39.60	12104.0	40731.8	1.00000	5.00001
Cmtr	29.72	12190.7	42030.8	1.82400	9.12201
Cmln	29.00	11350.0	40973.0	1.00000	5.00001
V2vr	27.71	12179.6	43220.8	2.50400	1.28201
V2kt	28.18	9	50	00	00

