

Interpolace povrchu

Vladimír Zenkl

ARCDATA PRAHA, s.r.o.

ARCDATA PRAHA



esri

Official
Distributor

Interpolace povrchu

ArcGIS Spatial Analyst

ArcGIS 3D Analyst

ArcGIS Geostatistical Analyst

Metody interpolace

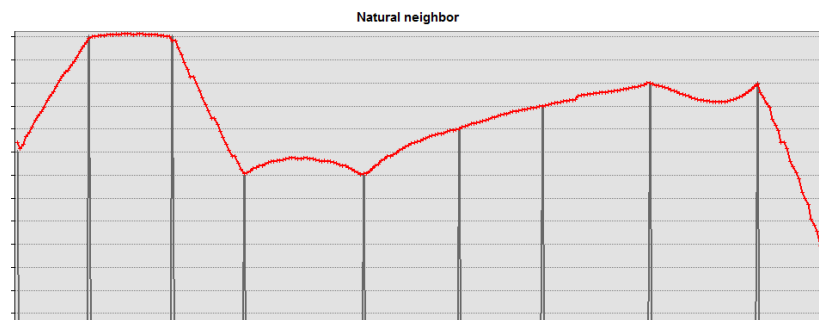
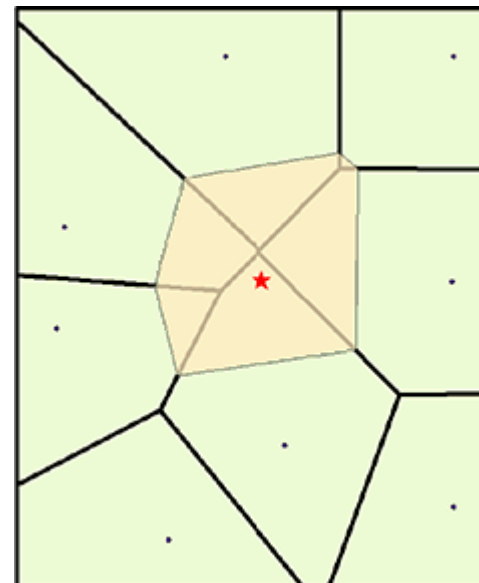
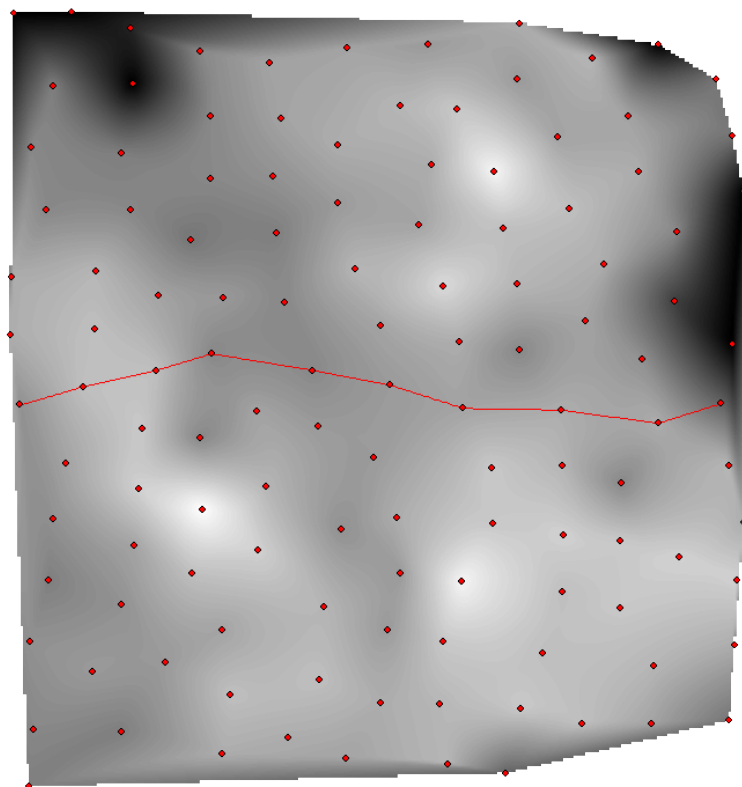
Interpolace povrchu

druhy metod:

- **deterministické**
 - Natural Neighbor, IDW, Spline, Trend
- **geostatistické**
 - Kriging
- **speciální**
 - TopoToRaster

Natural Neighbor

váhy okolních bodů:
v poměru ploch Thiessenových polygonů

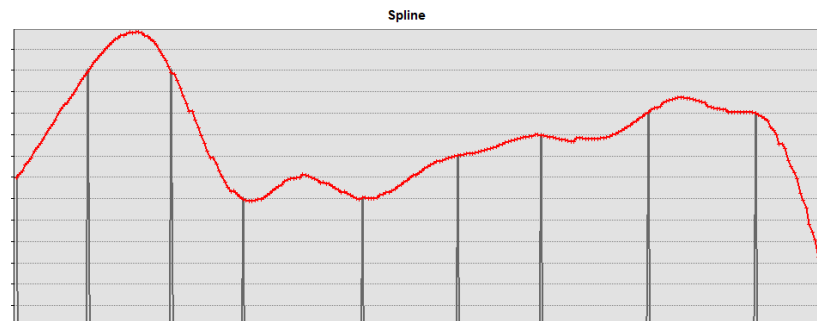
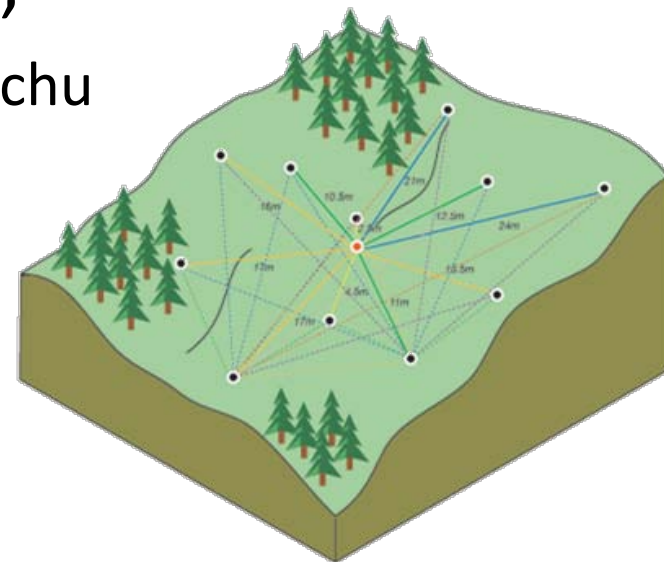
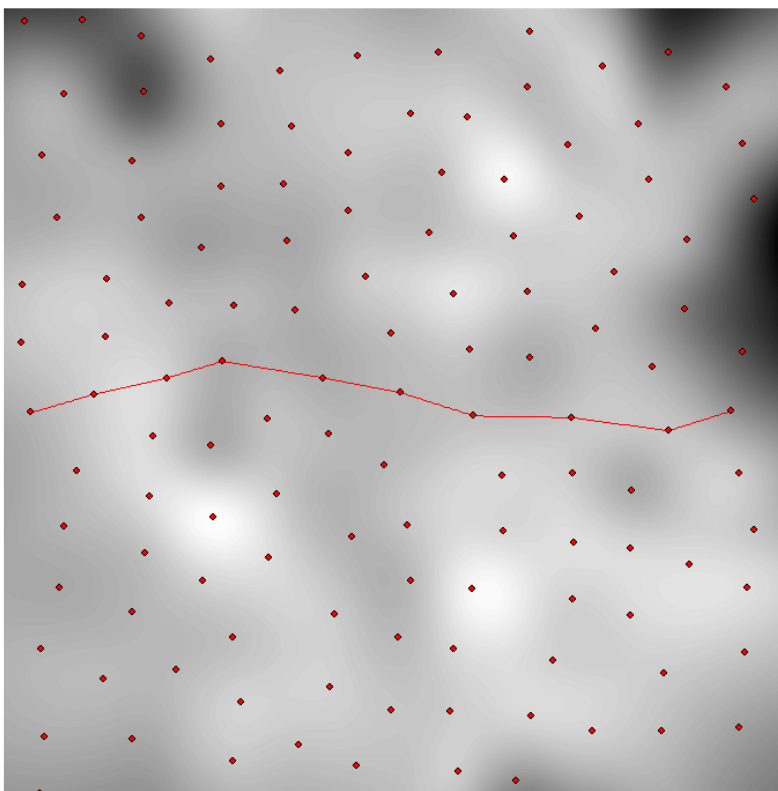


Spline

Spline with Barriers

možnost zohlednění diskontinuit povrchu

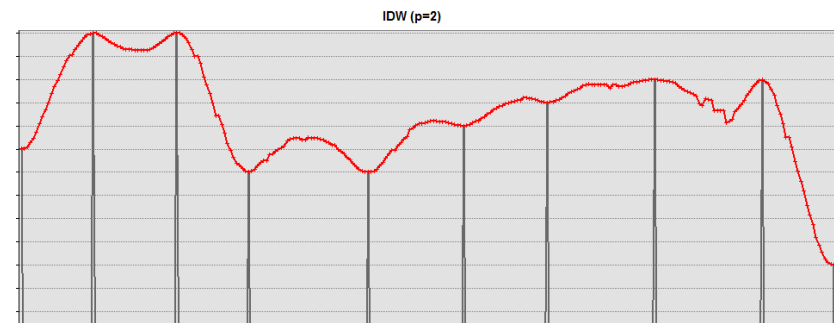
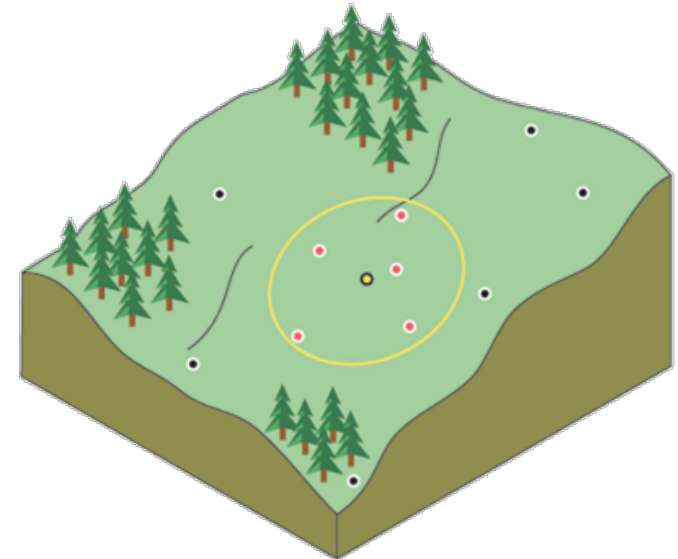
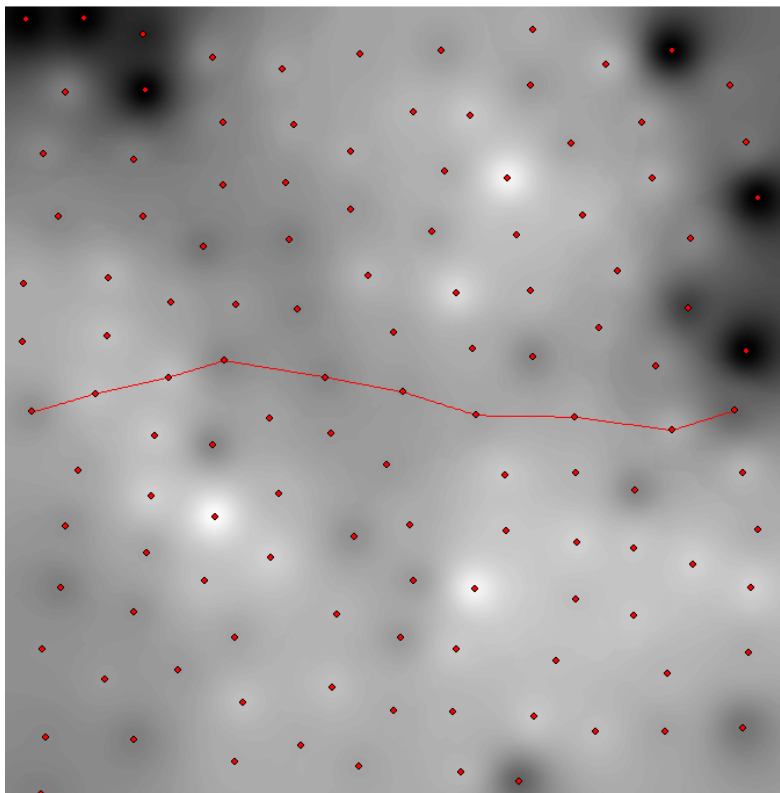
interpolace matematickou funkcí,
která minimalizuje celkové zakřivení povrchu



IDW (Inverse Distance Weighted)

váhy okolních bodů:

klesají s rostoucí vzdáleností bodů



Kriging

geostatistická metoda

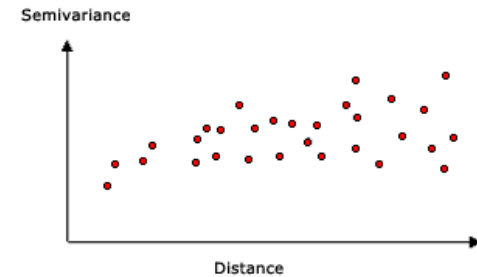
zkoumání prostorového chování jevu

reprezentovaného souřadnicí Z (prostorová autokorelace)

před volbou vhodného způsobu generování povrchu

váhy okolních bodů:

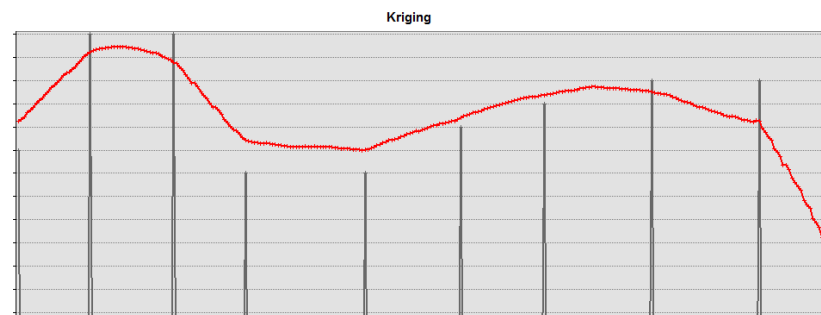
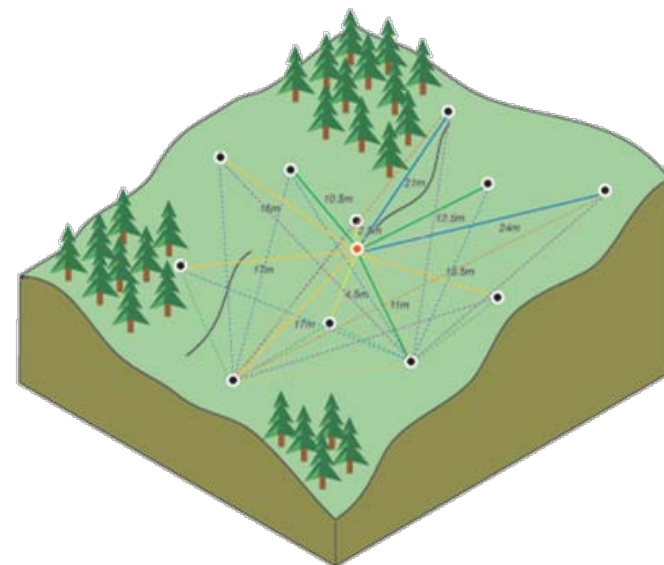
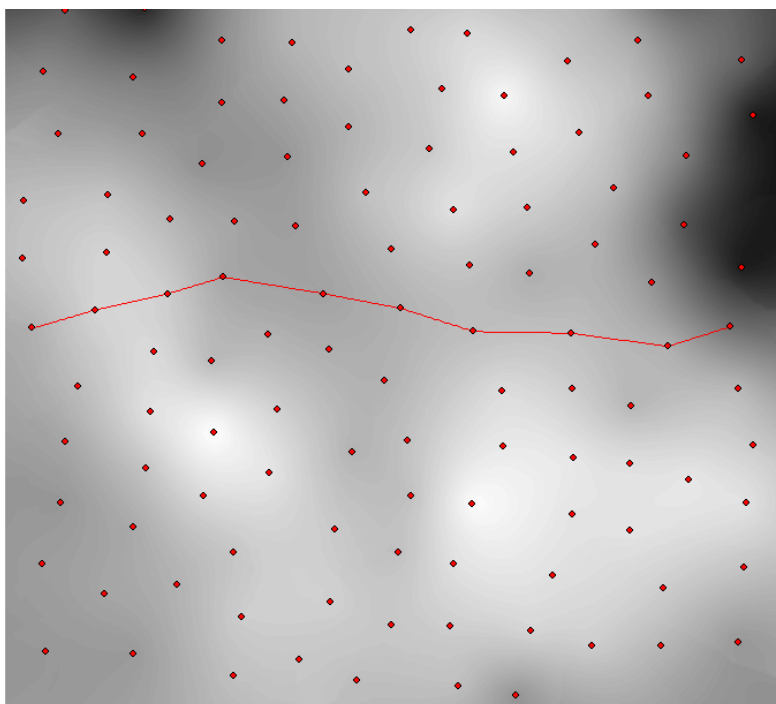
- vzdálenost
- prostorové uspořádání okolních bodů



Kriging

váhy okolních bodů:

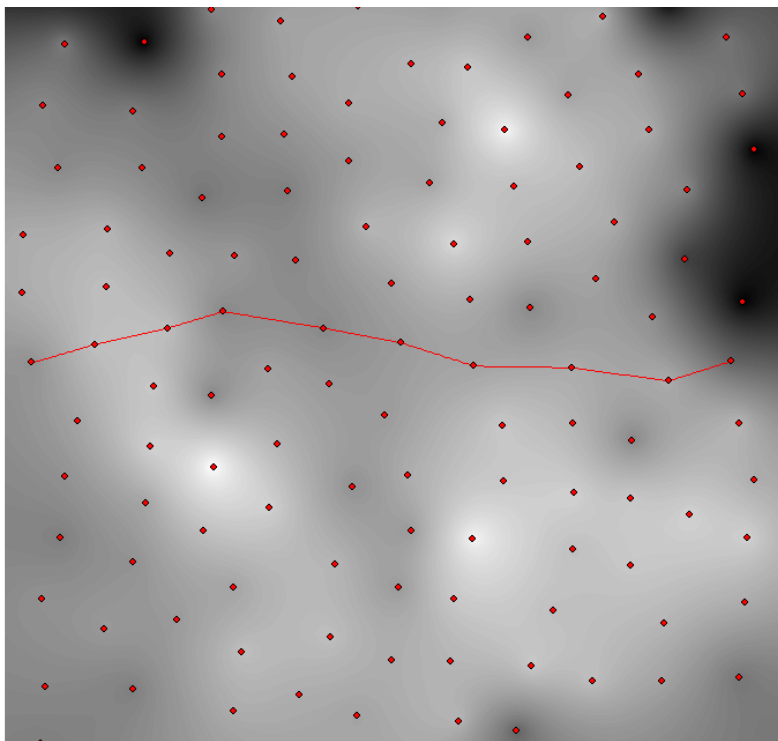
- vzdálenost
- prostorové uspořádání okolních bodů



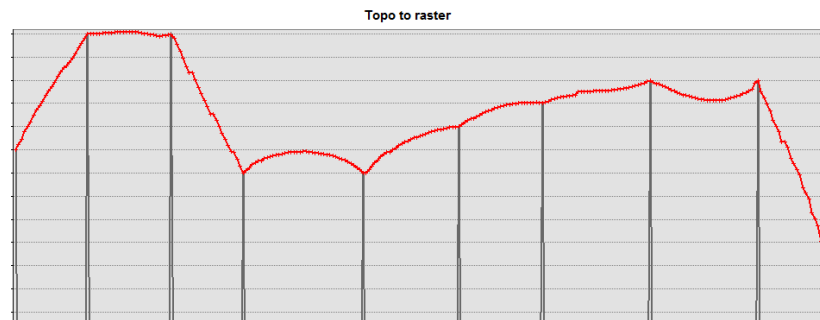
TopoToRaster

interpolace topografických povrchů

zdroj: body, linie, polygony, *vrstevnice*

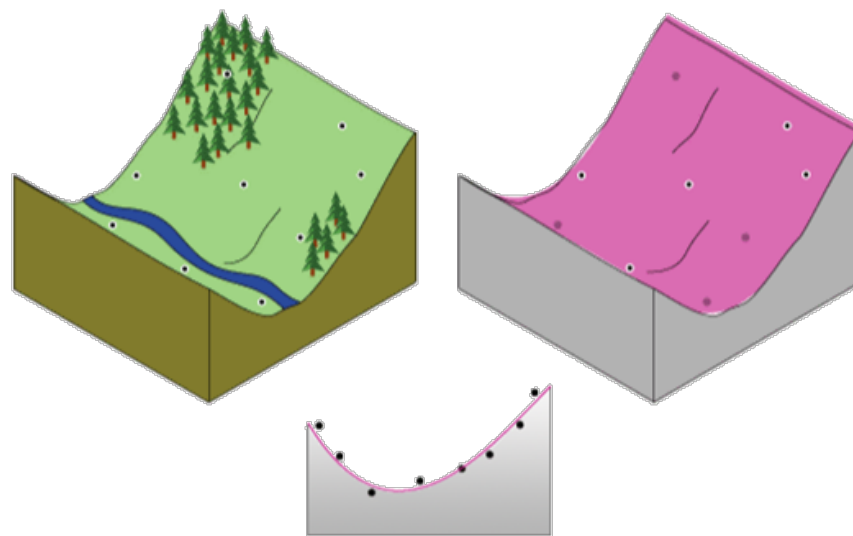
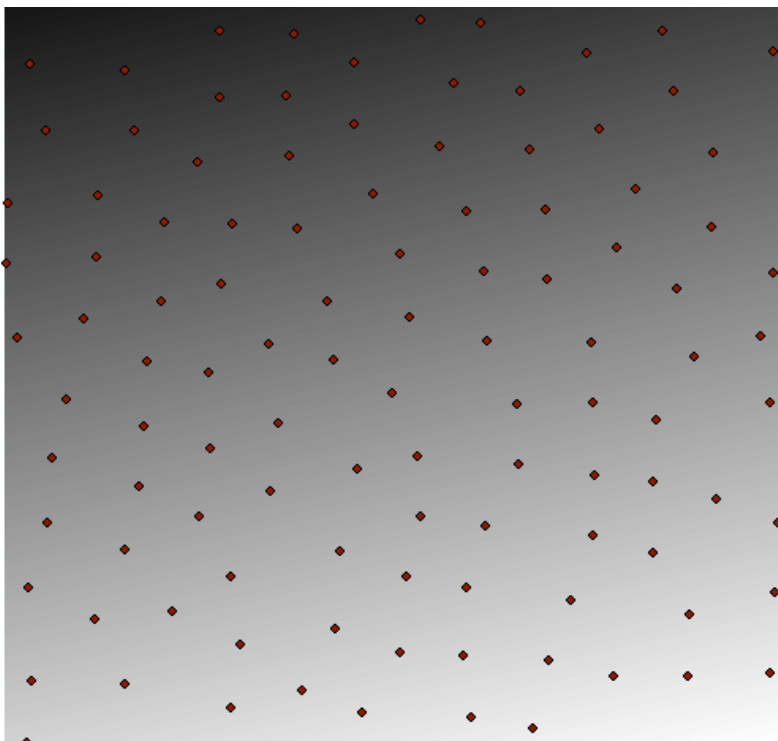


hydrologicky korektní
povrch



Trend

interpolace matematickou funkcí,
která vystihuje celkový tvar povrchu





Interpolace pomocí ArcGIS Spatial Analyst



Zadání – dialogové okno nástroje

Input point features
snowpoints

Z value field
SNOWDEPTH

Output raster
C:\Users\root\Documents\ArcGIS\Default.gdb\idw_snowpoin1

Output cell size (nepovinné)
53,2807324655019

Power (nepovinné)
2

Search radius (nepovinné)
Variable

Search Radius Settings

Number of points: 12

Maximum distance:

Input barrier polyline features (nepovinné)

OK Storno Prostředí... Zobrazit nápovědu >>

Kontrola výsledků

1. některé vzorky nezařadit do interpolace
2. hodnoty nezařazených vzorků porovnat v odpovídajících místech s hodnotami interpolovaného povrchu
3. pomoc: skript (Python), který doplní do atributové tabulky bodů hodnoty pixelů z rastru.



Interpolace pomocí ArcGIS Geostatistical Analyst



Průzkum dat

Geostatistical Analyst

Explore Data

Geostatistical Wizard...

Subset Features...

Geostatistical Analyst Help

Tutorial

Histogram

Normal QQPlot

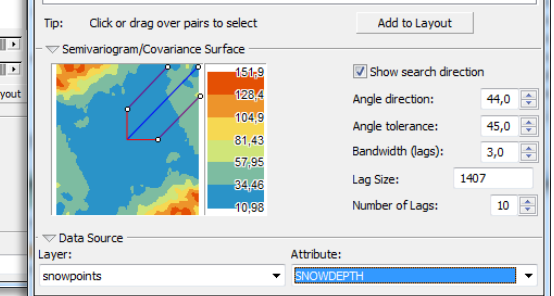
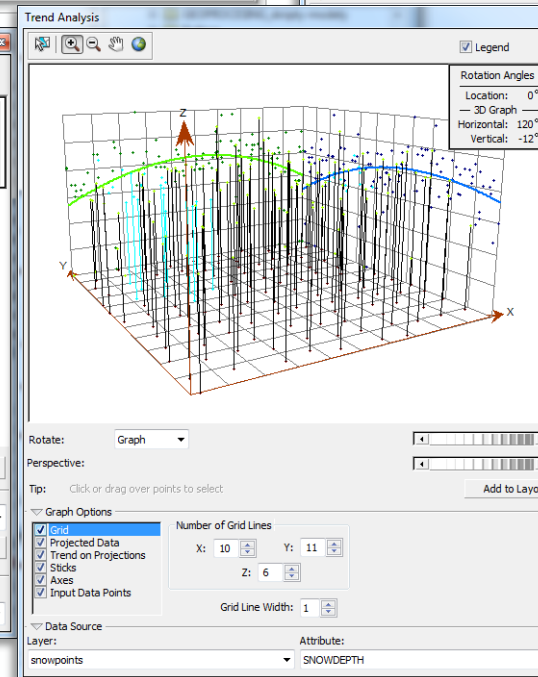
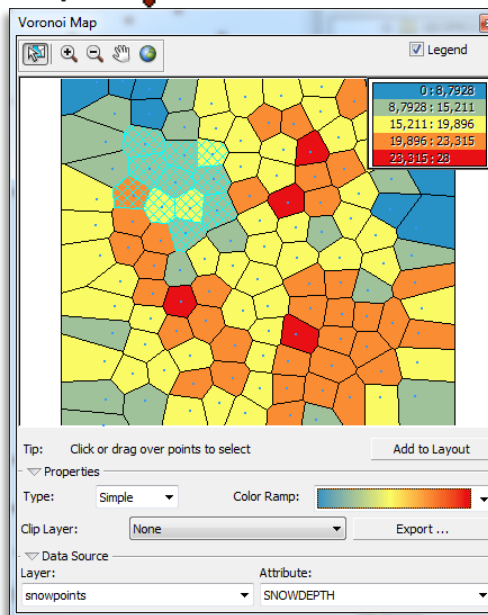
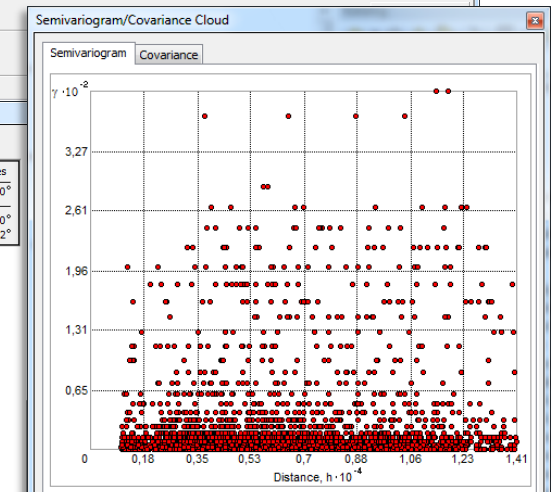
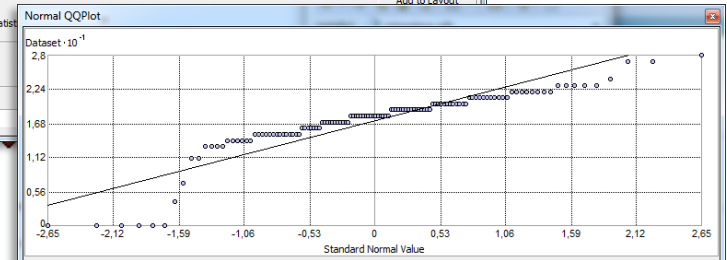
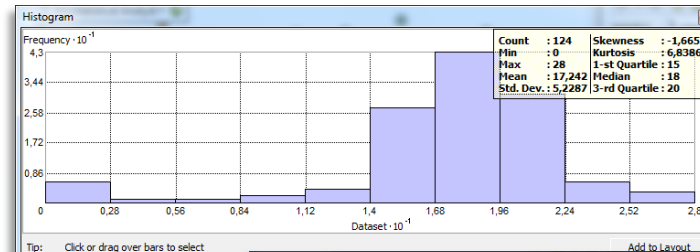
Voronoi Map

Trend Analysis

Semivariogram/Covariance Cloud

General QQPlot

Crosscovariance Cloud



Příprava k interpolaci – Geostat. Wizard

Geostatistical wizard - Kriging step 2 of 5

Kriging Type
Ordinary
Simple
Universal

Dataset #1
Transformation type
Decuster before tra
Order of trend remo

Geostatistical wizard - Kriging step 3 of 6 - Normal Score Transformation

Density 10^1

Transformation #1 [snowpoints - G...]
View properties
Number of bins: 11
Approximation method
Type: Multiplicative skewing
Number of modifiers: 1
Base distribution: Empirical
Diagnostic information
ADC: 717,8393
Mean: 17,30499
StdDev: 5,046698
Beta (1,1)
weight: 1

Geostatistical wizard - Kriging step 4 of 6 - Semivariogram/Covariance Model

Covariance

$C \cdot 10^1$

Model: $0.32768^{\text{Nugget}} + 0.6723^{\text{Stable}}(3594,4,2)$

Geostatistical wizard - Kriging step 5 of 6 - Searching Neighborhood

Dataset: #0 [snowpoints - SNOWDLE...]
Search Neighborhood
Neighborhood type: Standard
Maximum neighbors: 5
Minimum neighbors: 2
Sector type: 4 Sectors with 45° offset
Copy from Variogram: True
Angle: 0
Major semiaxis: 2594,296
Minor semiaxis: 2594,296
Anisotropy factor: 1
Predicted Value
X: 745033,2
Y: 4313597
Value: 16,77267
Weights (20 neighbors)

Geostatistical wizard - Kriging step 6 of 6 - Cross Validation

Source ID	Included	Measured	Predicted	Error	Stand...	Standardize...
1	Yes	17	18.68...	1.68512...	3.035...	0.55510734
2	Yes	19	17.16...	-1.8333...	3.728...	-0.4910034
3	Yes	17	20.48...	3.48137...	2.409...	1.4449902
4	Yes	19	18.53...	-0.4609...	2.992...	-0.1145508
5	Yes	19	19.17...	0.1764...	2.900...	0.0597104
6	Yes	23	21.15...	-1.8405...	2.271...	-0.7773216
7	Yes	23	20.20...	-2.7931...	2.533...	-1.1022869
8	Yes	19	14.63...	-4.3697...	4.444...	-0.9831587
9	Yes	20	16.58...	-3.4123...	3.624...	-0.9416462
10	Yes	15	20.79...	5.79650...	2.375...	2.44060637
11	Yes	18	18.26...	0.26660...	2.921...	0.0919297
12	Yes	15	19.26...	4.26318...	2.591...	1.64491195
13	Yes	19	17.37...	-1.6292...	3.220...	-0.5059764
14	Yes	15	17.05...	2.05343...	3.435...	0.59776057
15	Yes	20	17.87...	-2.1234...	2.963...	-0.7165470
16	Yes	19	18.07...	-0.8202...	3.210...	-0.2866372
17	Yes	15	15.33...	0.33278...	4.029...	0.08258675
18	Yes	14	15.65...	1.63616...	3.784...	0.43762945
19	Yes	20	17.17...	-2.8235...	3.223...	-0.8759713
20	Yes	19	19.60...	-0.3915...	2.631...	-0.1487583
21	Yes	22	20.05...	-1.9467...	2.502...	-0.7789594
22	Yes	19	19.40...	-0.5976...	2.531...	-0.2360293
23	Yes	22	23.43...	1.4366...	2.754...	0.63680855
24	Yes	19	17.39...	-1.6036...	3.128...	-0.5102881
25	Yes	20	20.16...	0.16475...	2.421...	0.06802793
26	Yes	21	20.75...	-0.2497...	2.391...	-0.1044189
27	Yes	19	21.63...	2.63903...	2.261...	1.16713435
28	Yes	22	19.62...	-3.2725...	2.474...	-0.9508644
29	Yes	27	19.85...	-7.1489...	2.453...	-2.9143190
30	Yes	18	16.50...	-1.4911...	3.462...	-0.4306547
31	Yes	16	14.77...	-1.2258...	4.767...	-0.2671202
32	Yes	14	15.38...	1.38713...	4.981...	0.2784317
33	Yes	19	17.99...	-1.0079...	2.938...	-0.3496410
34	Yes	17	16.94...	-0.1529...	3.292...	-0.0452423
35	Yes	22	20.60...	-1.3996...	2.315...	-0.6040180
36	Yes	16	14.03...	-1.0386...	3.454...	-0.3469001

Standardized Error

Regression Function: $-0.102083690000590 * x + 1.759631...$
Prediction Errors
Samples: 124 of 124
Mean: 0.1919467
Root-Mean-Square: 3.752377
Mean Standardized: 0.03112892
Root-Mean-Square Standardized: 1.06659
Average Standard Error: 3.819343

(Kriging)

Geostatistical wizard - Kriging step 6 of 6 - Cross Validation

General
Kriging is an interpolator that can be exact or smoothed depending on the measurement error model. It is very flex...