

GIS

Cvičení 10.

Mapová algebra

Mapa potenciálních průměrných ročních teplot vzduchu

Sestrojte mapu potenciálních průměrných ročních teplot vzduchu na území ŠLP Křtiny.

1. Proč ?

- interpolace bodových měření do prostorově souvislých dat na základě předem daných fyzikálních zákonů za využití GIS (mapová algebra).

2. Jak ?

- zdrojová data
 - digitální model terénu
 - klimatologická data

3. Postup:

Z dat klimatologických stanic (poloha ve smyslu nadmořské výšky a teploty) zjistíme regresní závislost teploty na nadmořské výšce a touto rovnicí přepočítáme DMT. Dále z DMT zjistíme sklony a expozice reliéfu a pomocí rovnic klimatologických závislostí zpřesníme vypočtené teploty na základě reliéfu terénu (koeficient relativní ozáření).

Průměrná roční teplota vzduchu

1. Tuřany	241 m n.m.	8,9 °C
2. Pisárky	223 m n.m.	8,5 °C
3. Babice	460 m n.m.	6,6 °C
4. Bukovinka	524 m n.m.	6,4 °C
5. Blansko	287 m n.m.	8,4 °C
6. Kuřim	291 m n.m.	8,0 °C
7. Olomučany	360 m n.m.	7,6 °C
8. Hády	420 m n.m.	7,5 °C
9. Soběšice	398 m n.m.	7,2 °C
10. Vranov	440 m n.m.	6,9 °C
11. Polanka	296 m n.m.	8,2 °C
12. Křtiny	430 m n.m.	7,1 °C
13. Proklost	540 m n.m.	6,1 °C

$$T = T1 + T2 [^{\circ}\text{C}]$$

T1... závislost teploty na nadmořské výšce
T2... oprava teploty na sklon a expozici terénu

$$T1 = 10,593 - 0,0082 * [\text{DMT}]$$

$$T2 = A * K - A$$

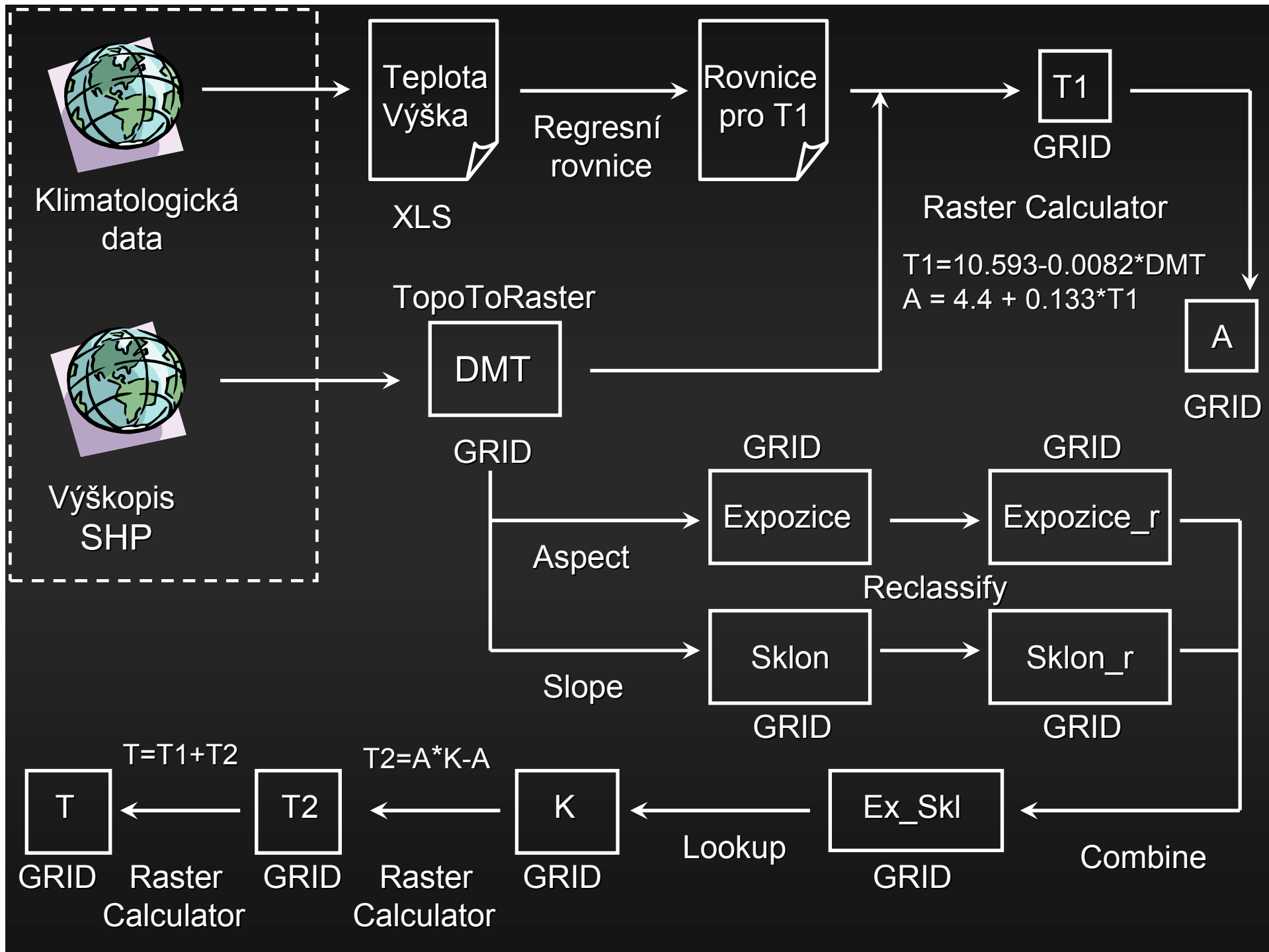
$$A = 4,4 + T1 * 0,133$$

K = koeficient relativní ozáření

sklon

K	(1) 0° - 5°	(2) 5° - 10°	(3) 10° - 15°	(4) 15° - 20°	(5) 20° - 25°	(6) 25° - 30°	(7) 30° - 40°	(8) 40° - 50°
(1) J	1.05 (04)	1.38 (03)	1.17 (06)	1.22 (08)	1.26 (31)	1.31 (34)	1.34 (35)	1.37 (40)
(2) JV, JZ	1.04 (05)	1.10 (02)	1.16 (01)	1.20 (07)	1.24 (30)	1.26 (33)	1.28 (32)	1.30 (39)
(3) V, Z	1.02 (09)	1.06 (20)	1.09 (21)	1.11 (14)	1.12 (27)	1.12 (26)	1.10 (29)	1.07 (38)
(4) SV, SZ	1.00 (10)	1.02 (11)	1.01 (15)	1.00 (17)	0.99 (22)	0.97 (24)	0.92 (28)	0.84 (36)
(5) S	0.99 (13)	1.00 (12)	0.98 (16)	0.96 (18)	0.93 (19)	0.87 (23)	0.81 (25)	0.75 (37)

expozice



Tvorba digitálního modelu terénu

Untitled - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

Layers

- slp_poly
- slp_vrs
- slp_aspect
- slp_slope
- slp_dmt10

Value
High : 573.211
Low : 212.433

Display Source Selection

Distance
Extraction
Generalization
Groundwater
Hydrology
Interpolation
IDW
Kriging
Natural Neighbor
Spline
Spline with Barriers
Topo to Raster
Topo to Raster by File
Trend
Local

Topo to Raster

Input feature data

Feature Layer	Field	Type
slp_vrs	VAL	Contour
slp_poly		Boundary

Output surface raster
D:\GIS\temp\slp_dmt10

Output cell size (optional)
10

Output extent (optional)

Y Maximum
-1141702.100000

X Minimum
-603319.737000

X Maximum
-577990.352000

Y Minimum

OK Cancel Environments... << Hide Help

Output surface raster
Output surface raster dataset.

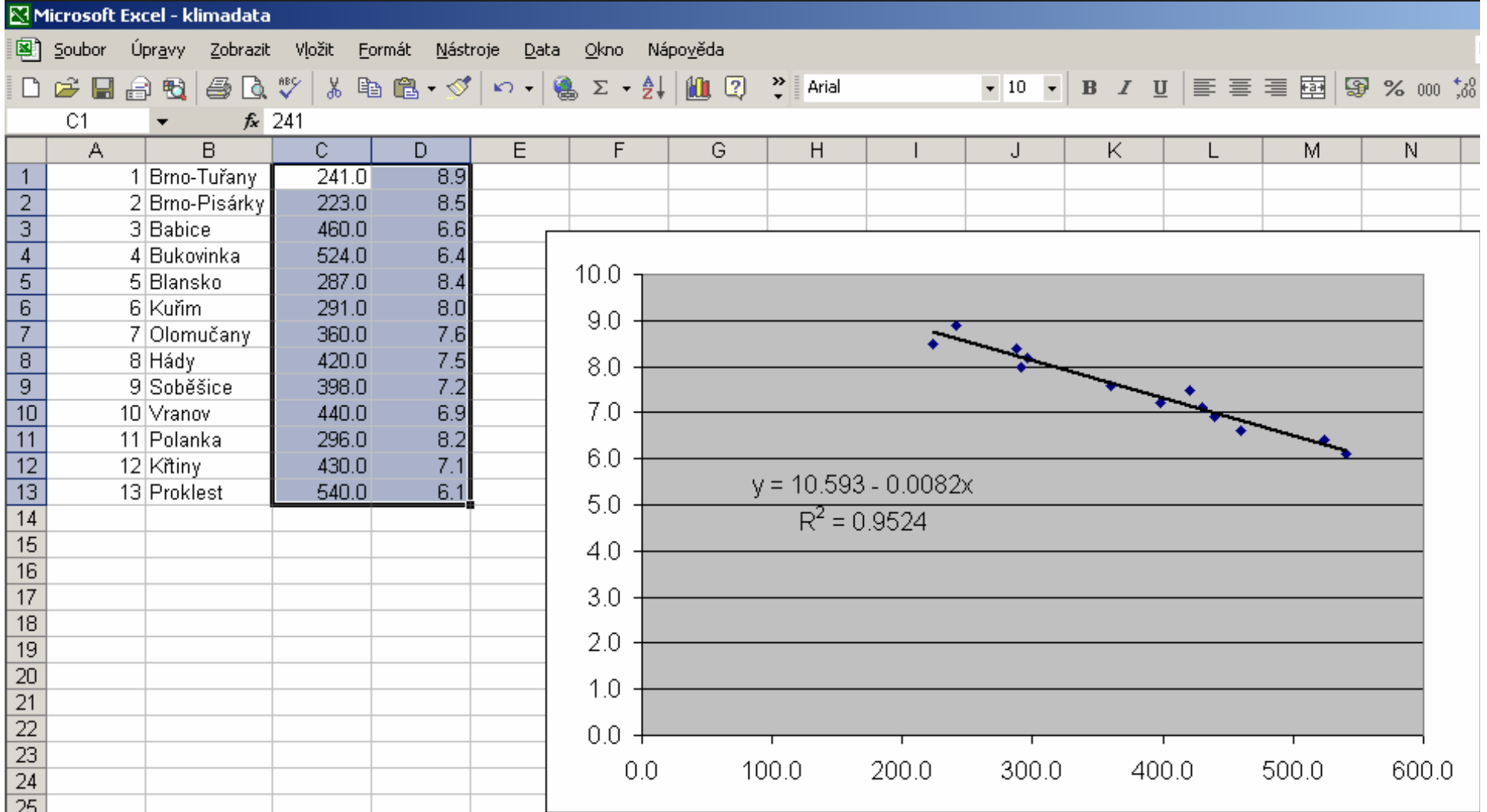
Drawing

Arial 10 B I U

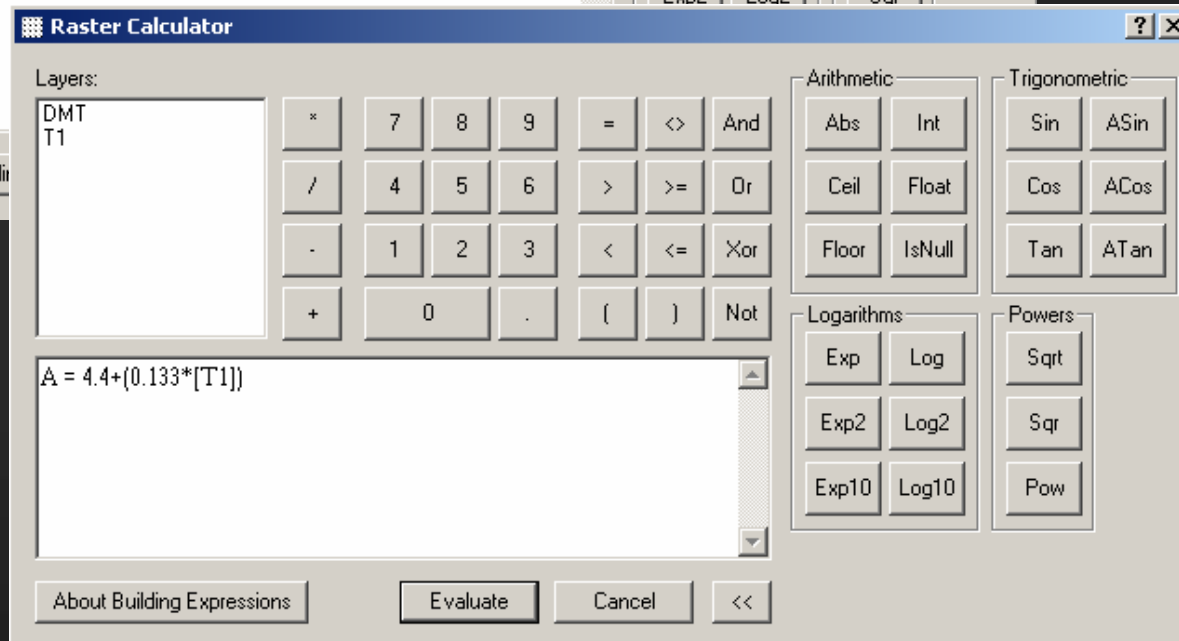
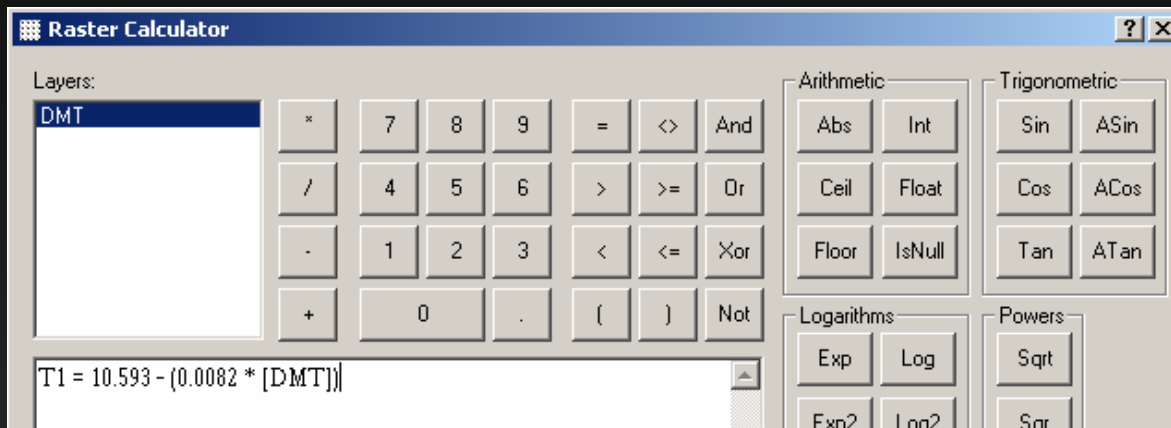
-589242.757 -1157548.168 Unknown Units

Zjištění závislosti teploty na nadmořské výšce

- Pomocí lineární regrese v MS Excel (vytvořením grafu a přidáním spojnice trendu) získáme regresní rovnici pro závislost teploty a nadmořské výšky.



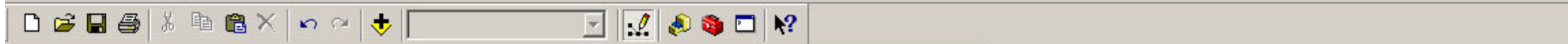
Raster Calculator (Spatial Analyst toolbar)



$$T1 = 10.593 - (0.0082 * [DMT])$$

$$A = 4.4 + (0.133 * [T1])$$

Výstupy nerespektují Current workspace!



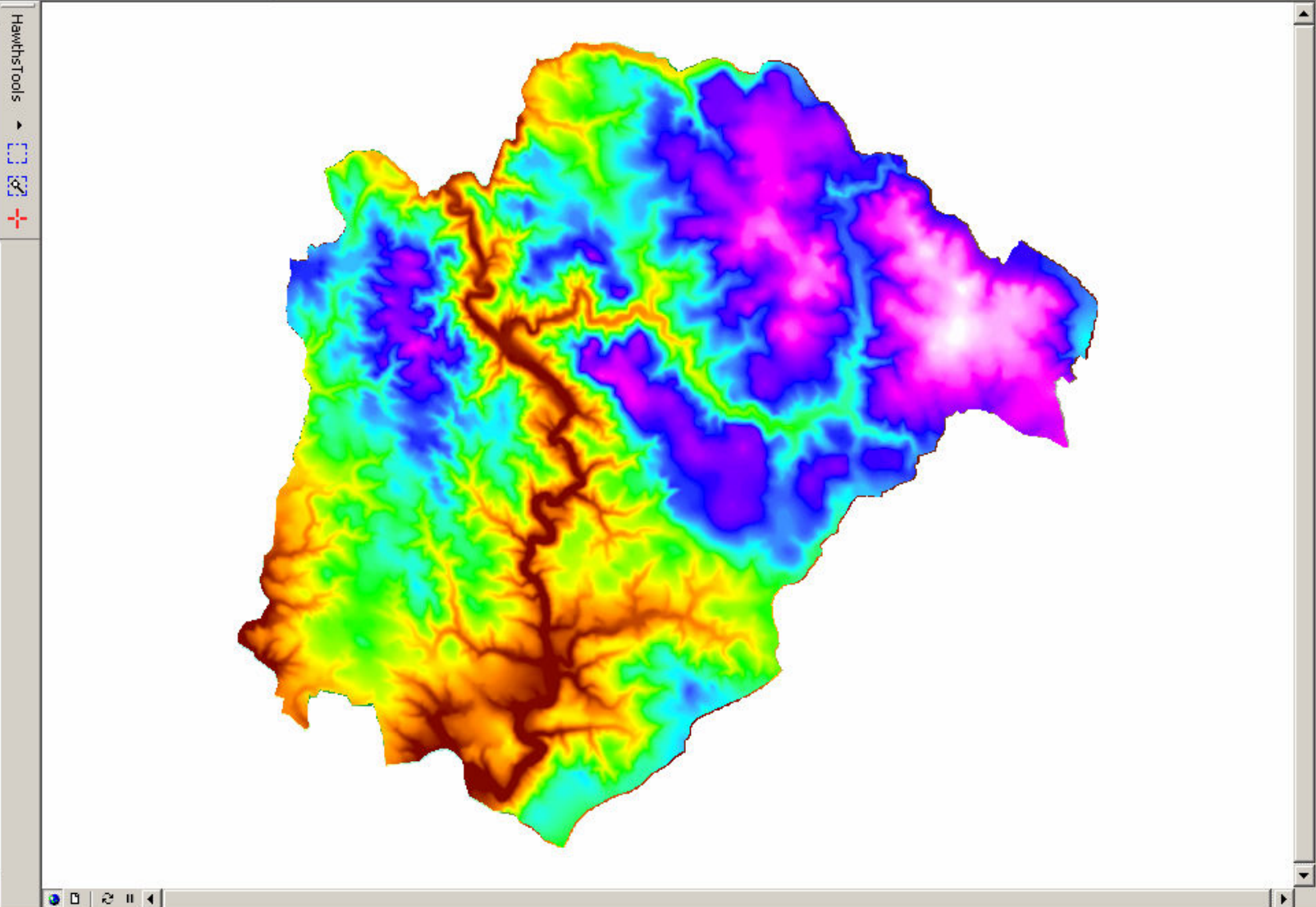
Editor Task: Create New Feature Target:

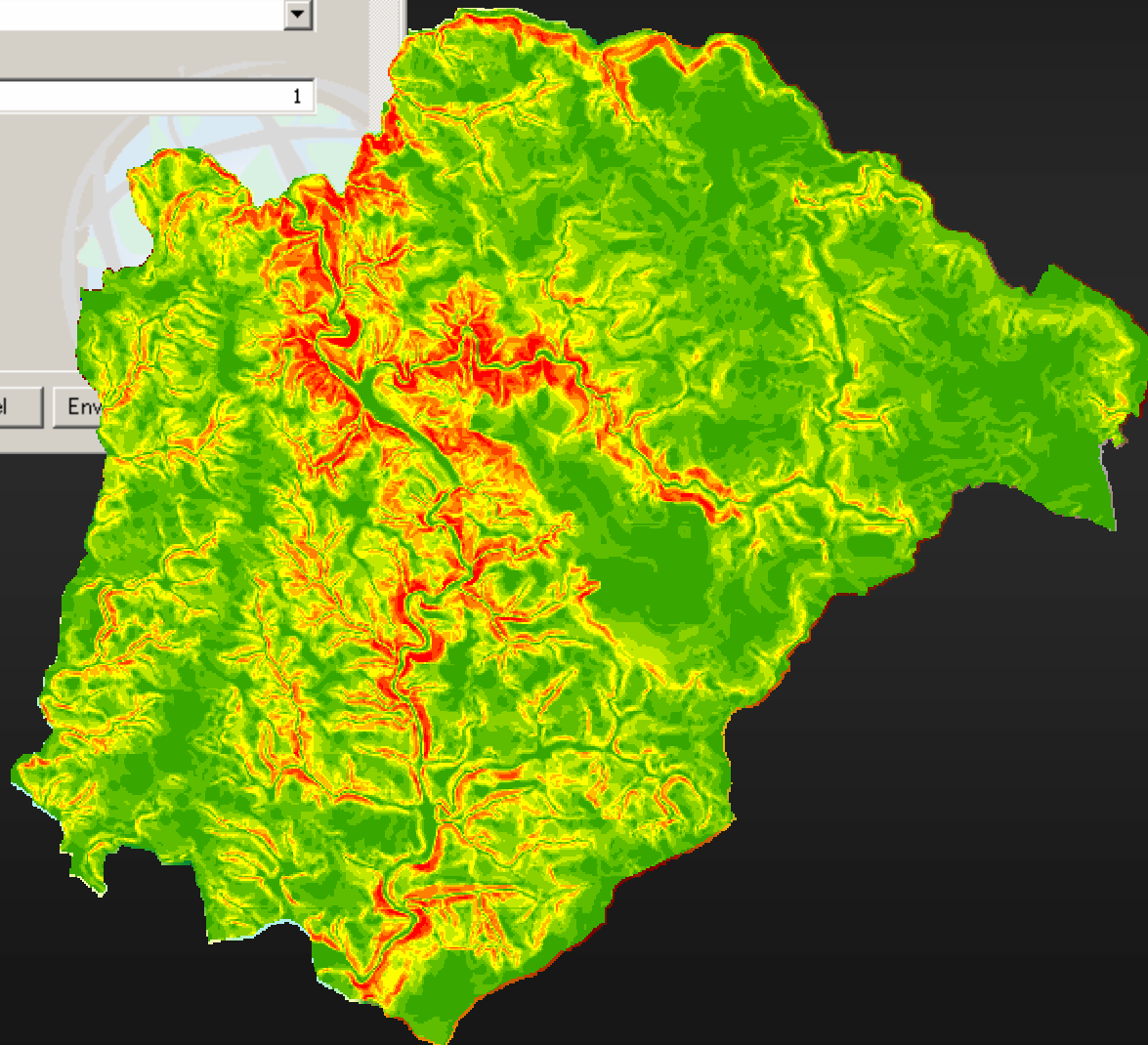
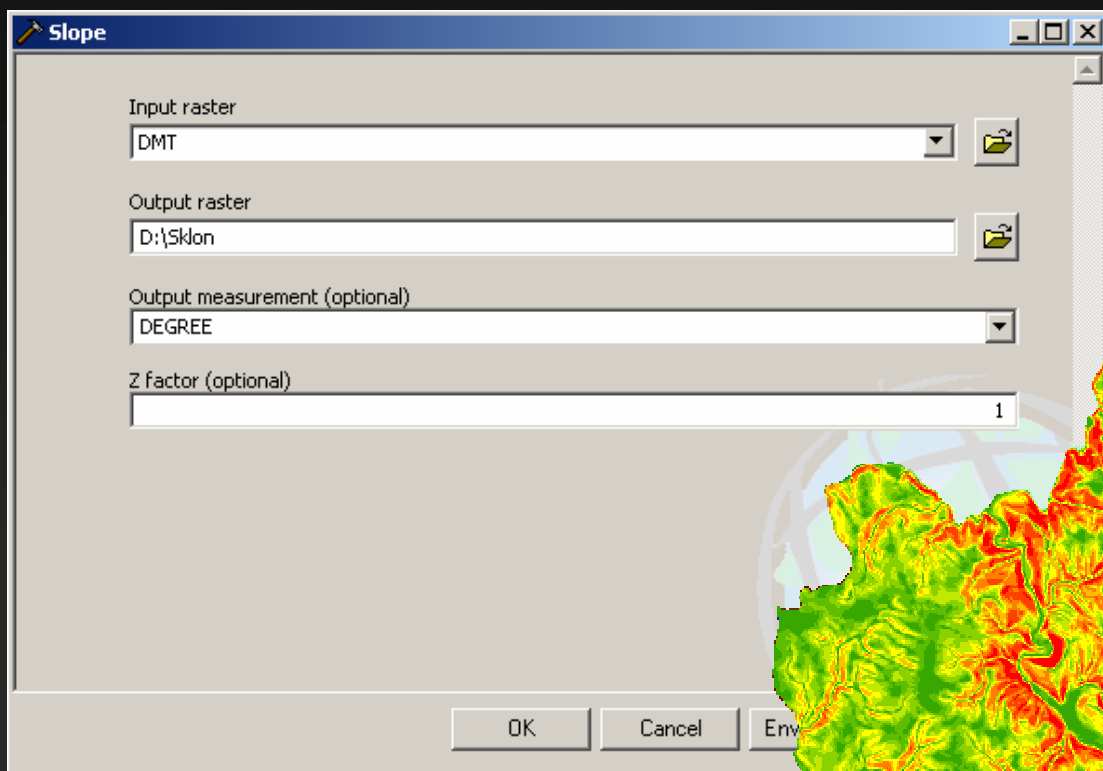
3D Analyst Layer: DMT Spatial Analyst Layer: DMT



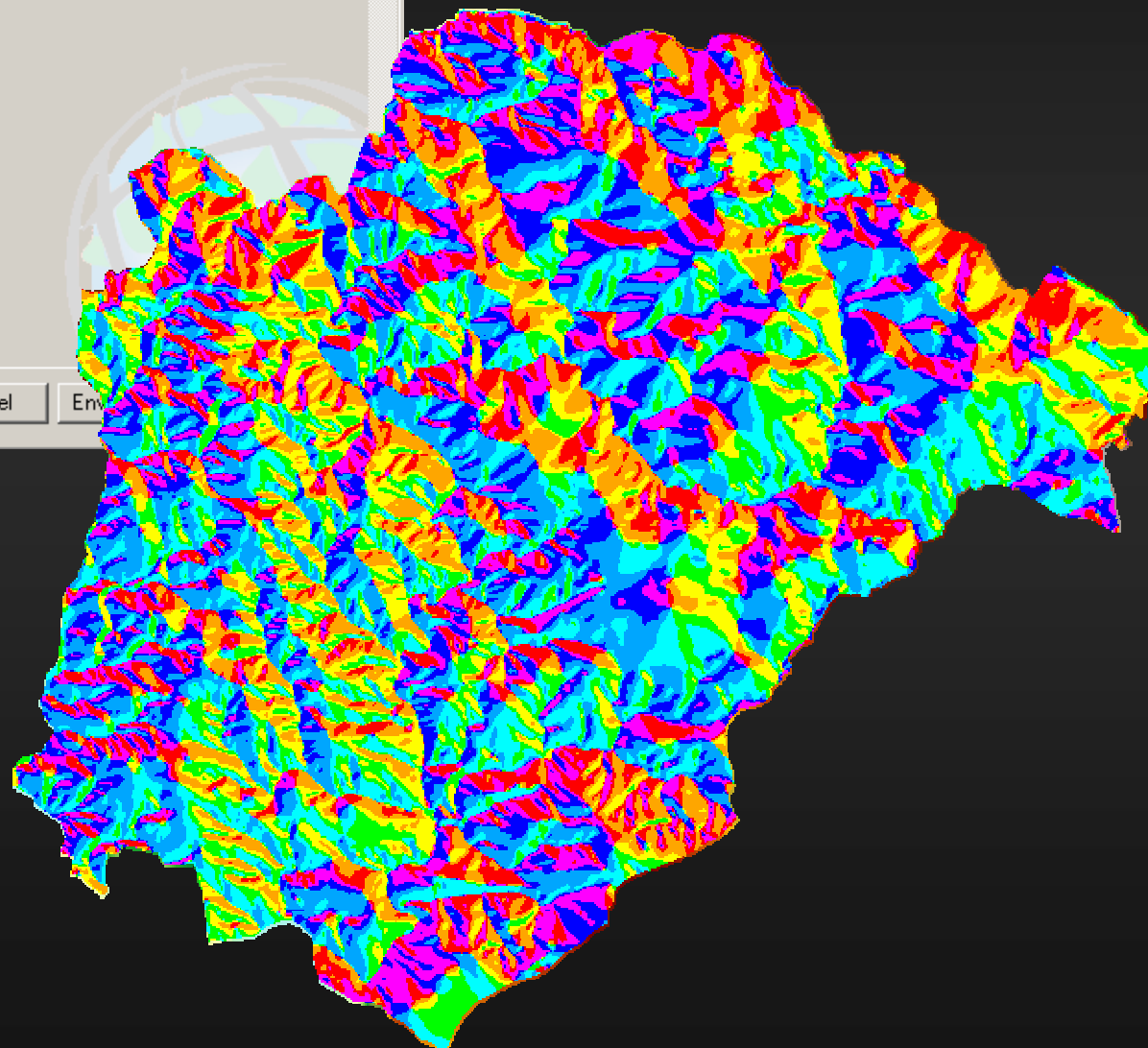
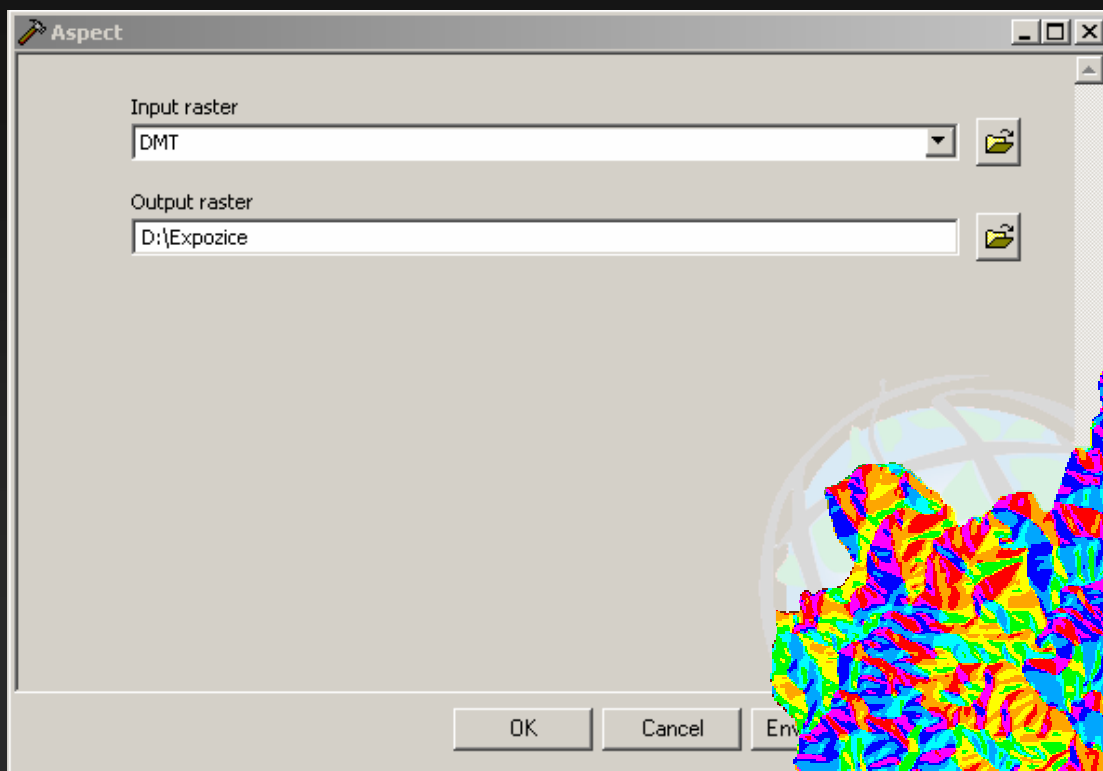
Layers

- A
Value
High : 5.57517
Low : 5.18301
- T1
Value
High : 8.83585
Low : 5.8873
- DMT
Value
High : 573.866
Low : 214.286





Sklony svahů

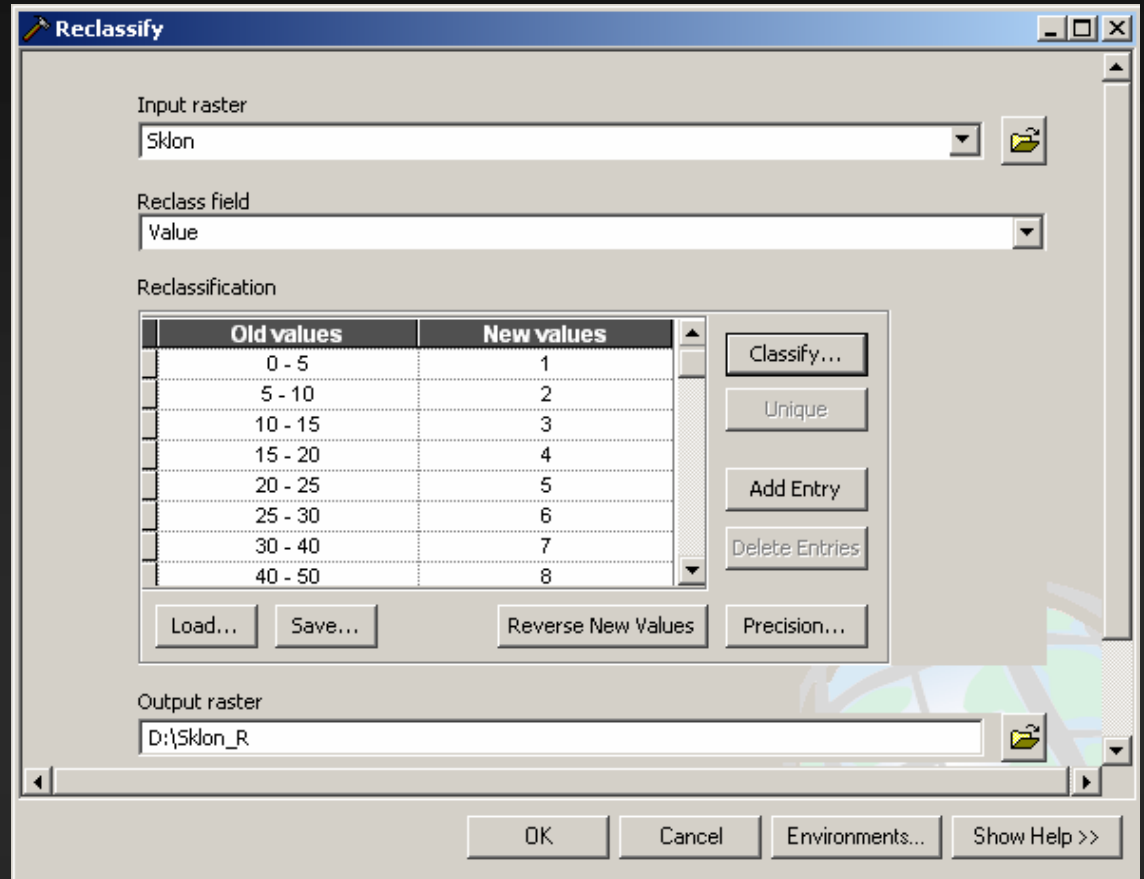


Expozice svahů

Reclassify Sklon

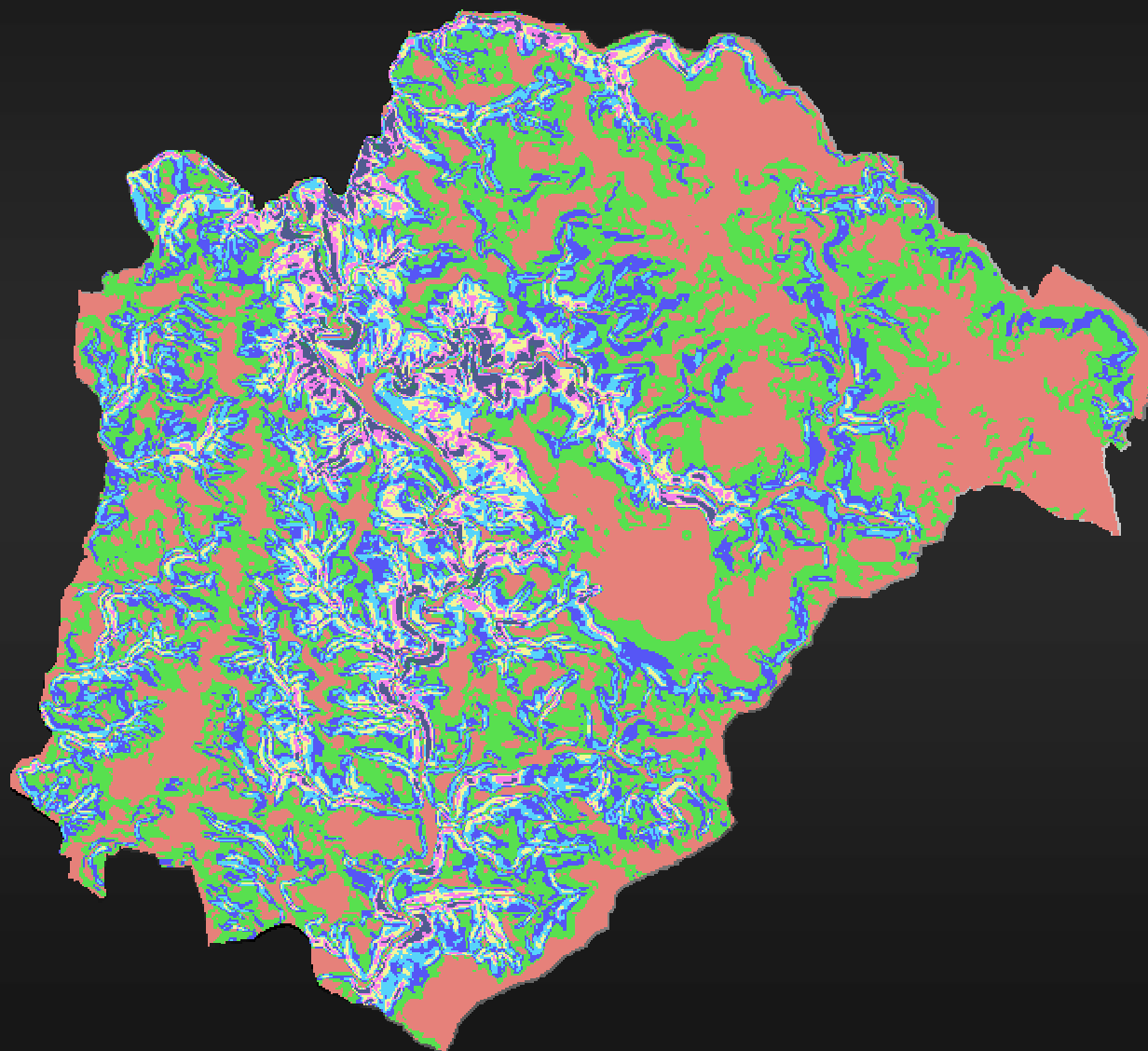
1	0	5
2	5	10
3	10	15
4	15	20
5	20	25
6	25	30
7	30	40
8	40	50

↓
Sklon_R



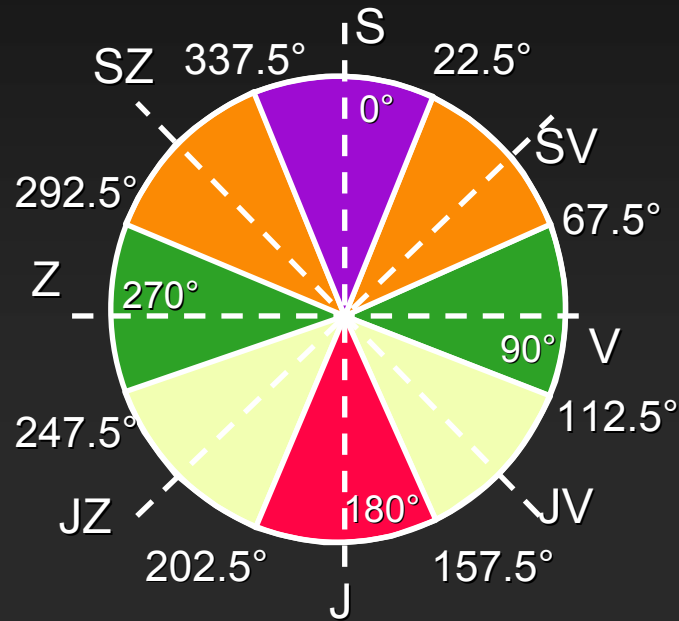
K	(1) 0°- 5°	(2) 5°-10°	(3) 10°-15°	(4) 15°-20°	(5) 20°-25°	(6) 25°-30°	(7) 30°-40°	(8) 40°-50°
(1) J	1.05 (04)	1.38 (03)	1.17 (06)	1.22 (08)	1.26 (31)	1.31 (34)	1.34 (35)	1.37 (40)
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(4) SV, SZ	1.00 (10)	1.02 (11)	1.01 (15)	1.00 (17)	0.99 (22)	0.97 (24)	0.92 (28)	0.84 (36)
(5) S	0.99 (13)	1.00 (12)	0.98 (16)	0.96 (18)	0.93 (19)	0.87 (23)	0.81 (25)	0.75 (37)

Reklasifikované sklony svahů pro koeficient rel. ozáření

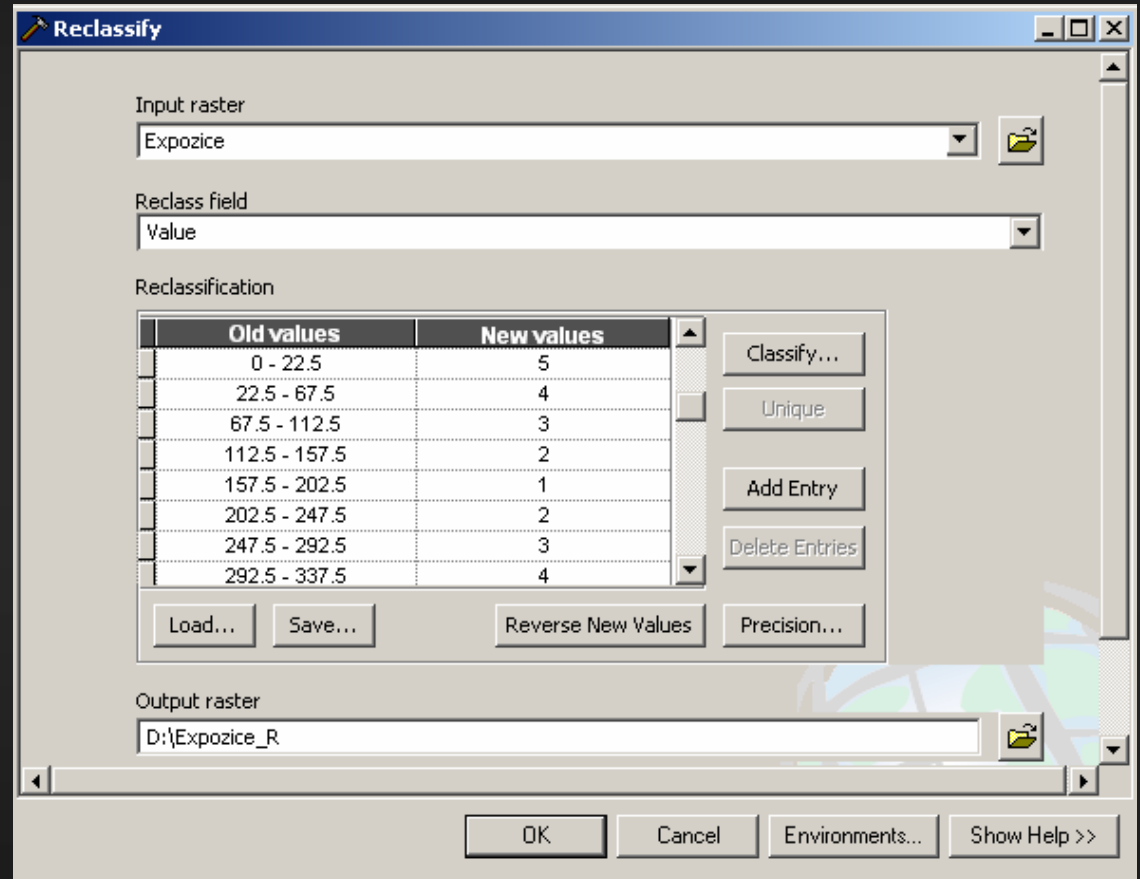


Reclassify Expozice

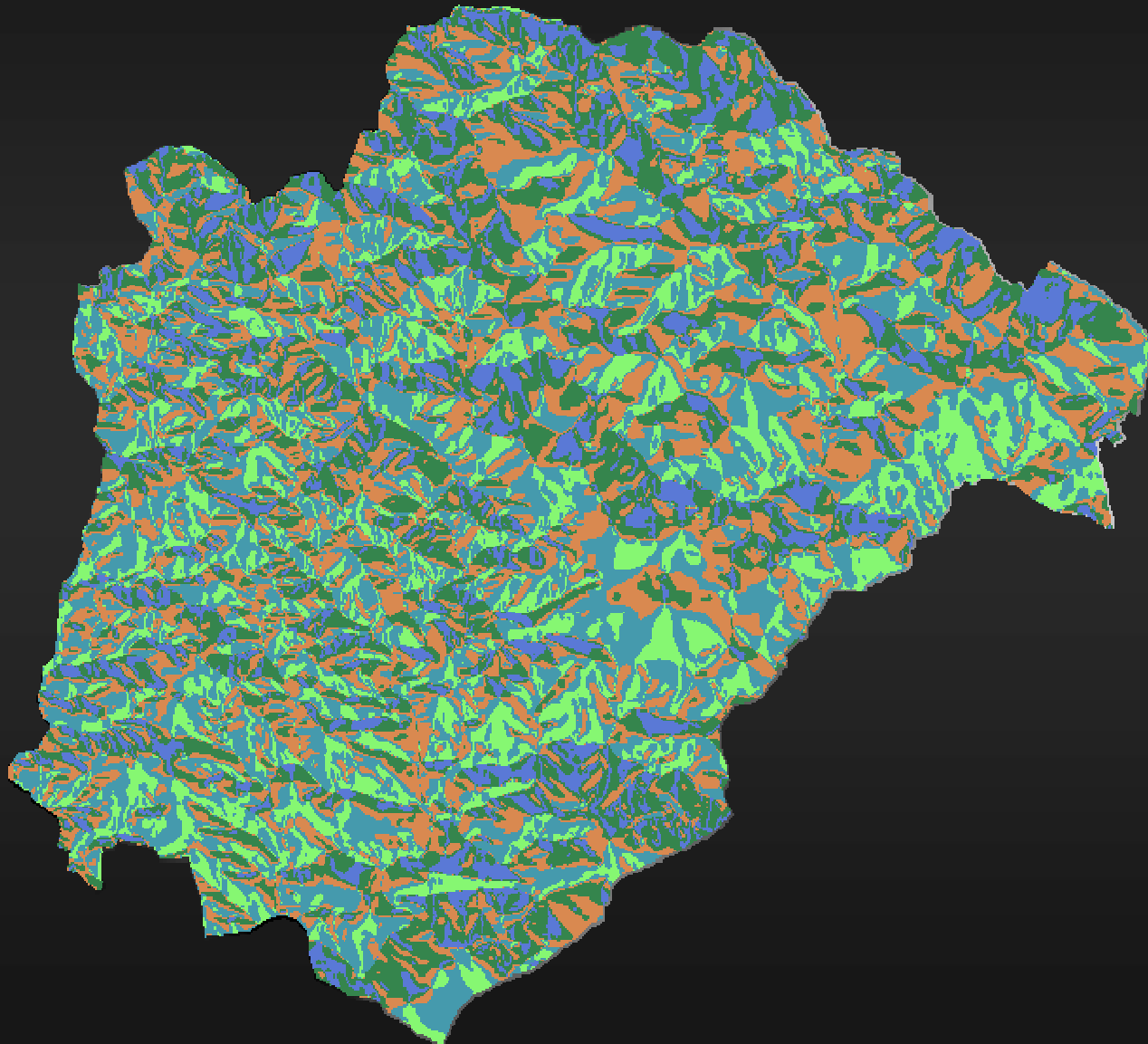
Expozice_R



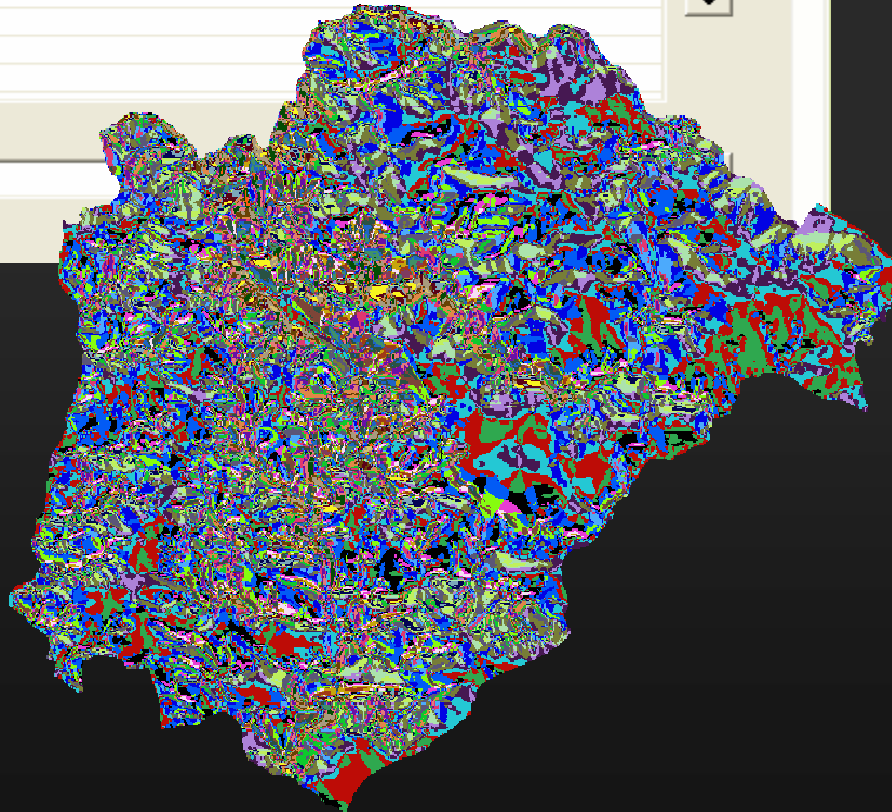
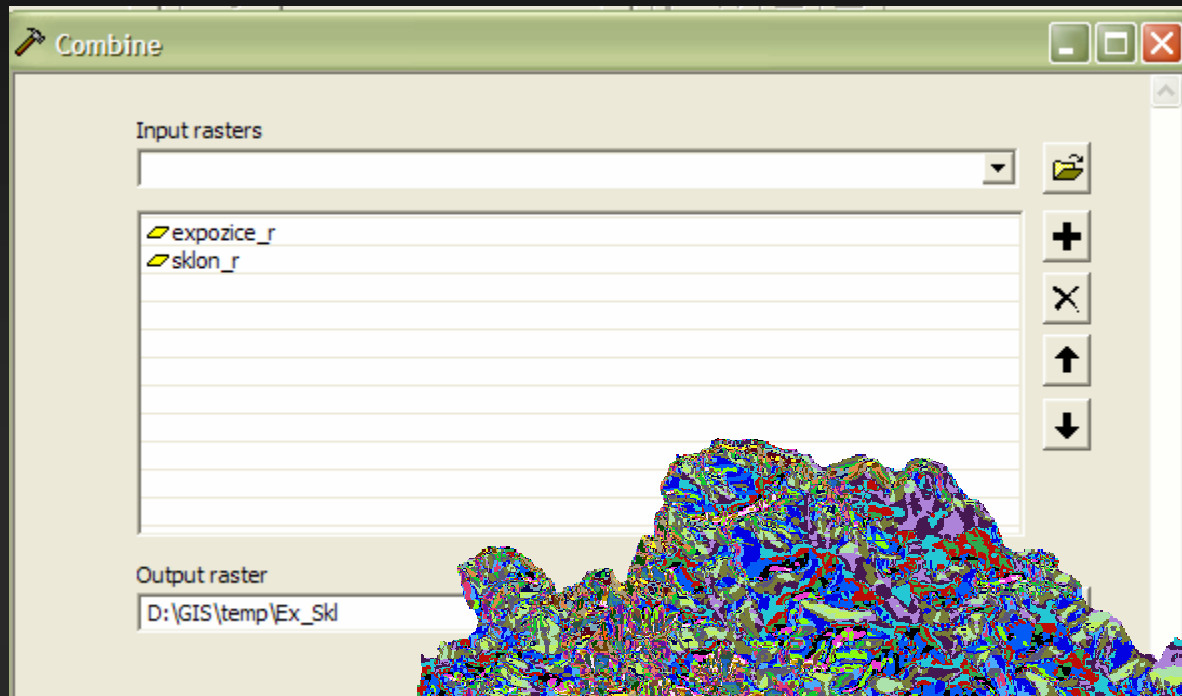
1	157.5	202.5
2	112.5	157.5
2	202.5	247.5
3	67.5	112.5
3	247.5	292.5
4	22.5	67.5
4	292.5	337.5
5	0	22.5
5	337.5	360



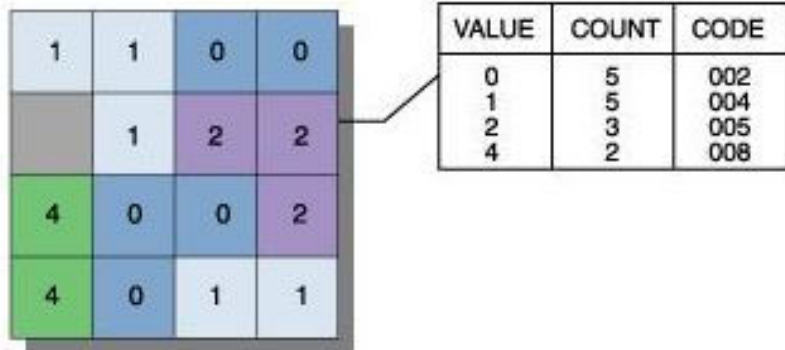
Reklasifikované expozice svahů pro koeficient rel. ozáření



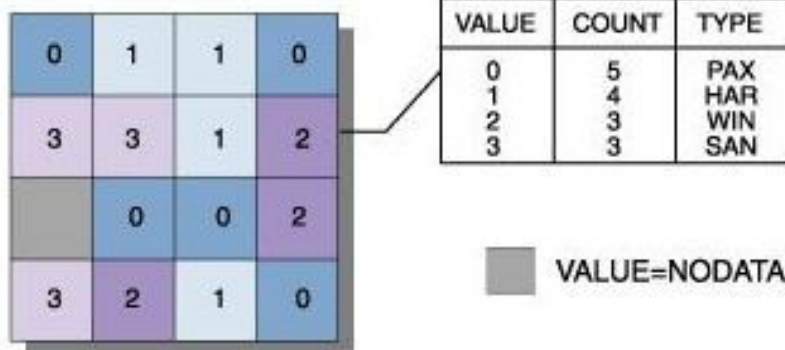
Combine Expozice_R x Sklon_R



Nástroj Combine



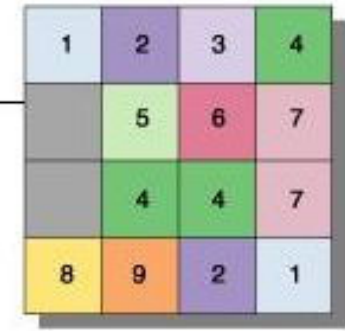
INGRID1



■ VALUE=NODATA

INGRID2

VALUE	COUNT	INGRID1	INGRID2
1	2	1	0
2	2	1	1
3	1	0	1
4	3	0	0
5	1	1	3
7	1	2	1
8	2	2	2
9	1	4	3
	1	0	2



OUTGRID

Expression: COMBINE(INGRID1, INGRID2)

Expozice_R

Sklon_R = křížová klasifikace

Expozice_R x Sklon_R

Layers

- slp_vrs
- slp_poly
- ex_skl
- expozice_r
- sklon_r
- A
- T1
- slp_dmt10
- slp_slope
- slp_aspect

Display Source Selection

Type in the keyword to find:

combine

- Combine (sa)
- Compact (management)
- Compare Replica Schema (mana
- Composite Bands (management)
- Compress (management)
- Compress File Geodatabase Dat
- Con (sa)
- Concatenate Date And Time Fiel
- Contour (3d)
- Contour (sa)
- Contour List (3d)

Locate

Attributes of ex_skl

Rowid	VALUE *	COUNT	EXPOZICE_R	SKLON_R
0	1	66991	2	3
1	2	123574	2	2
2	3	64341	1	2
3	4	66951	1	1
4	5	124765	2	1
5	6	41226	2	4
6	7	31741	1	3
7	8	19533	1	4
8	9	93959	3	1
9	10	86270	4	1
10	11	99124	4	2
11	12	47793	5	2
12	13	36708	5	1
13	14	34515	3	4
14	15	69058	4	3
15	16	33879	5	3
16	17	44002	4	4
17	18	20749	5	4
18	19	14089	5	5
19	20	104718	3	2
20	21	60332	3	3
21	22	28025	4	5
22	23	9211	5	6
23	24	16668	4	6
24	25	5579	5	7
25	26	13539	3	6
26	27	23273	3	5
27	28	10928	4	7
28	29	8753	3	7

Record: 1 Show: All Selected Records (0 out of 40 Selected) Options

Add Field

Name: K

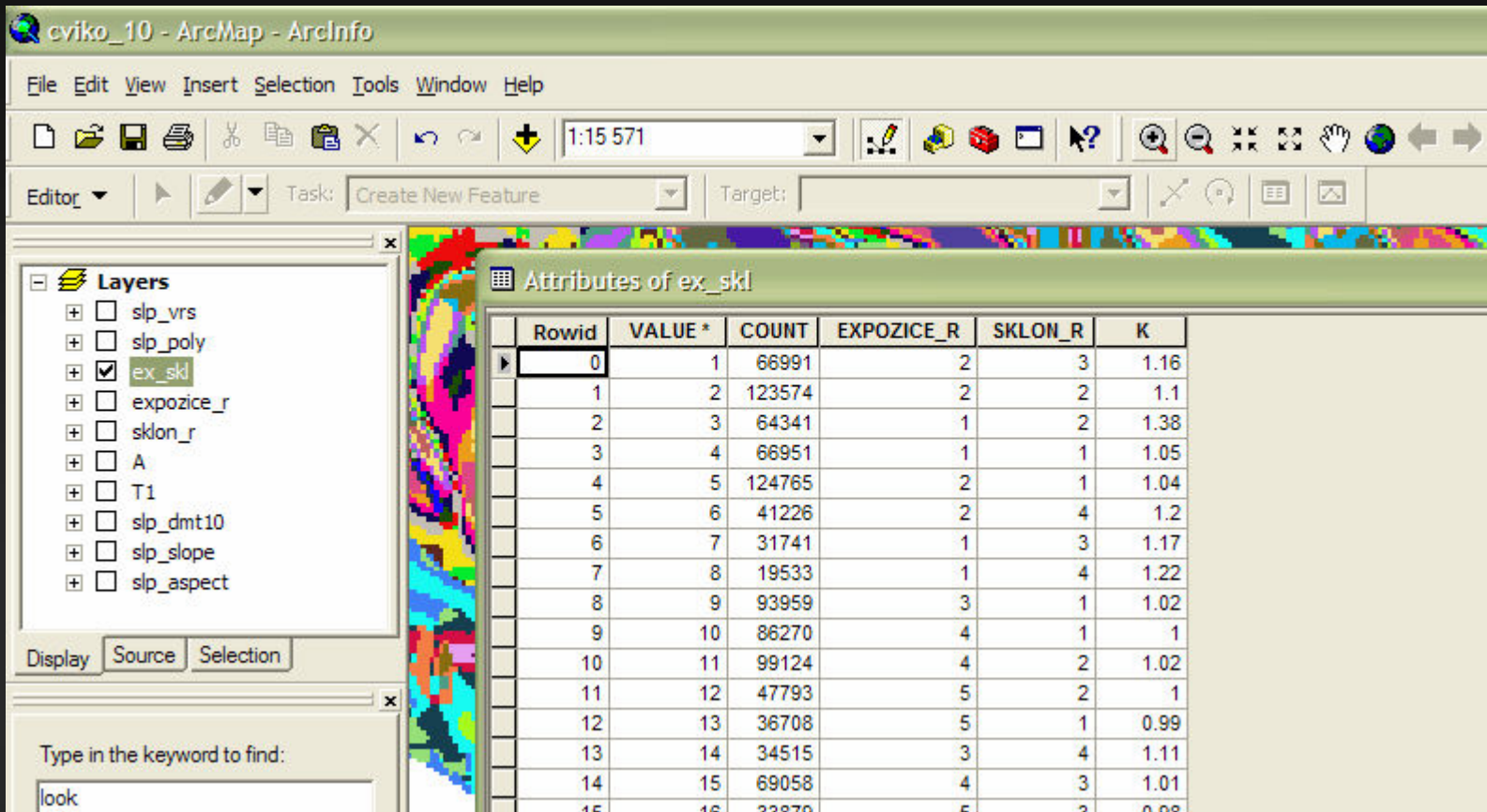
Type: Float

Field Properties

Precision: 6

Scale: 2

OK Cancel



K	(1) 0° - 5°	(2) 5° - 10°	(3) 10° - 15°	(4) 15° - 20°	(5) 20° - 25°	(6) 25° - 30°	(7) 30° - 40°	(8) 40° - 50°
(1) J	1.05 (04)	1.38 (03)	1.17 (06)	1.22 (08)	1.26 (31)	1.31 (34)	1.34 (35)	1.37 (40)
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(3) V, Z	1.02 (09)	1.06 (20)	1.09 (21)	1.11 (14)	1.12 (27)	1.12 (26)	1.10 (29)	1.07 (38)
(4) SV, SZ	1.00 (10)	1.02 (11)	1.01 (15)	1.00 (17)	0.99 (22)	0.97 (24)	0.92 (28)	0.84 (36)
(5) S	0.99 (13)	1.00 (12)	0.98 (16)	0.96 (18)	0.93 (19)	0.87 (23)	0.81 (25)	0.75 (37)

K	(1) 0°-5°	(2) 5°-10°	(3) 10°-15°	(4) 15°-20°	(5) 20°-25°	(6) 25°-30°	(7) 30°-40°	(8) 40°-50°
(1) J	1.05 (04)	1.38 (02)	1.17 (03)	1.00 (03)	1.00 (01)	1.31 (34)	1.34 (35)	1.37 (40)
(2) JV, JZ	1.04 (05)	1.10 (03)	1.00 (03)	1.00 (03)	1.00 (01)	1.26 (33)	1.28 (32)	1.30 (39)
(3) V, Z	1.02 (09)	1.06 (2)	1.00 (03)	1.00 (03)	1.00 (01)	1.12 (26)	1.10 (29)	1.07 (38)
(4) SV, SZ	1.00 (10)	1.02 (1)	1.00 (03)	1.00 (03)	1.00 (01)	0.97 (24)	0.92 (28)	0.84 (36)
(5) S	0.99 (13)	1.00 (1)	1.00 (03)	1.00 (03)	1.00 (01)	0.87 (23)	0.81 (25)	0.75 (37)

Rowid	VALUE *	COUNT	ASPECT_R	SLOPE_R2	K
0	1	67024	2	3	1.16
1	2	123891	2	2	1.1
2	3	64435	1	2	1.38
3	4	67451	1	1	1.05
4	5	125566	2	1	1.04
5	6	31752	1	3	1.17
6	7	41230	2	4	1.2
7	8	19533	1	4	1.22
8	9	94652	3	1	1.02
9	10	86907	4	1	1
10	11	99278	4	2	1.02
11	12	47861	5	2	1
12	13	36983	5	1	0.99
13	14	34515	3	4	1.11
14	15	69078	4	3	1.01
15	16	33885	5	3	0.98
16	17	44002	4	4	1
17	18	20749	5	4	0.96
18	19	14089	5	5	0.93
19	20	104875	3	2	1.06
20	21	60369	3	3	1.09
21	22	28025	4	5	0.99
22	23	9211	5	6	0.87
23	24	16668	4	6	0.97
24	25	5579	5	7	0.81
25	26	13539	3	6	1.12
26	27	23273	3	5	1.12
27	28	10928	4	7	0.92
28	29	8753	3	7	1.1
29	30	26556	2	5	1.24
30	31	12301	1	5	1.26
31	32	6539	2	7	1.28
32	33	14027	2	6	1.26
33	34	6800	1	6	1.31
34	35	2341	1	7	1.34
35	36	216	4	8	0.84
36	37	85	5	8	0.75
37	38	223	3	8	1.07
38	39	95	2	8	1.3
39	40	28	1	8	1.37



Editor Task: Create New Feature Target:

- Layers
 - slp_vrs
 - slp_poly
 - ex_skl
 - expozice_r
 - sklon_r
 - A
 - T1
 - slp_dmt10
 - slp_slope
 - slp_aspect

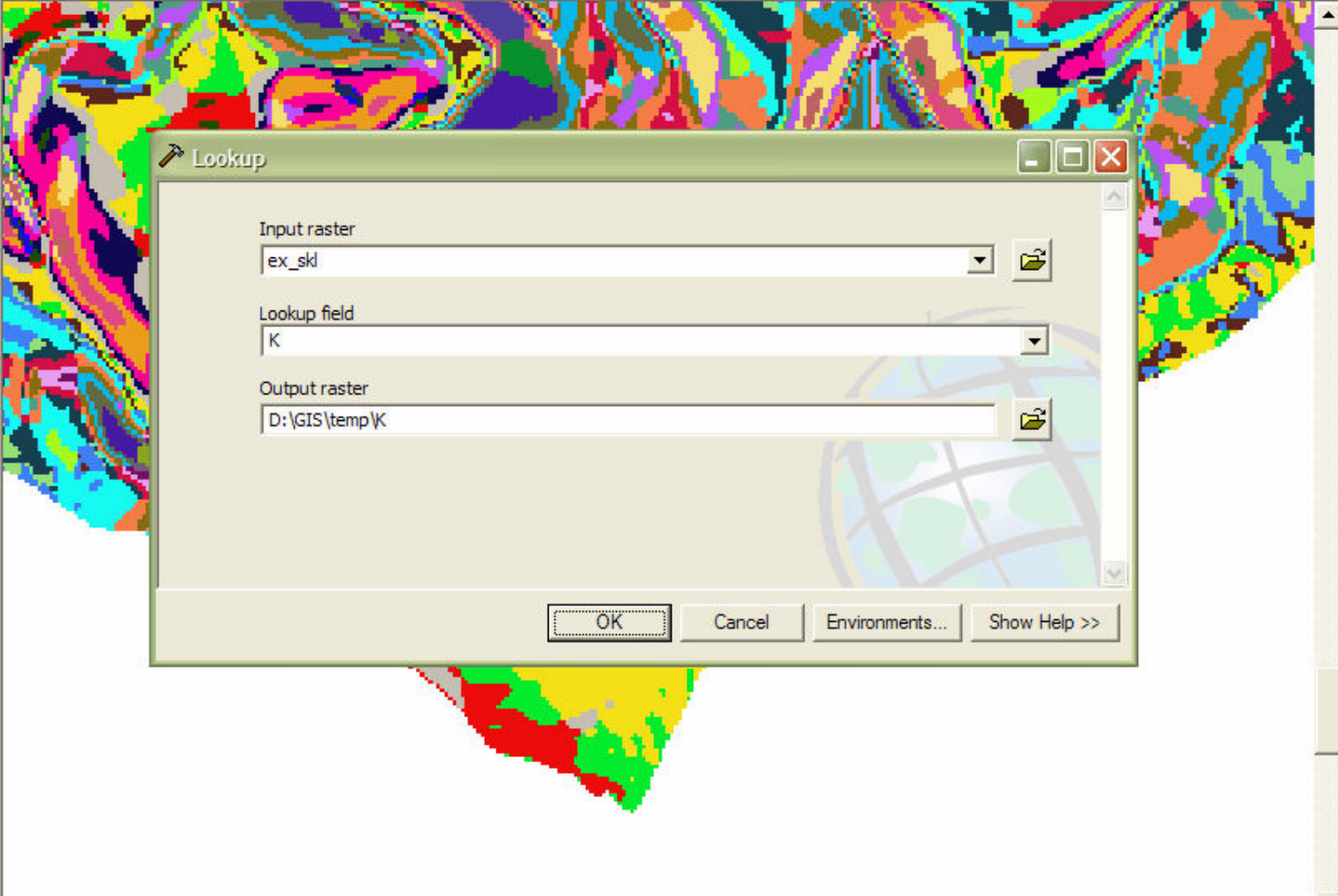
Display Source Selection

Type in the keyword to find:

look

- Lookup (3d)
- Lookup (sa)
- Lowest Position (sa)
- Majority Filter (sa)
- Make Closest Facility Layer (na)
- Make Feature Layer (managemer)
- Make NetCDF Feature Layer (mc)
- Make NetCDF Raster Layer (md)
- Make NetCDF Table View (md)
- Make OD Cost Matrix Layer (na)
- Make Query Table (management)

Locate



Lookup

Input raster: ex_skl

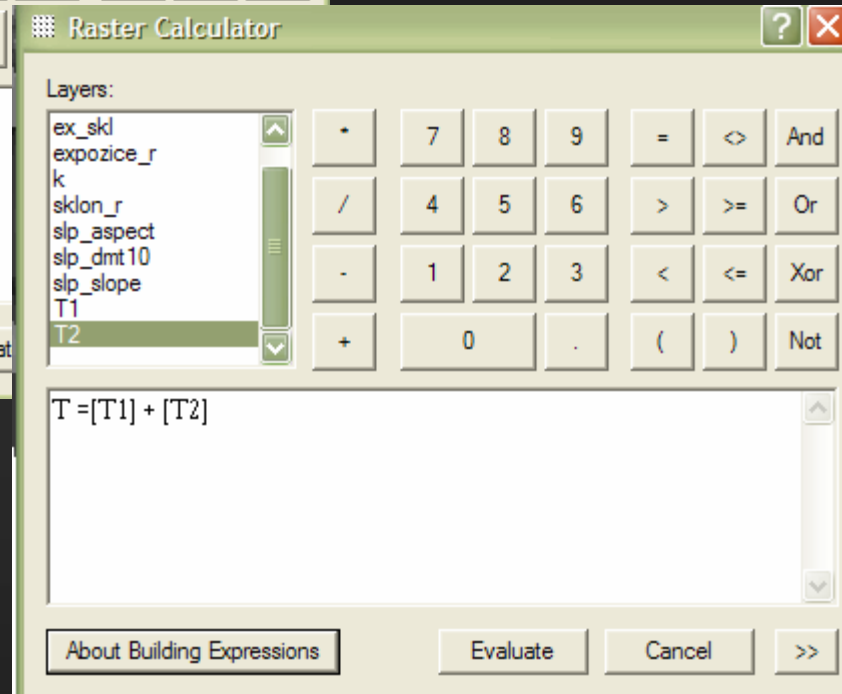
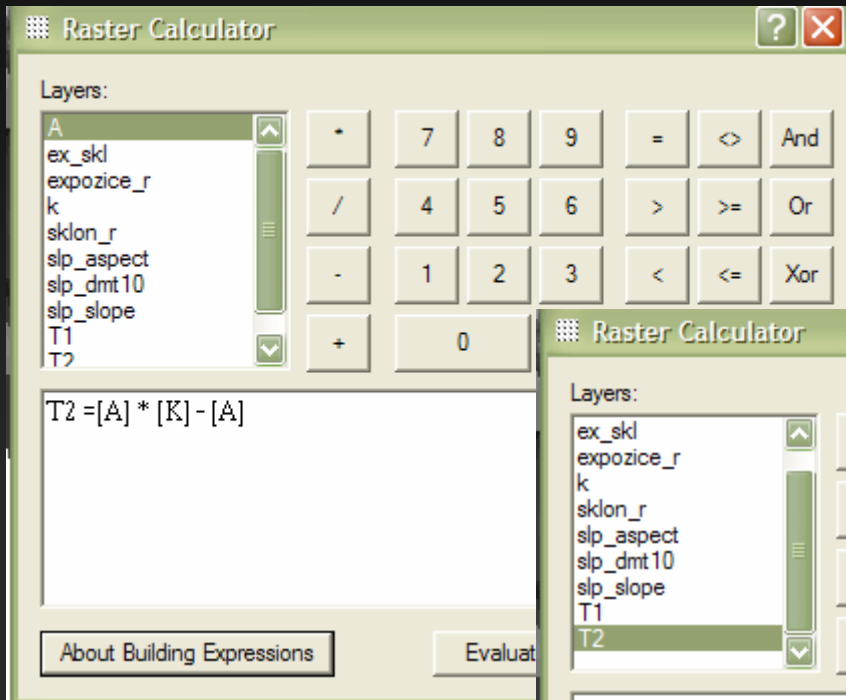
Lookup field: K

Output raster: D:\GIS\temp\K

OK Cancel Environments... Show Help >>

Favorites Index Search Results

Raster Calculator (Spatial Analyst toolbar)



$$T2 = [A] * [K] - [A]$$

$$T = [T1] + [T2]$$

Výstupy nerespektují Current workspace!

Layers

- slp_vrs
- slp_poly
- Value
 - Value
 - High : 10.9653
 - Low : 5.67493
- T2
- k
- ex_skl
- expozice_r

Display Source Selection

ArcToolbox

- 3D Analyst Tools
- Analysis Tools
- Cartography Tools
- Conversion Tools
- Data Interoperability Tools
- Data Management Tools
- Geocoding Tools
- Geostatistical Analyst Tools
- Linear Referencing Tools
- Multidimension Tools
- Network Analyst Tools
- Samples
- Server Tools
- Spatial Analyst Tools
- Spatial Statistics Tools
- Tracking Analyst Tools

Favorites Index Search Results

