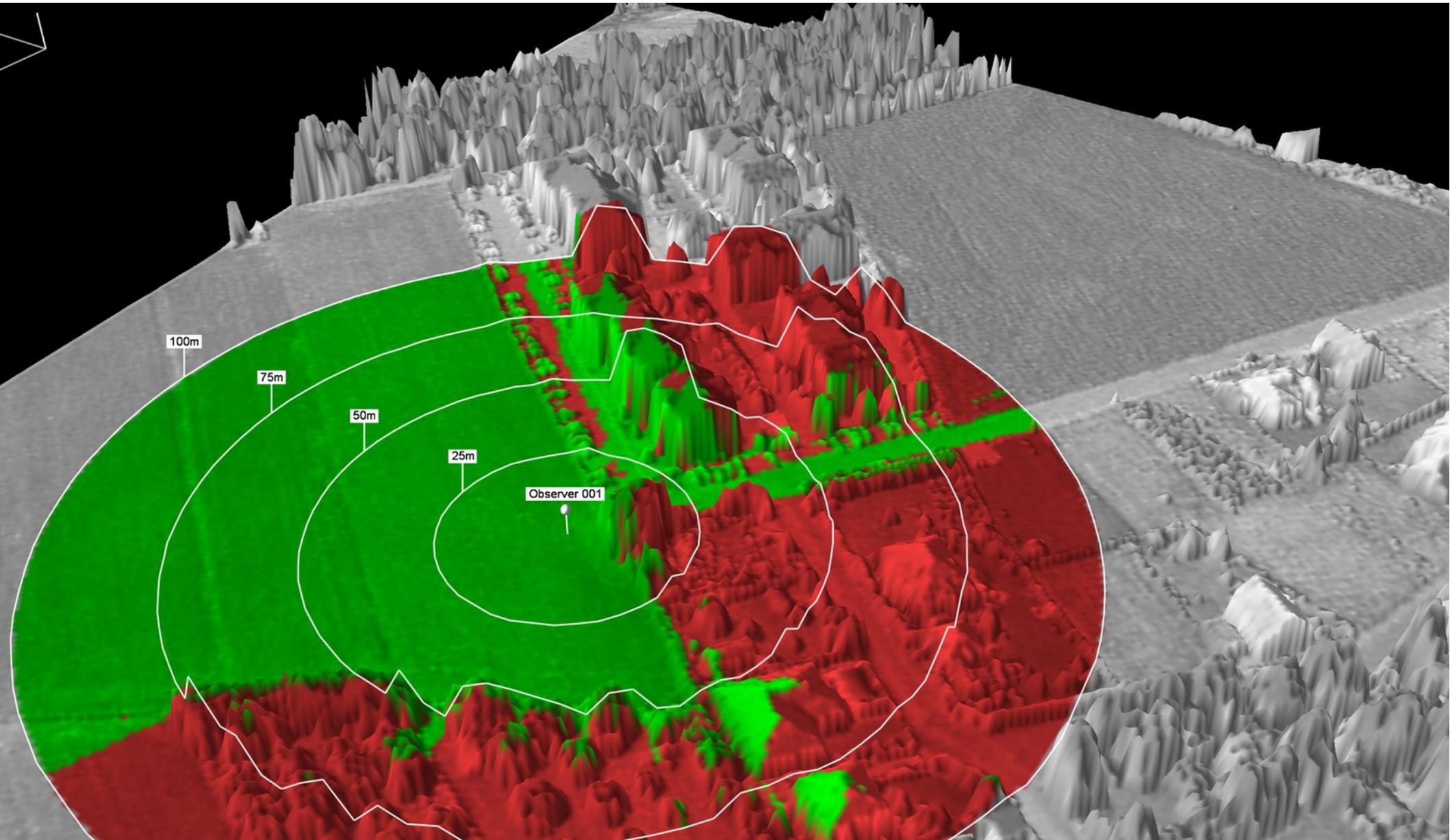


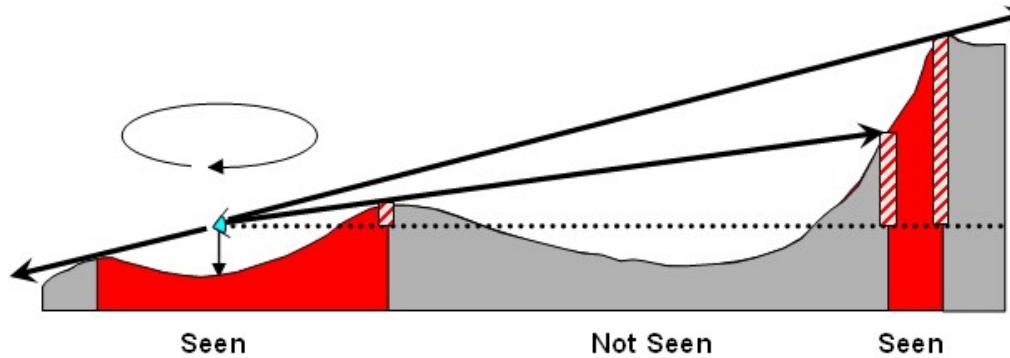
# Geomorfometria w praktyce



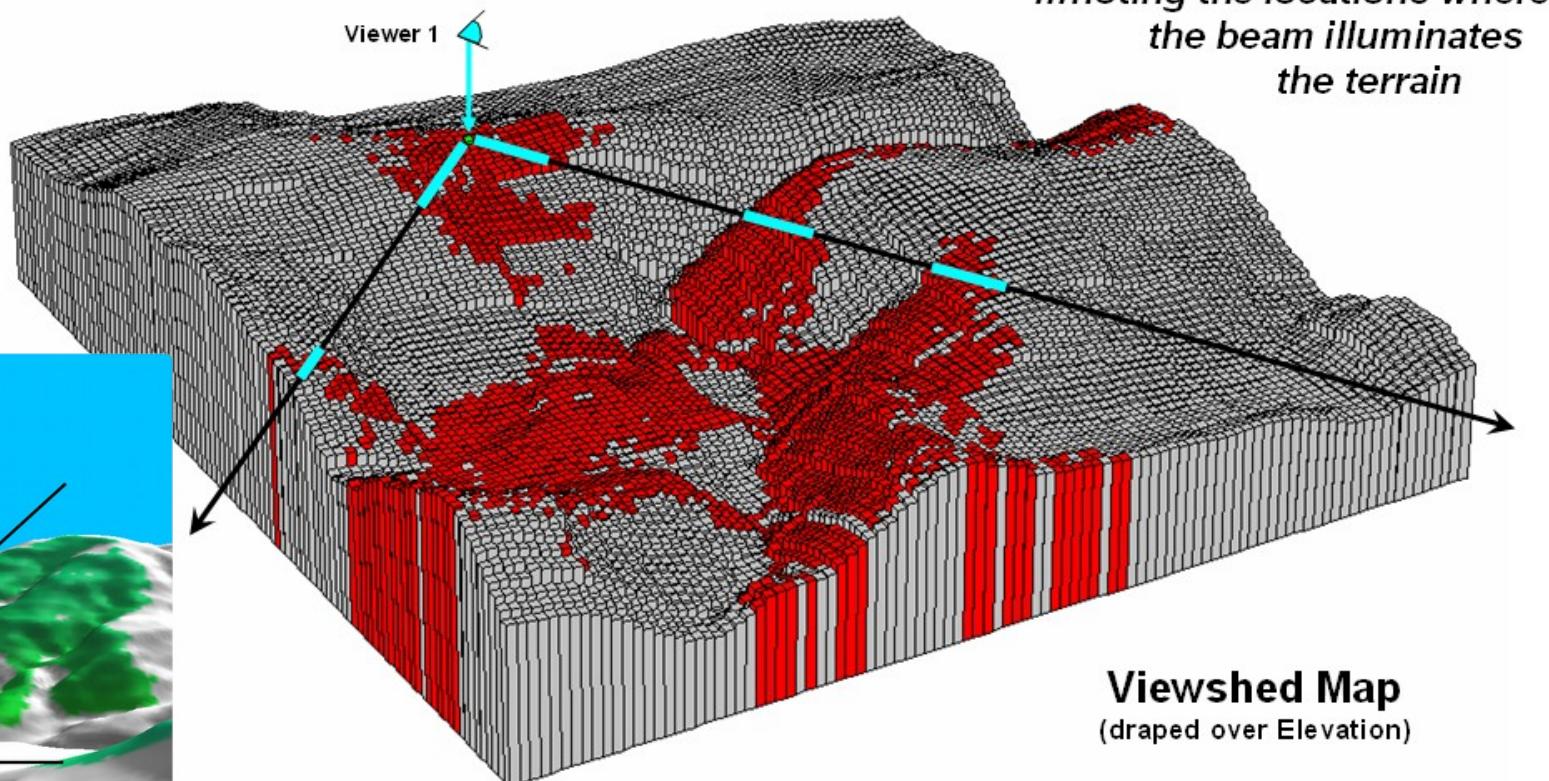
# Widoczność



# Zakres widoczności i linie widoczności



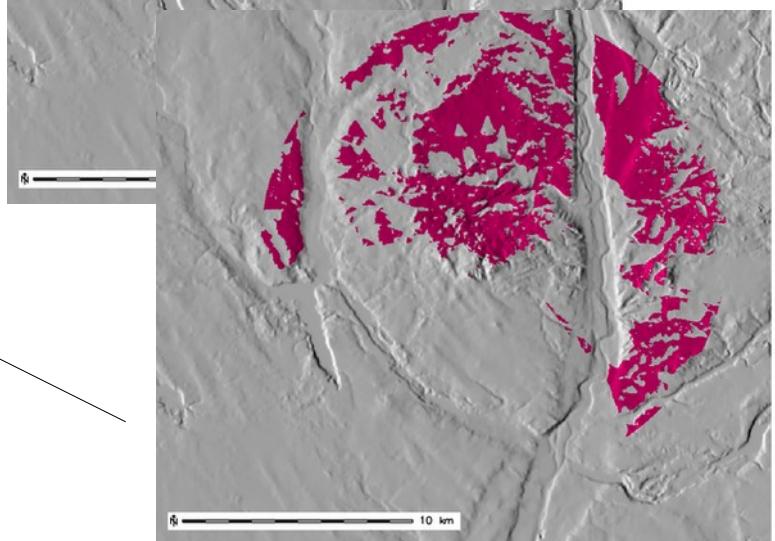
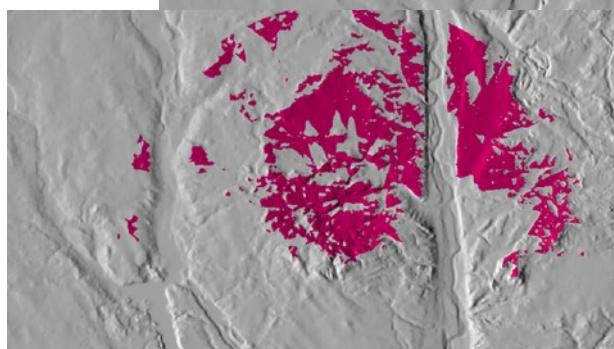
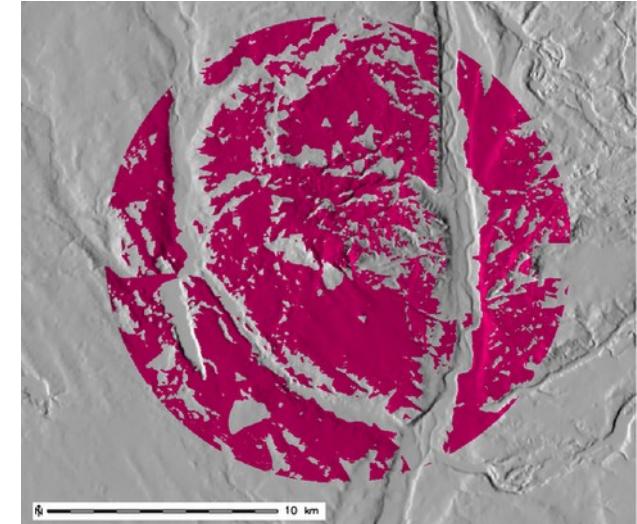
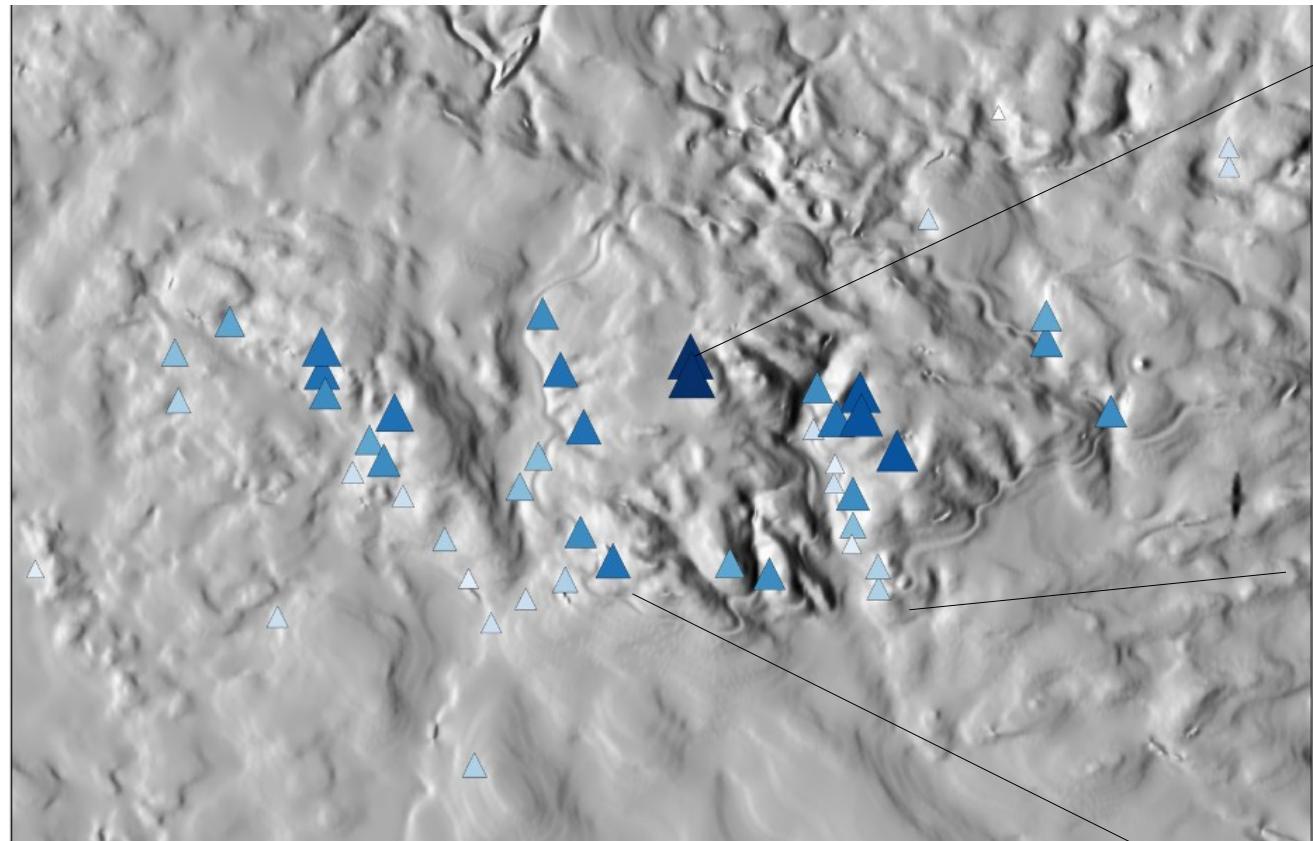
*...a viewshed is like a search light rotating at a “viewer” location...*



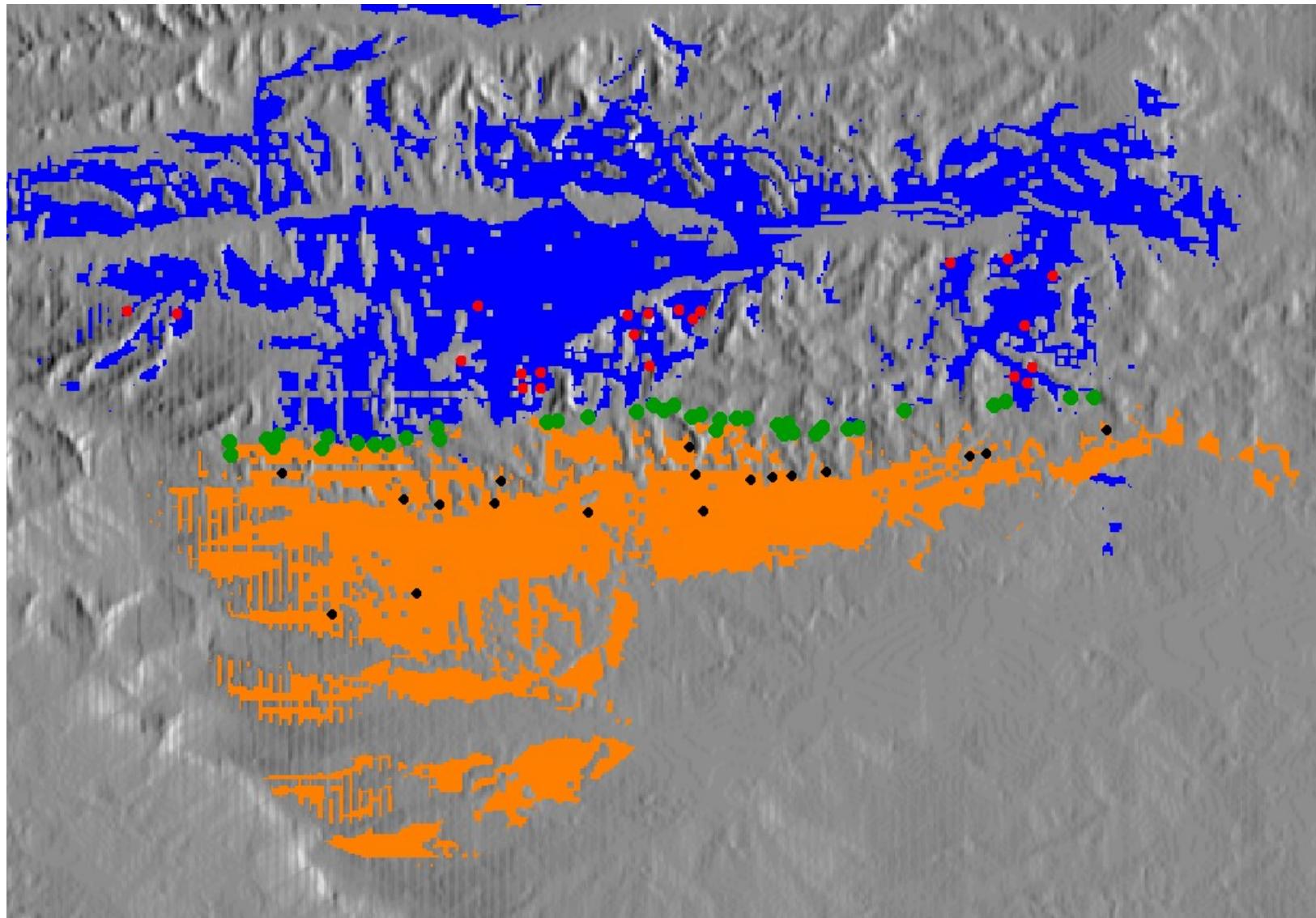
*...noting the locations where the beam illuminates the terrain*

**Viewshed Map**  
(draped over Elevation)

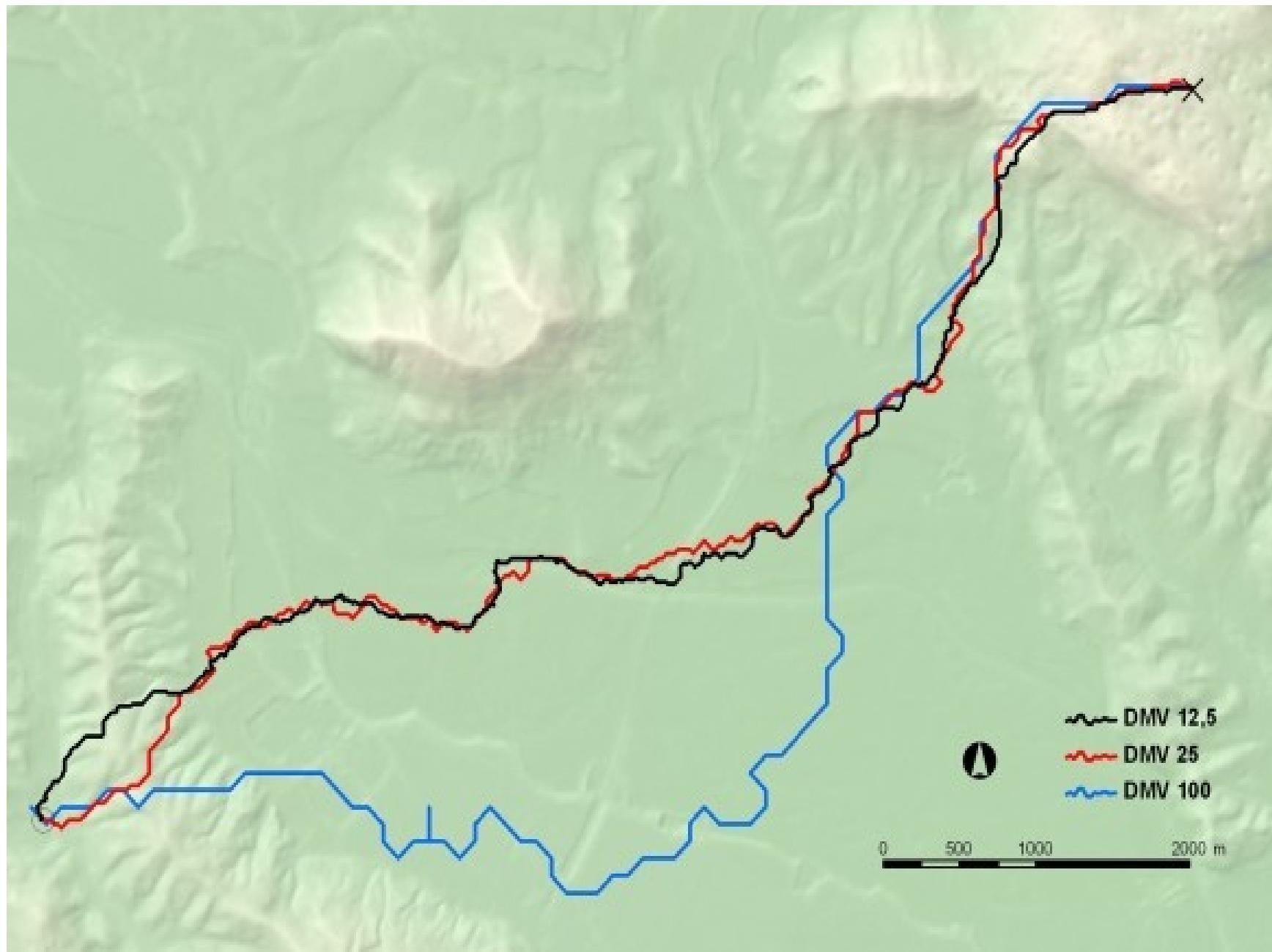
# Wybór punktów widokowych



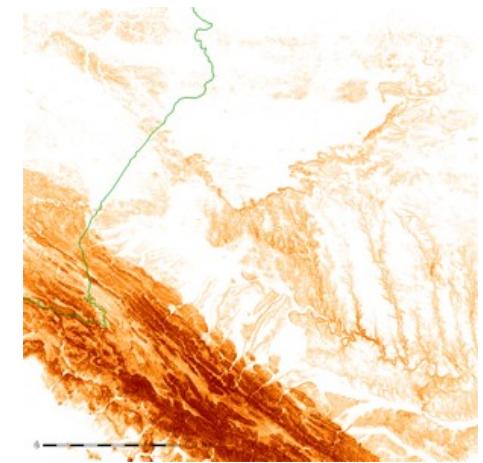
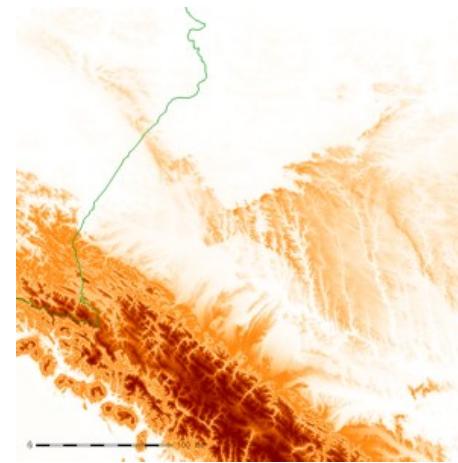
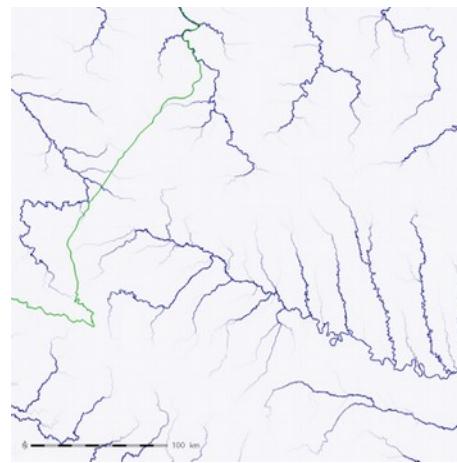
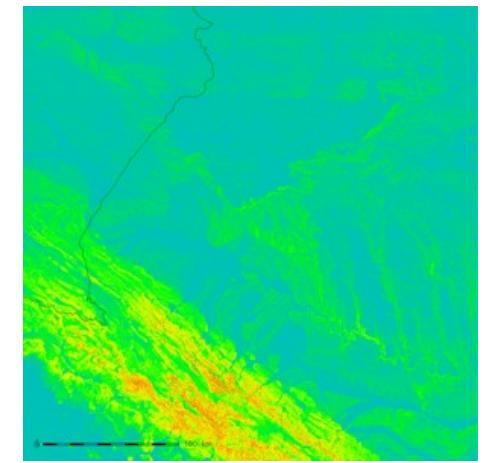
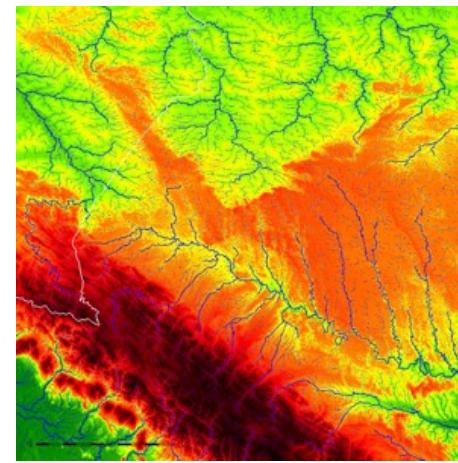
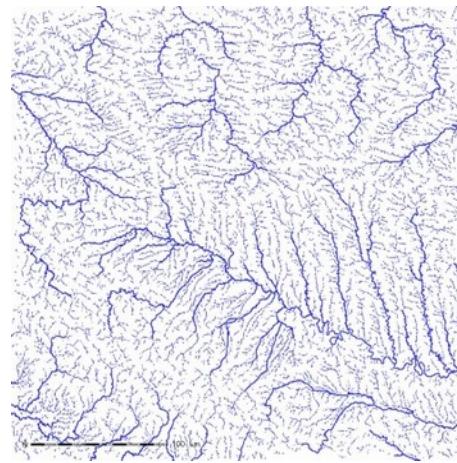
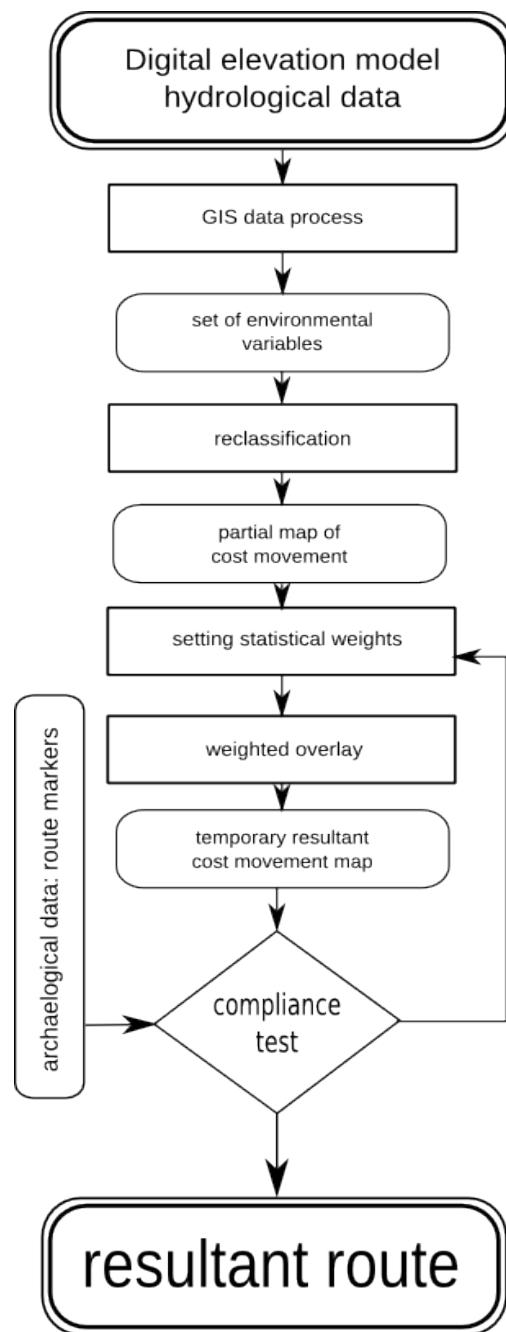
# Skumulowany obszar widoczności



# Analiza kosztów przemieszczania



# Składowe modelu

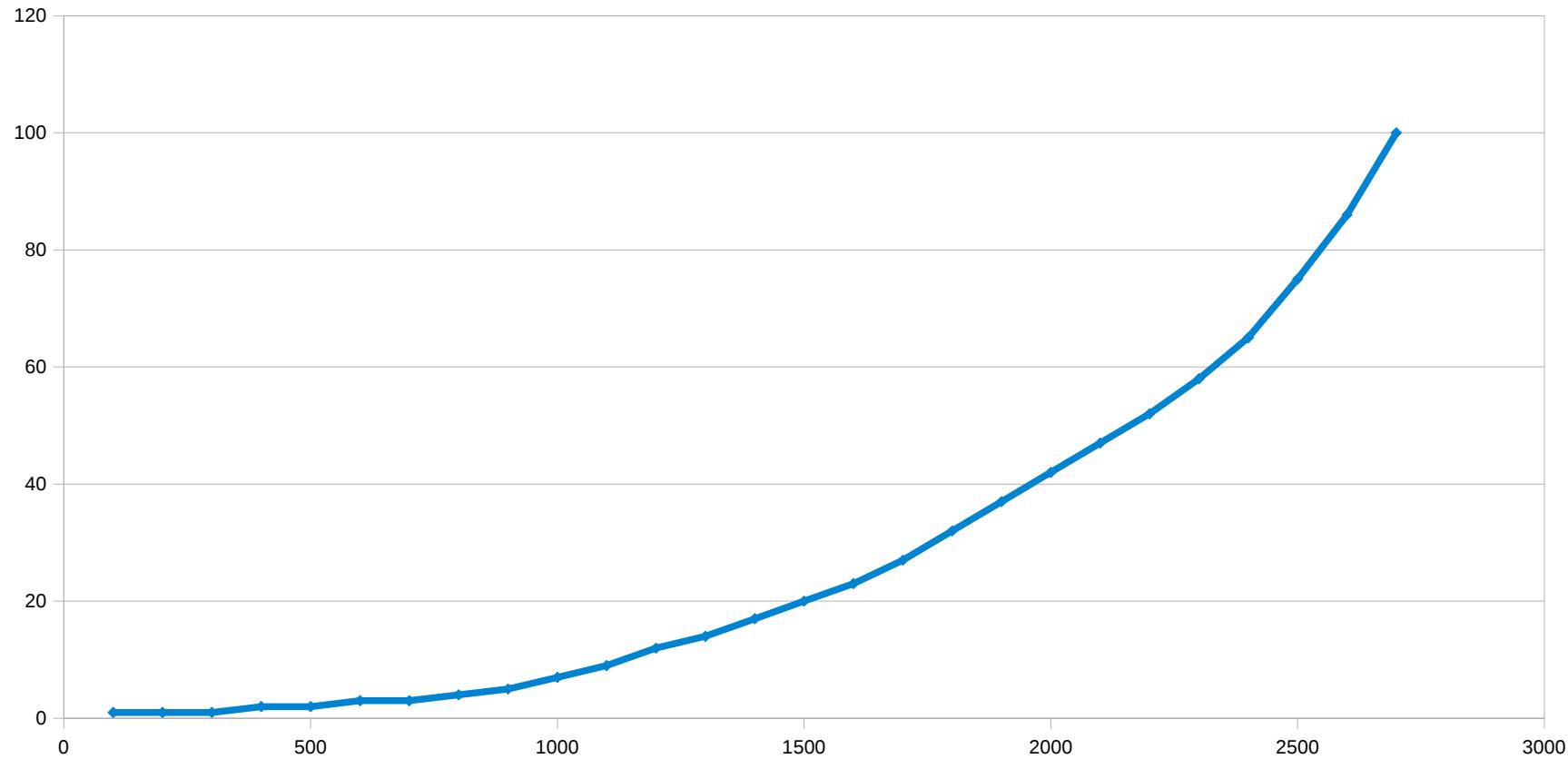


hydrografia

Wys. n. p. morza

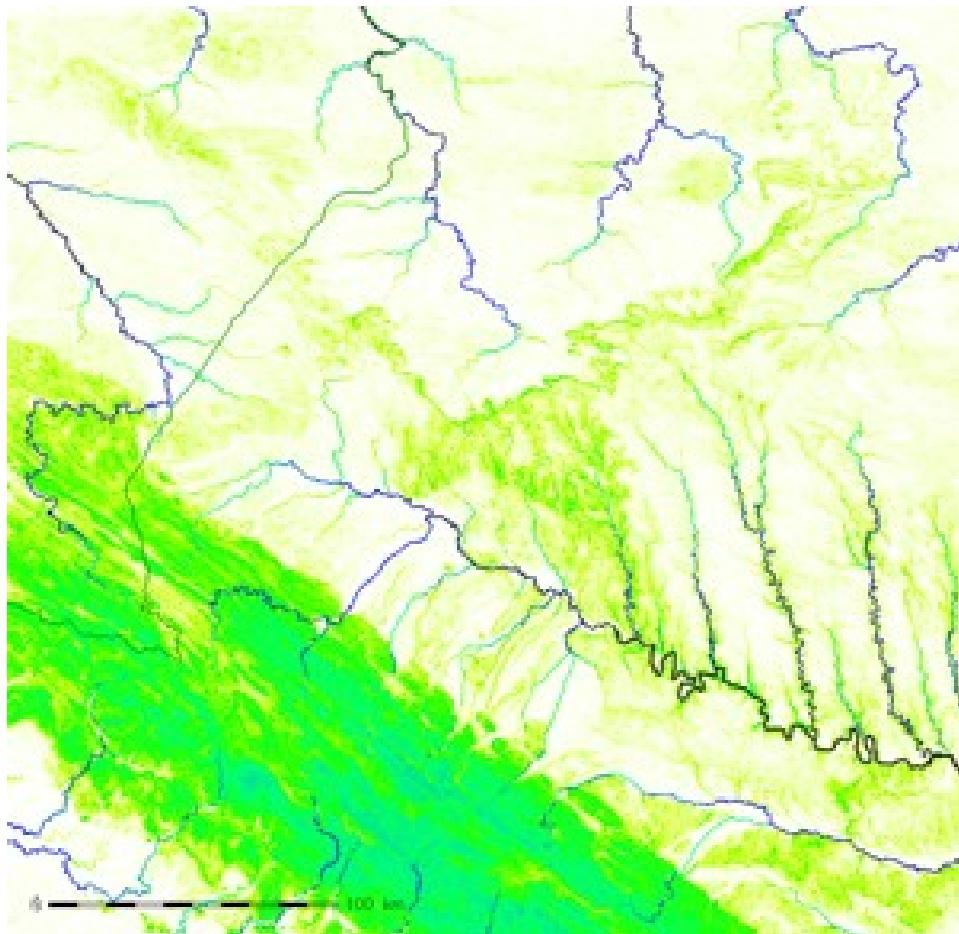
Lokalne deniwelacje

# Reklasyfikacja kosztów składowych

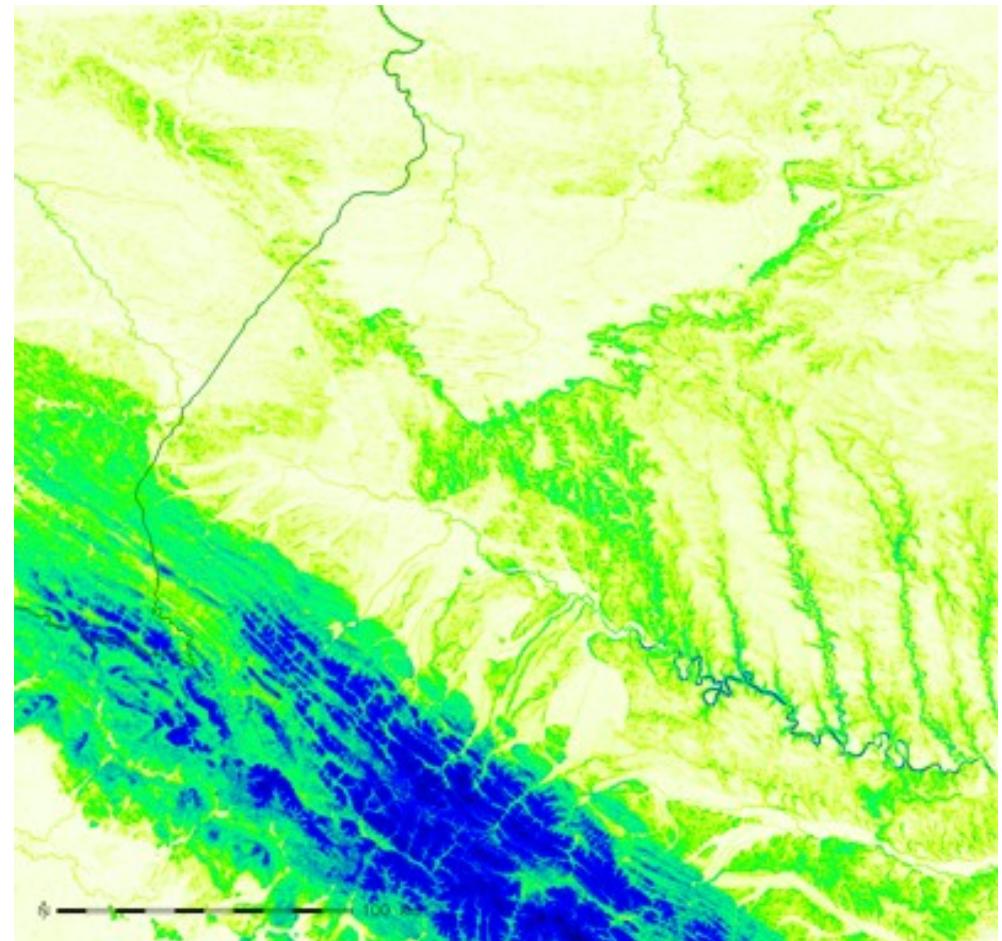


Koszt przemieszczania się w zależności od wysokości: dla strefy umiarkowanej  
(zależności wg Howey 2007)

# Procedura nakładania (overlay)



KRAWĘDZIE=0.2; RZEKI=0.8; RZĘDNA=0.2



KRAWĘDZIE=0.5; RZEKI=0.2; RZĘDNA=0.8



1

327

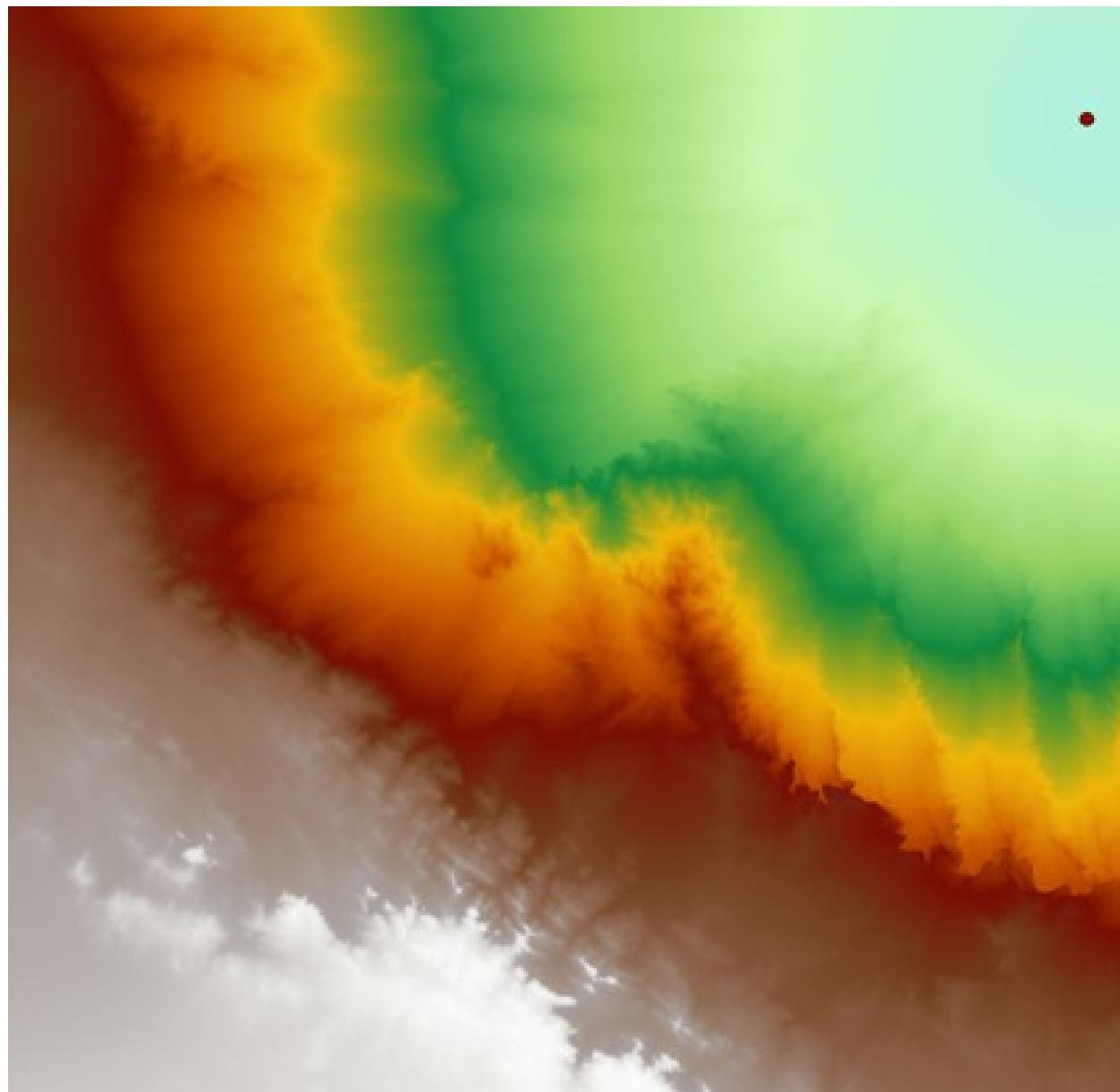
653

979

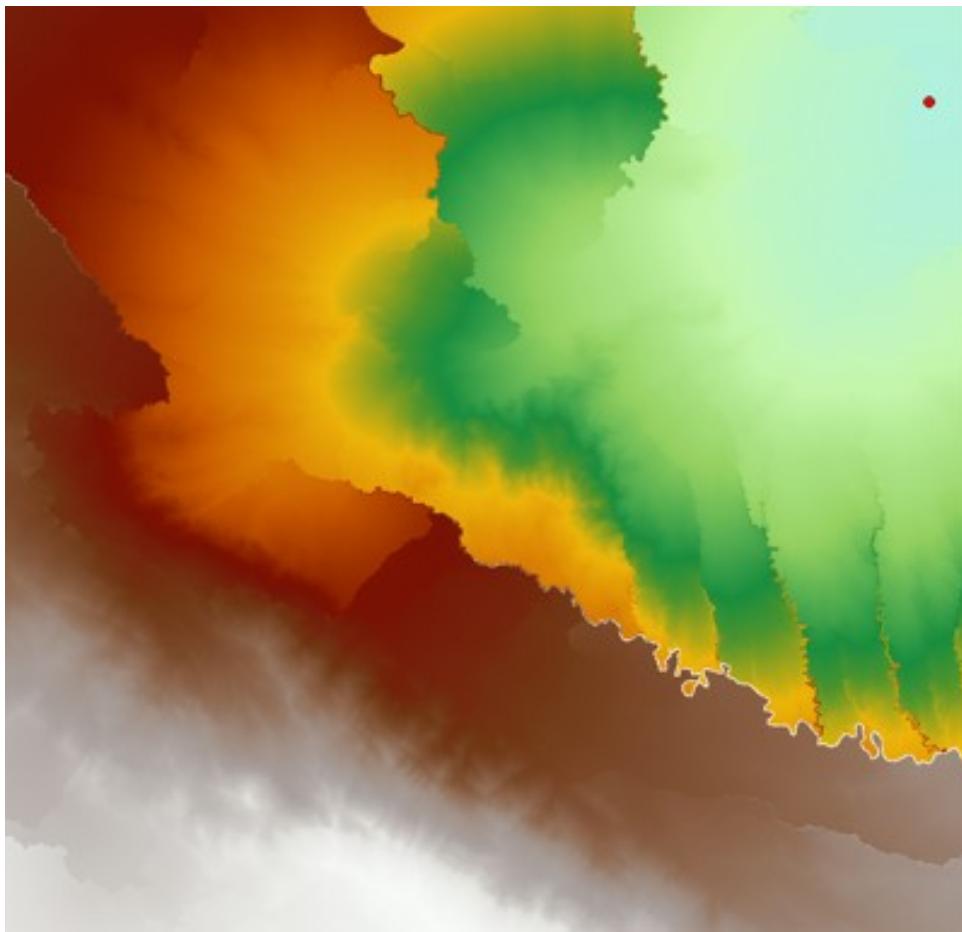
1305

16.2	43.2	37.0	10.0	15.8	30.6	10.3	10.8	26.3	38.3	38.3	91.2	11.3	9.5	9.0	11.0	15.9	12.3	13.0	16.0	8.3	3.4	1.6	1.6	1.6	1.6	1.6	1.6	1.7										
14.9	45.9	44.1	33.9	10.4	16.0	19.0	25.6	34.0	35.5	35.4	35.4	11.0	10.3	9.4	11.0	12.3	12.7	13.2	13.4	12.5	10.7	3.9	1.6	1.6	1.6	1.6	1.6	1.6	1.8									
15.4	48.4	46.3	45.4	42.0	39.0	35.8	17.4	16.1	29.5	30.1	30.0	9.9	9.3	9.5	9.7	13.2	13.1	13.4	13.5	13.4	12.6	9.6	2.8	1.6	1.6	1.6	1.7	1.7	1.8									
16.2	38.8	40.1	47.1	45.3	44.0	40.8	32.5	23.8	16.8	32.0	32.0	9.8	9.9	9.9	9.3	8.2	9.0	14.1	13.8	13.7	13.7	12.4	5.0	1.7	1.6	1.7	1.7	1.7	1.9									
16.8	46.5	46.1	46.1	47.3	44.2	40.8	32.5	23.8	16.8	32.0	32.0	9.8	9.9	9.9	9.3	8.2	9.0	14.1	13.8	13.7	13.7	12.4	2.0	1.7	1.8	1.9	2.0	2.1										
15.8	32.8	13.0	13.8	13.8	14.3	14.3	14.0	14.1	46.0	37.8	27.8	27.8	27.8	27.8	27.8	13.3	8.1	24.0	42.7	43.0	40.4	13.1	11.0	1.9	1.7	1.8	1.8	2.0	2.1									
2.9	3.3	4.3	8.6	9.6	11.1	10.7	14.1	14.1	13.9	46.0	37.8	27.8	27.8	27.8	27.8	27.8	13.3	8.1	24.0	42.7	43.0	40.4	13.1	11.0	1.8	1.7	1.8	1.9	2.0	2.1								
2.4	2.6	2.9	4.2	5.8	8.5	9.2	12.0	13.6	14.0	13.9	44.4	44.4	42.8	38.6	28.4	28.2	30.1	23.7	25.7	33.8	34.1	40.7	41.0	11.2	1.7	1.6	1.7	1.9	2.0	2.1								
2.1	2.3	2.4	2.4	2.3	4.1	7.2	8.5	12.4	13.1	13.8	12.6	13.3	12.1	38.9	38.6	38.4	11.2	11.8	32.9	37.9	38.7	38.8	10.8	1.7	1.5	1.7	2.0	1.9	2.2									
2.1	2.0	2.0	2.0	2.0	1.8	1.9	3.7	5.9	9.7	10.3	11.6	10.2	11.9	12.2	11.4	10.8	10.9	11.8	11.7	33.9	37.8	37.8	10.8	1.6	1.5	1.6	2.0	1.9	2.2									
4.1	1.9	2.0	2.1	1.9	1.9	1.8	1.8	3.8	6.7	6.8	6.3	6.9	6.7	4.3	9.5	12.1	11.9	26.8	34.0	38.0	38.0	16.2	7.8	1.6	1.6	1.6	1.9	1.9	2.2									
16.4	5.1	1.9	1.9	1.9	1.9	1.7	1.7	1.7	1.7	2.0	1.9	1.8	1.7	4.4	11.4	13.1	14.4	246.5	246.6	246.7	246.8	246.9	246.5	246.7	246.9	246.9	246.1	239.8	237.4	231.6	231.8	230.8	230.9	230.7	230.7	230.8	230.9	230.5
17.8	11.8	3.4	1.9	1.9	1.8	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	5.8	12.2	12.1	39.1	246.1	246.7	246.7	246.7	246.8	246.8	246.9	246.9	246.2	232.8	232.8	231.3	230.8	230.1	230.8	230.4	230.7	230.7			
17.2	16.4	16.3	3.3	2.0	1.9	1.8	1.7	1.6	1.5	1.6	1.6	1.6	1.7	1.7	5.8	12.8	12.2	39.8	246.1	246.7	246.7	246.7	246.8	246.8	246.9	246.9	246.2	232.8	232.8	231.3	230.8	230.1	230.8	230.4	230.7	230.7		
17.3	17.2	15.8	9.9	2.8	2.0	1.9	1.7	1.6	1.5	1.5	1.5	1.6	1.6	5.8	12.8	40.5	39.0	246.5	246.6	246.8	246.4	246.5	246.5	246.7	246.9	247.1	237.8	237.8	231.4	231.6	230.8	230.8	230.1	230.8	230.0			
18.9	17.1	17.2	14.9	8.0	2.7	1.9	1.7	1.6	1.5	1.5	1.5	1.6	1.6	5.8	12.7	40.6	39.9	246.5	246.6	246.7	246.8	246.9	246.5	246.7	246.9	246.9	246.2	232.8	232.8	231.3	230.8	230.0	230.8	230.5				
16.6	16.6	16.6	16.6	16.6	16.6	7.1	5.1	1.7	1.6	1.6	1.9	1.9	1.9	1.8	5.8	12.7	40.2	40.0	246.2	246.3	246.3	246.3	246.4	246.4	246.5	246.5	246.2	232.8	232.8	231.4	231.6	230.8	230.8	230.5				
16.6	16.0	16.2	16.6	16.6	16.6	6.6	3.3	2.0	1.7	1.8	2.5	3.6	3.6	4.6	12.7	40.3	40.0	246.2	246.3	246.3	246.3	246.4	246.4	246.5	246.5	246.2	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	15.6	15.6	16.0	16.0	8.0	4.9	3.3	2.4	2.4	3.5	5.0	5.0	5.8	12.6	40.2	39.3	247.0	246.8	246.8	246.8	246.9	246.9	247.0	247.0	246.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	9.7	6.1	4.1	3.0	3.2	4.5	6.9	11.8	12.7	39.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5							
16.6	16.6	16.6	16.6	16.6	16.6	10.2	10.0	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5						
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6	16.6	16.6	16.6	16.6	16.6	12.2	10.2	10.2	8.1	6.6	5.0	4.0	4.1	5.8	11.0	12.3	37.4	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.0	247.3	232.8	232.8	231.4	231.6	230.8	230.8	230.5					
16.6</																																						

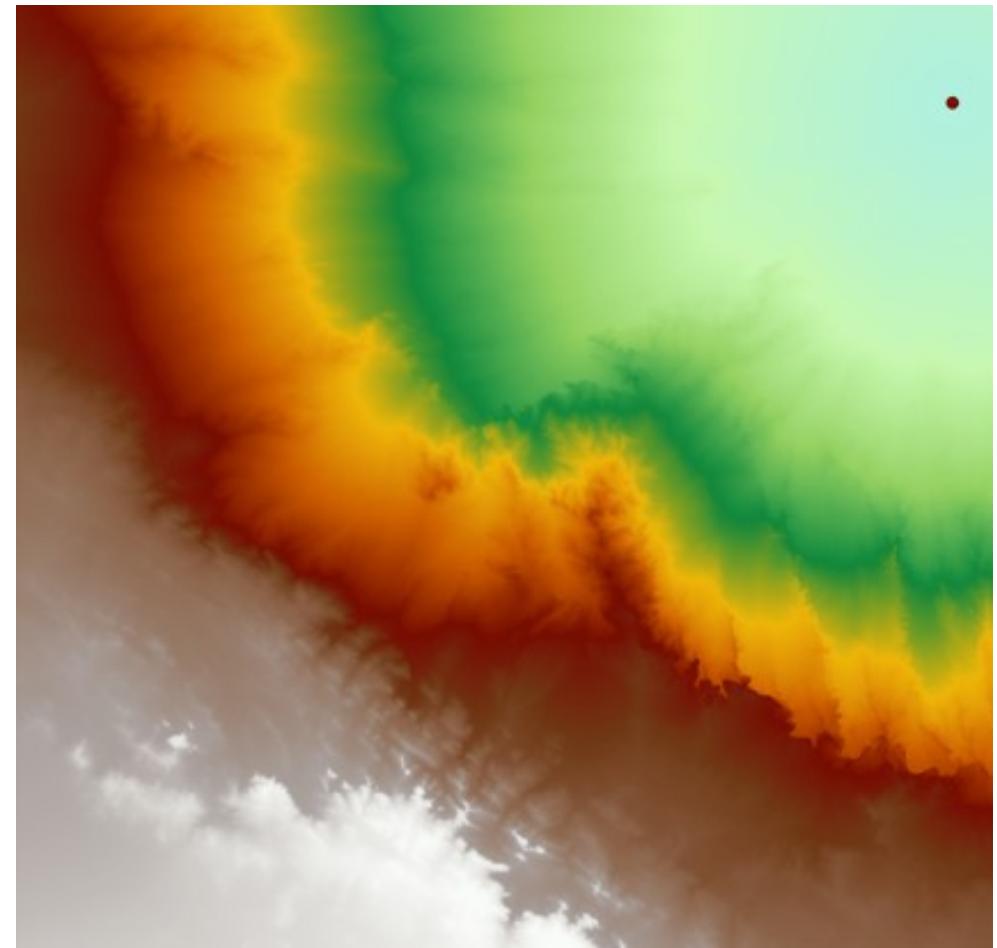
# Tworzenie mapy kosztu



# Przykładowe mapy kosztów



Istotna rola rzek



Istotna rola rzędnej



0

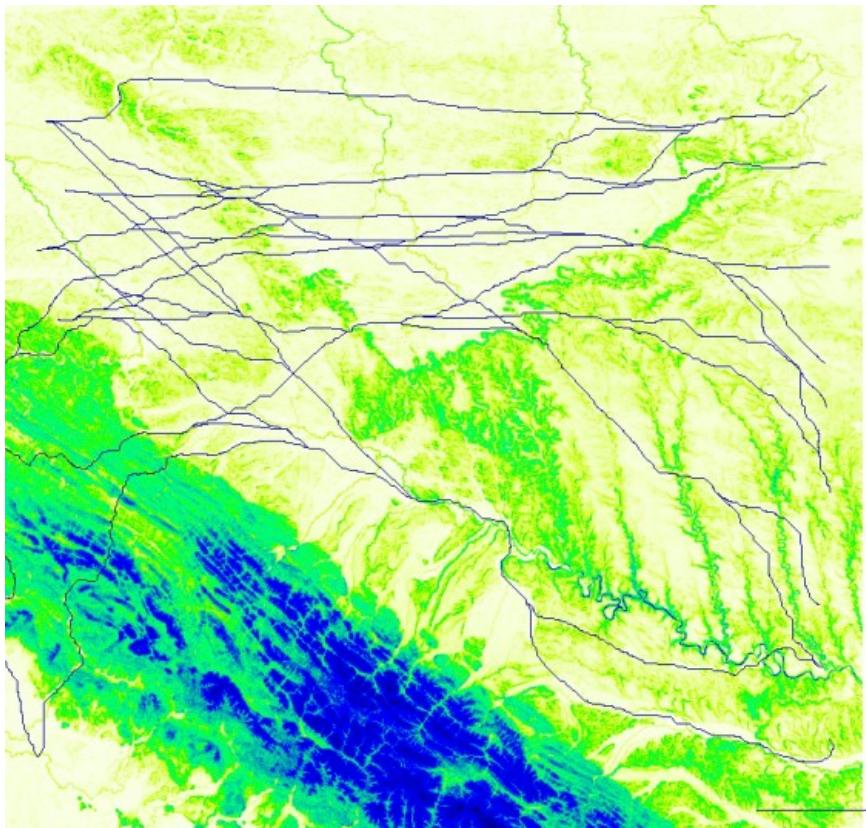
7032

14064

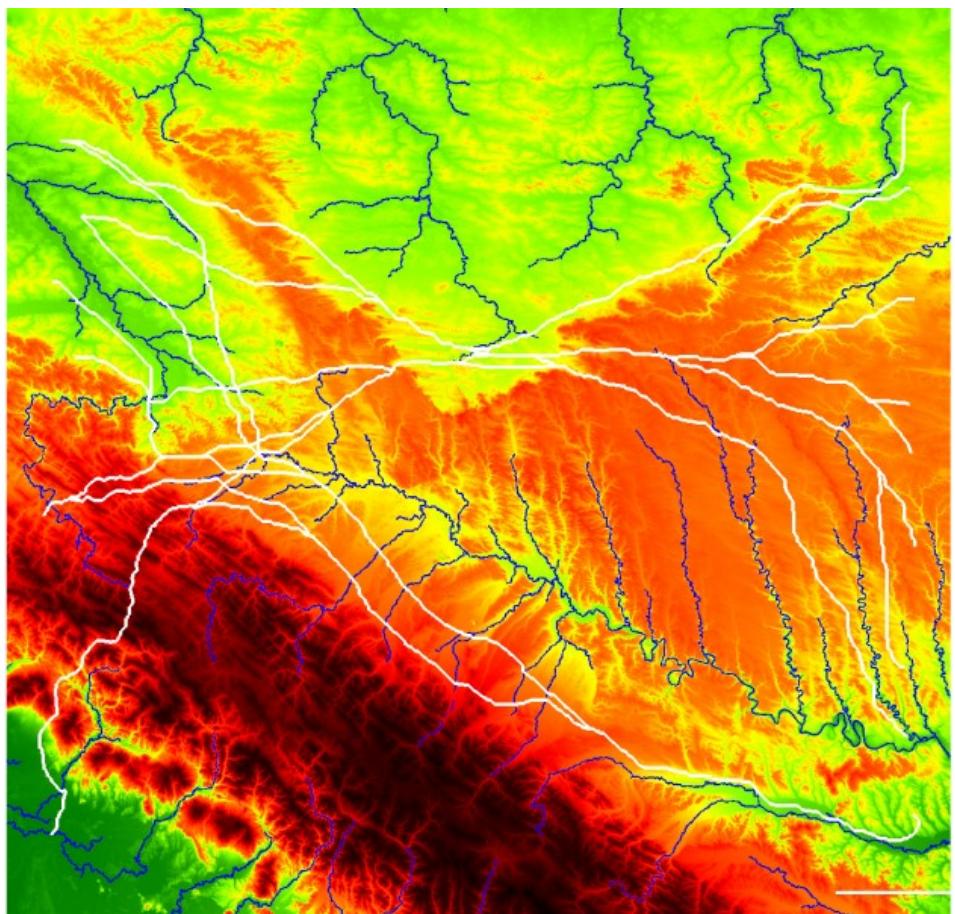
21095

28127

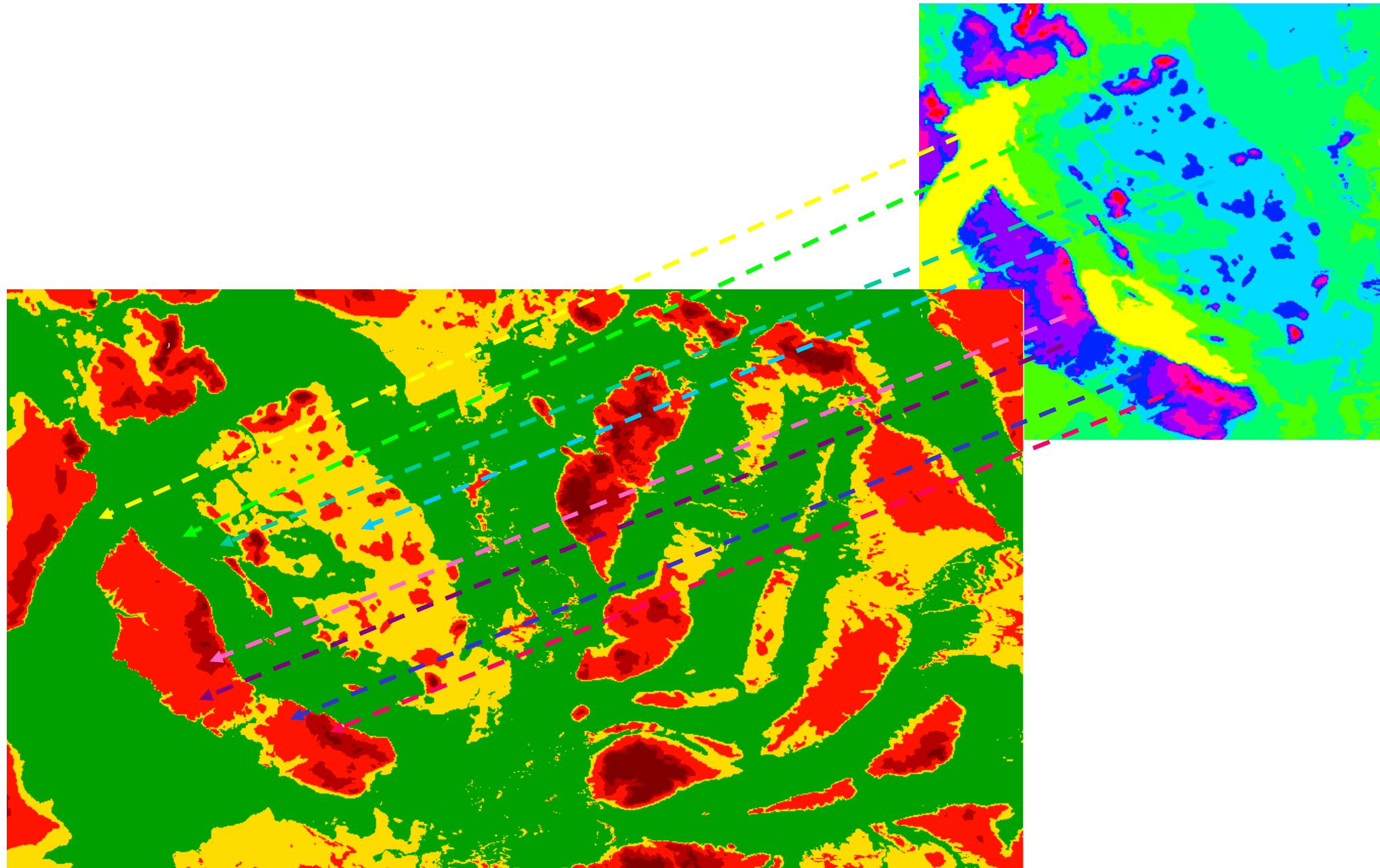
# Wyznaczanie szlaków migracji



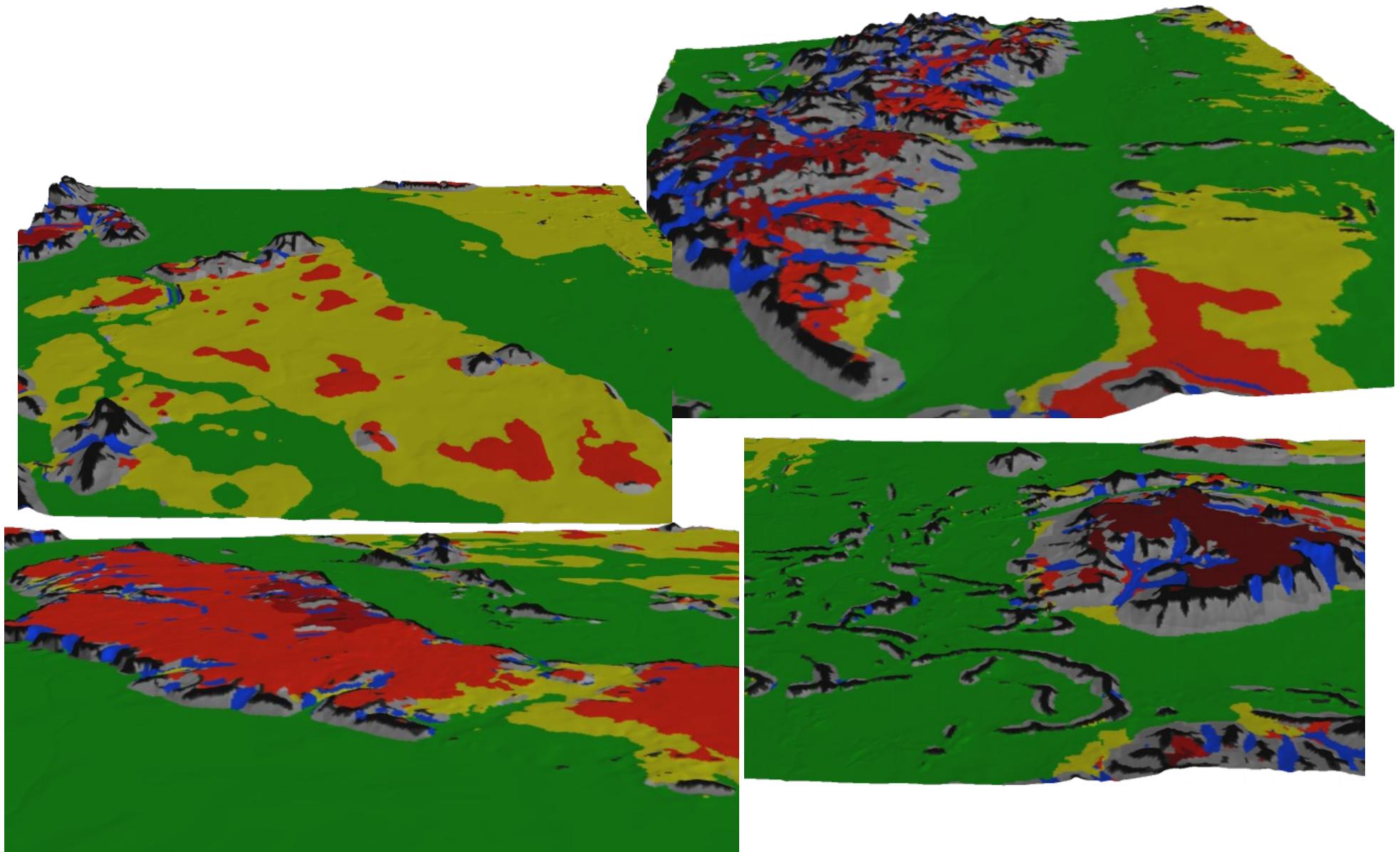
1    327    653    979    1305



# Klasyfikacja poziomów morfometrycznych

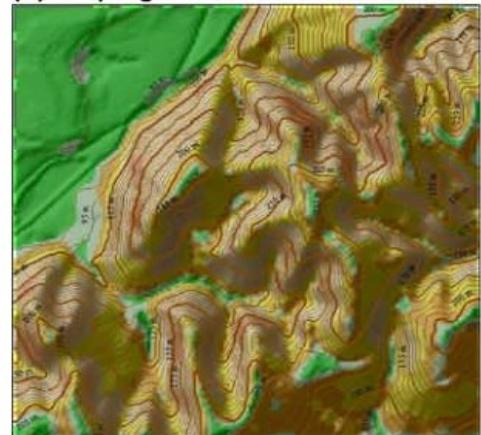


# Klasyfikacja form terenu metodą nakładania

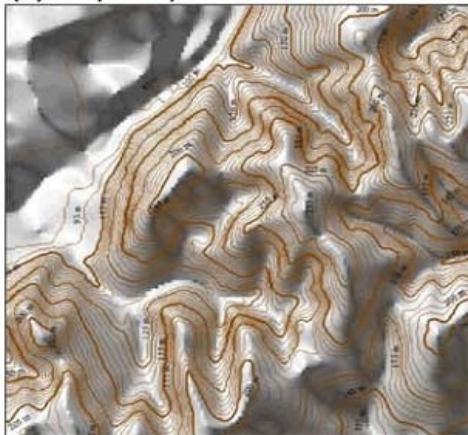


# Analizy wielozmienne i rozmyte

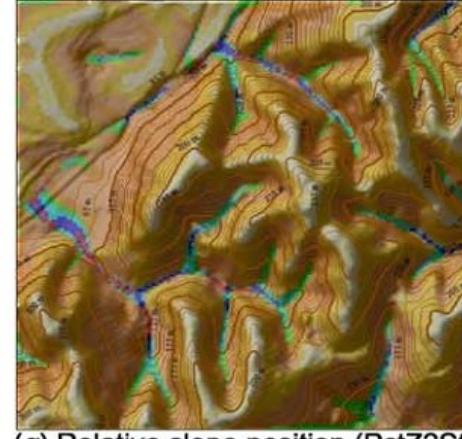
(a) Slope gradient



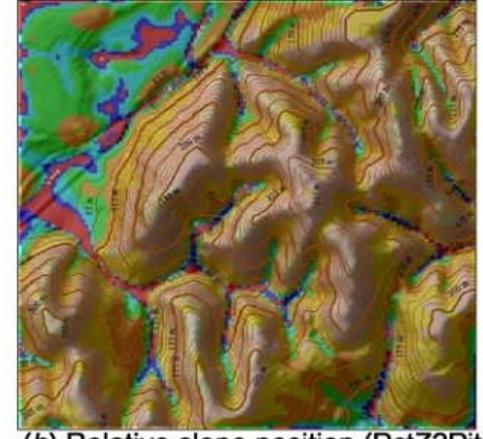
(b) Slope aspect



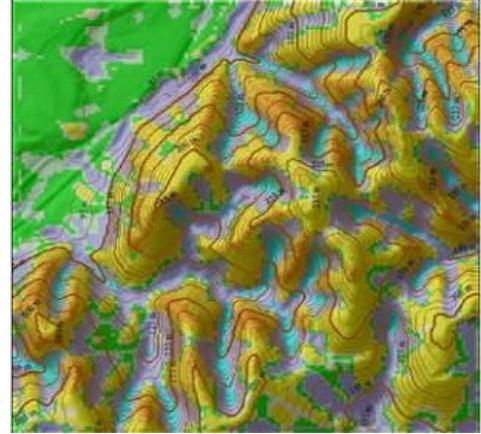
(e) Log of diffuse upslope area



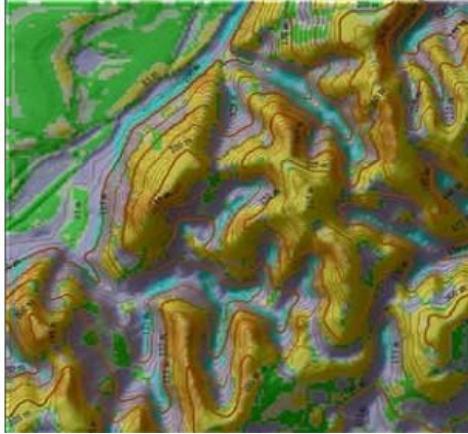
(f) Quinn wetness index



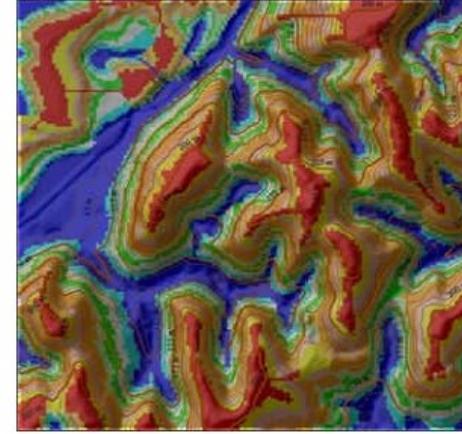
(c) Plan curvature



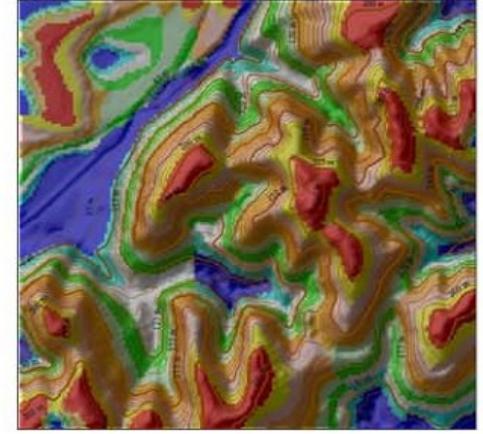
(d) Profile curvature



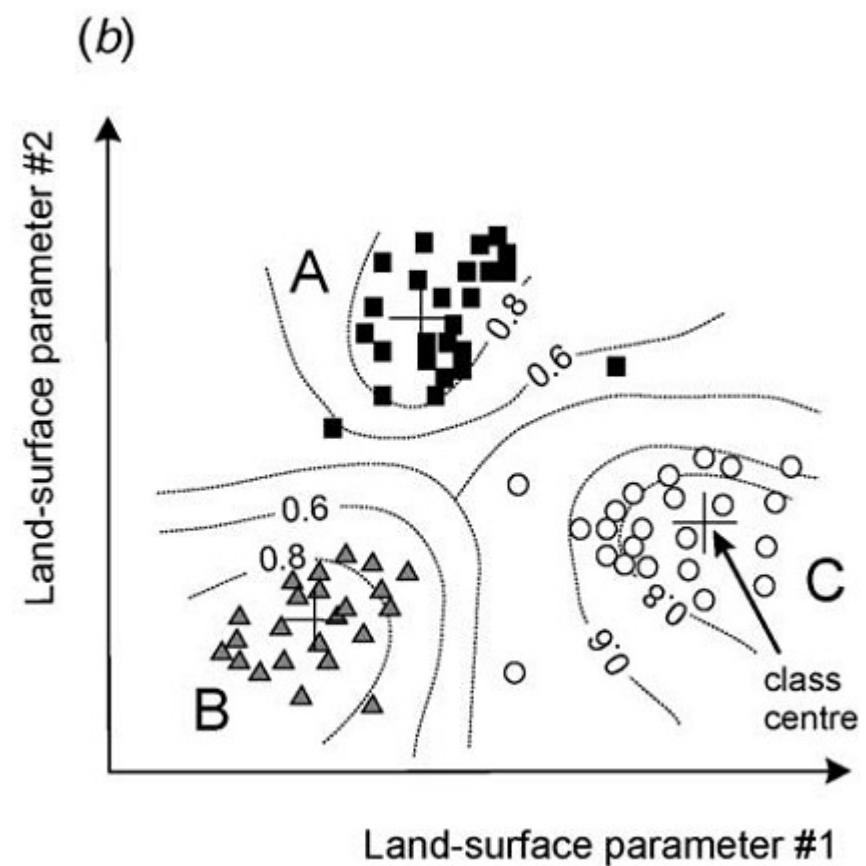
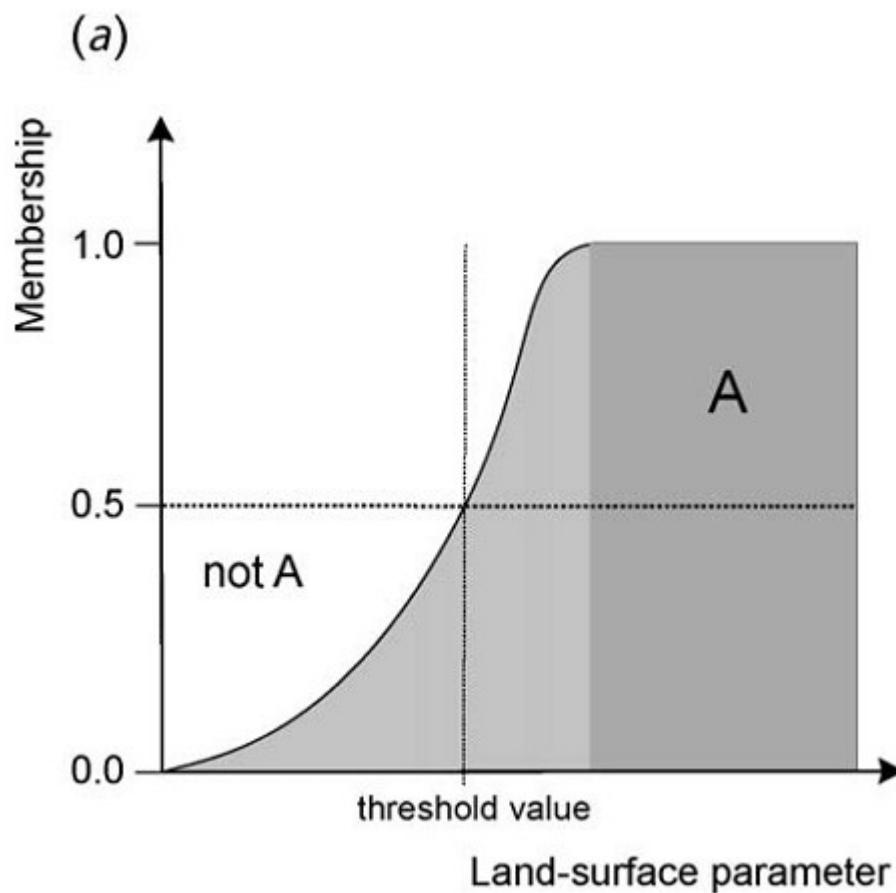
(g) Relative slope position (PctZ2St)



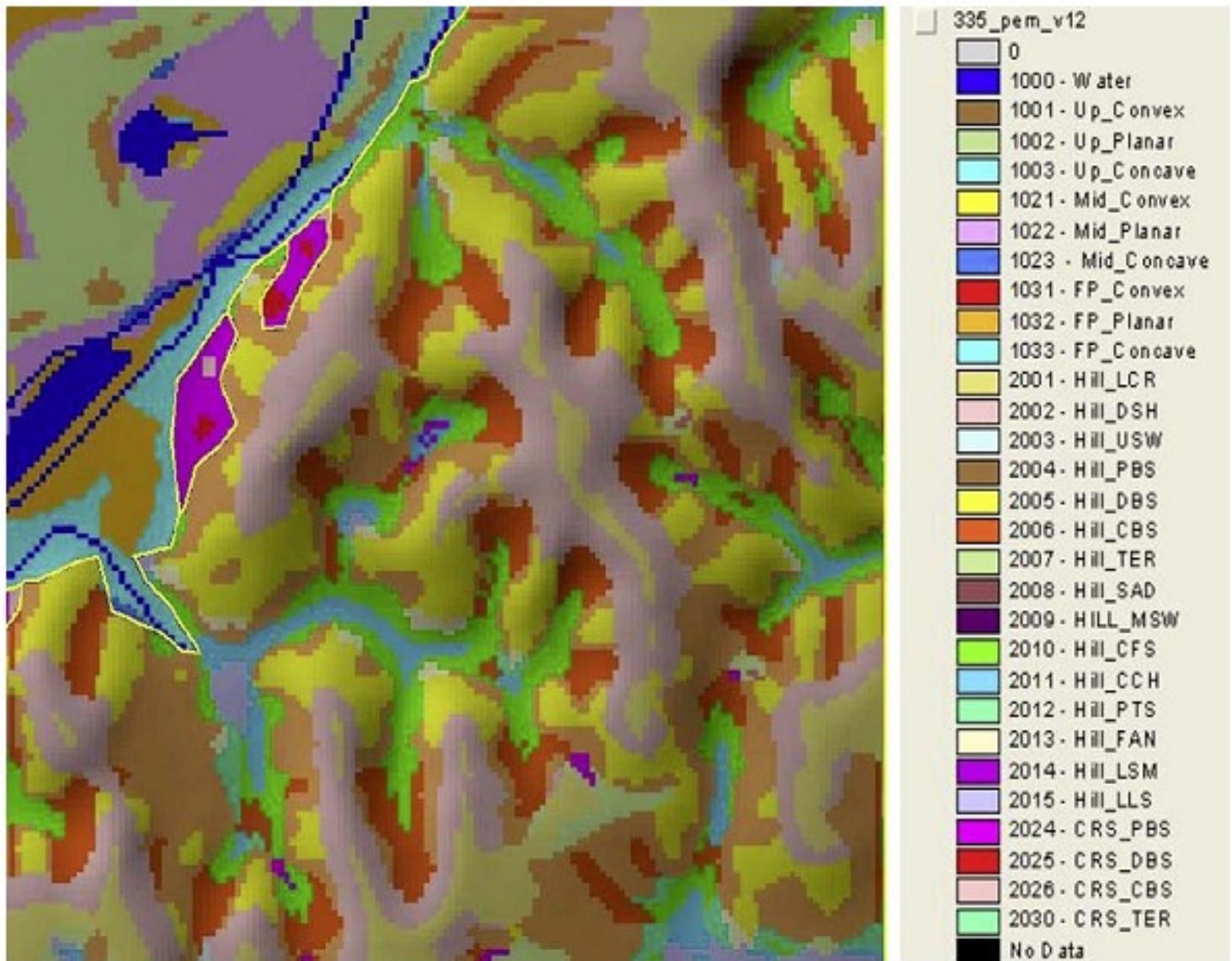
(h) Relative slope position (PctZ2Pit)



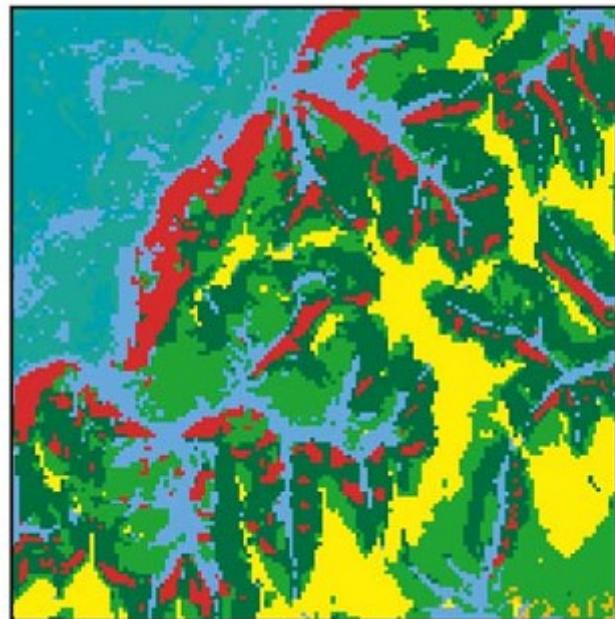
# Analizy rozmyte



# Wynik

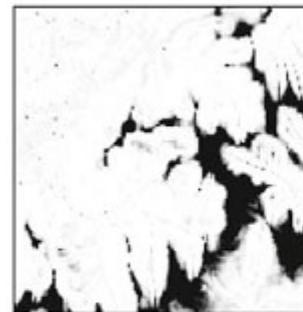


# Klasyfikacje nadzorowane form terenu

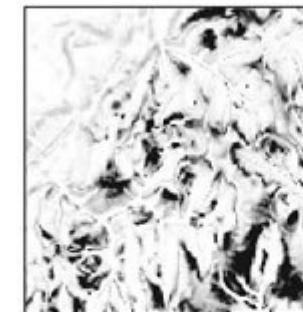


Legend:  
Hi111  
Hi112  
Hi211  
Hi212  
Hi311  
Hi312  
Hi411  
PI311  
PI411

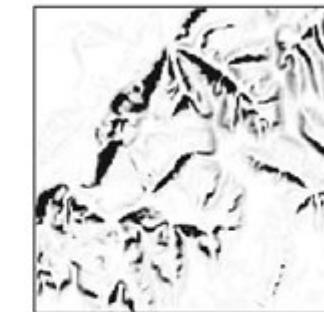
Hi111



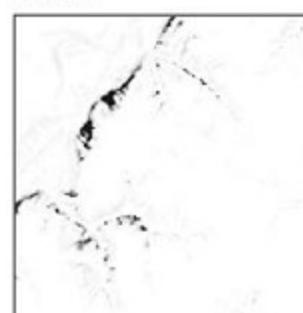
Hi112



Hi211



Hi212



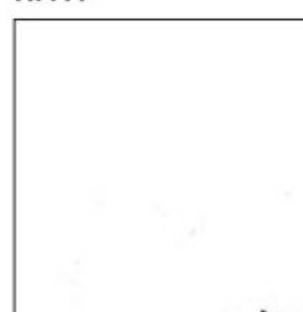
Hi311



Hi312



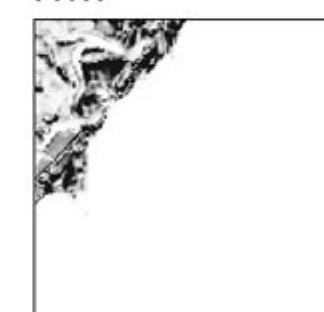
Hi411



PI311



PI411

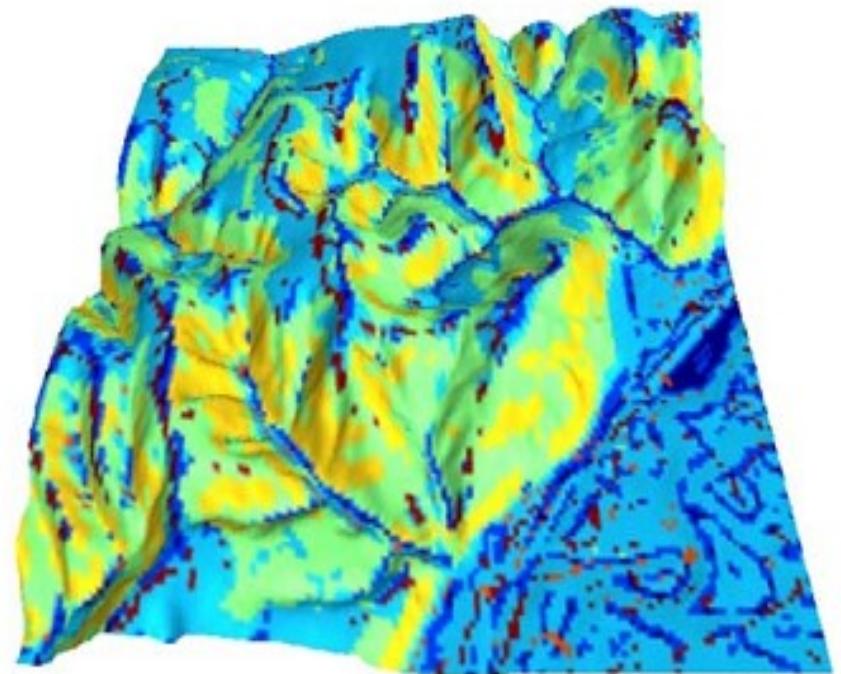


# Klasyfikacje nienadzorowane

3 classes



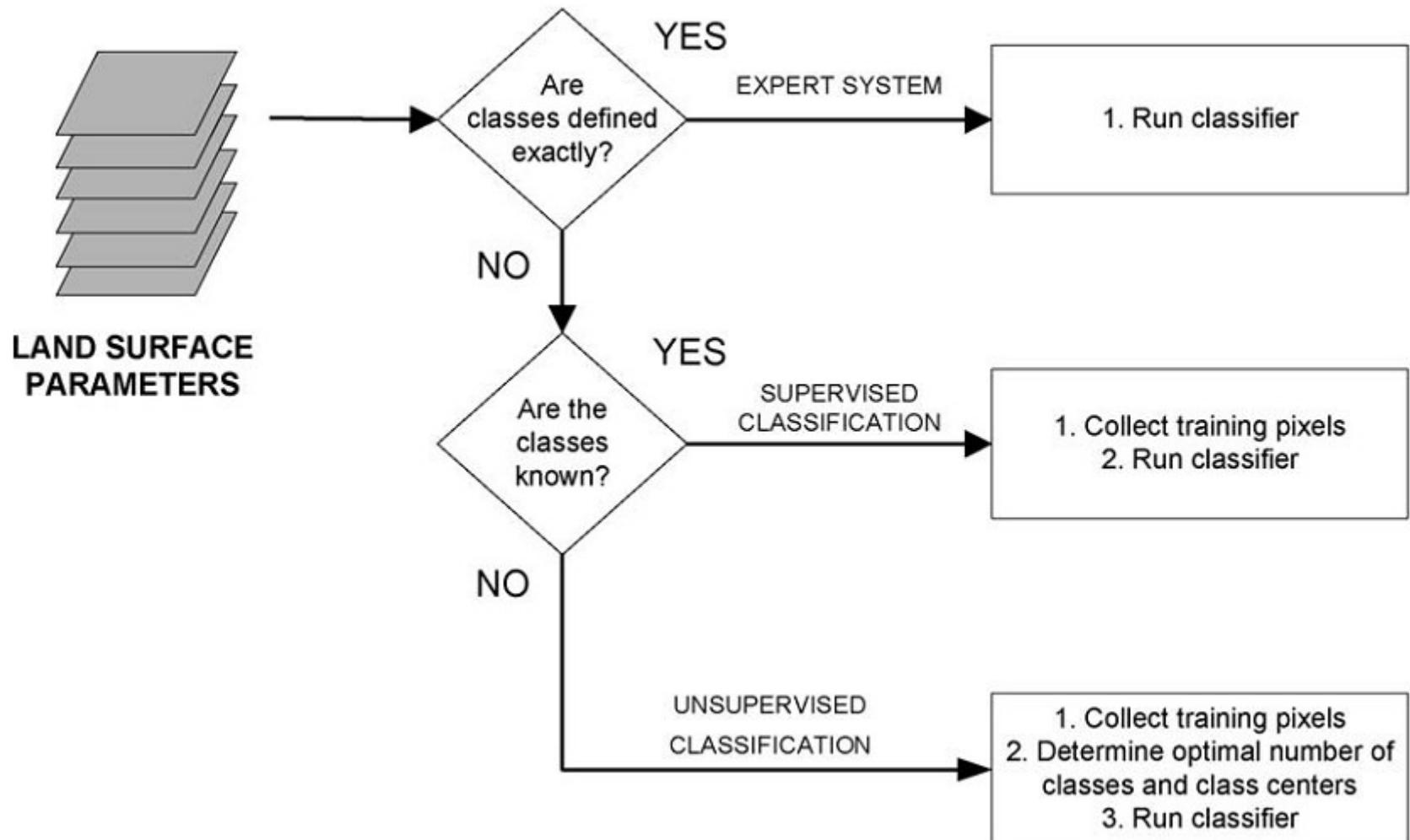
7 classes



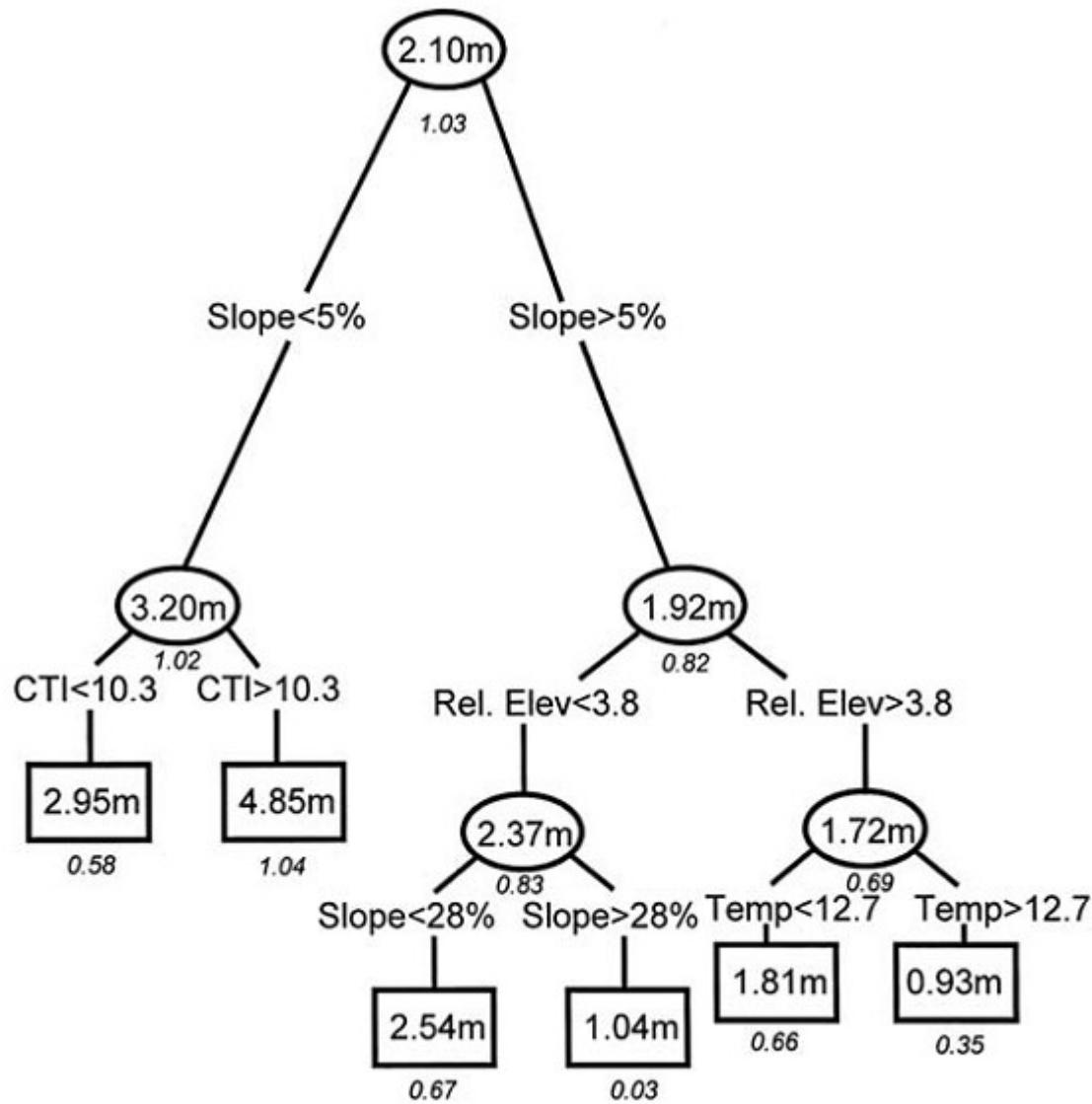
Klasyfikacje nadzorowane - legenda a priori

Klasyfikacje nienadzorowane legenda a posteriori

# Klasyfikacje nadzorowane



# Uczenie maszynowe



# Modelowanie parametrów gleb

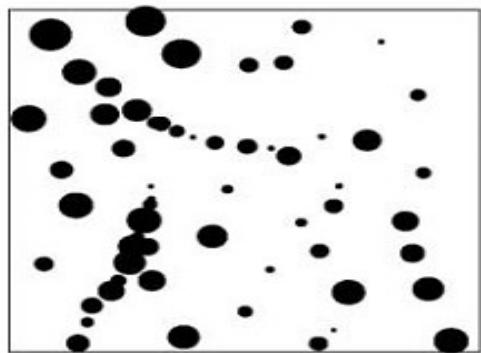
**TABLE 1** List of land-surface parameters (supplemented with climatic images, lithology Landsat imagery and land use maps) used to interpolate soil properties over the Australian continent

Land-surface parameters	Mapped soil properties
elevation	pH
deposition path length	Organic carbon
erosion path length	Total phosphorus
relative elevation relief	Extractable phosphorus
slope percent	Total nitrogen
hill slope length	Clay, Silt and Sand %
slope position	Layer (horizon) thickness
river distance	Solum thickness
ridge distance	Bulk density
contributing area	Available water capacity
inverse contributing area	Saturated hydraulic conductivity
transport power in	
transport power out	

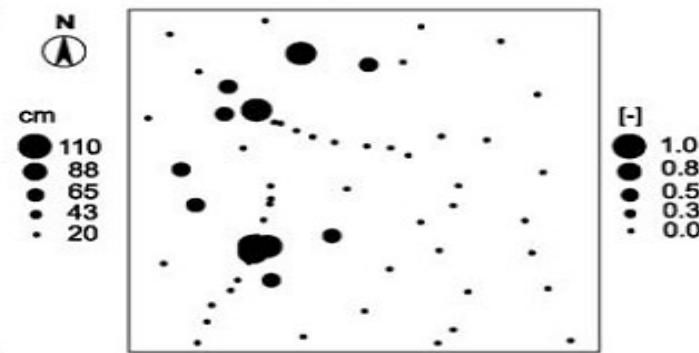
# Miąższość i oglejenie gleb

(a)

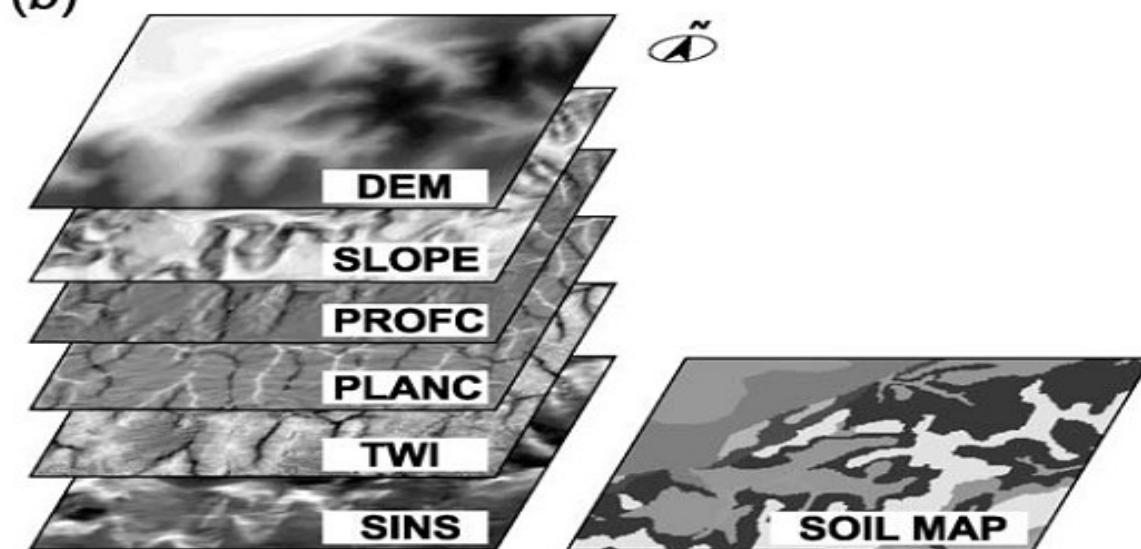
SOLUM



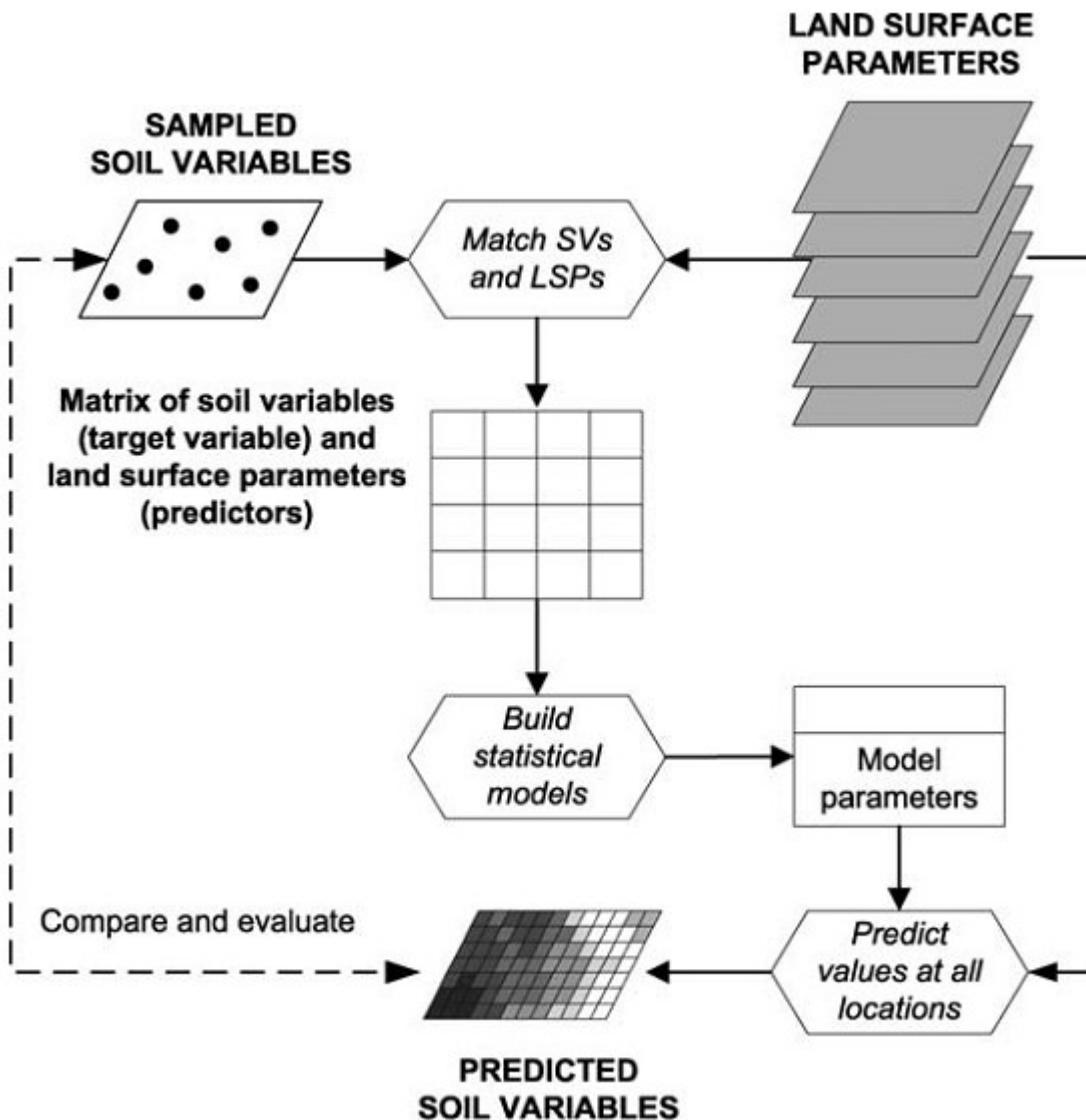
GLEY\_P



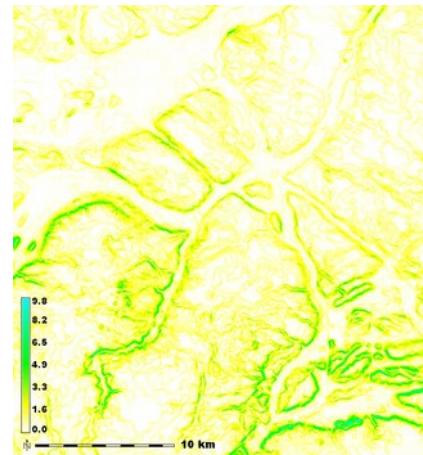
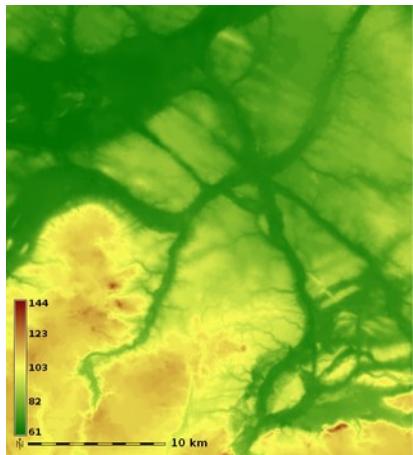
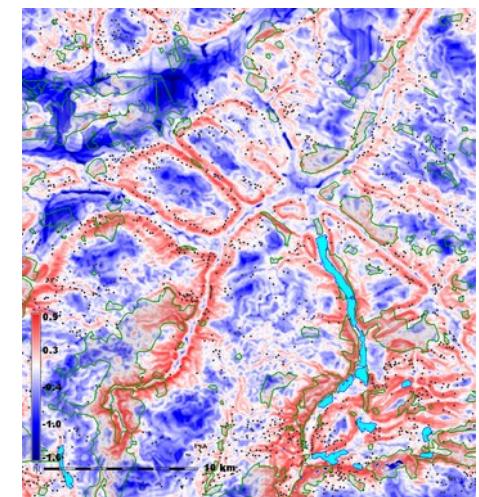
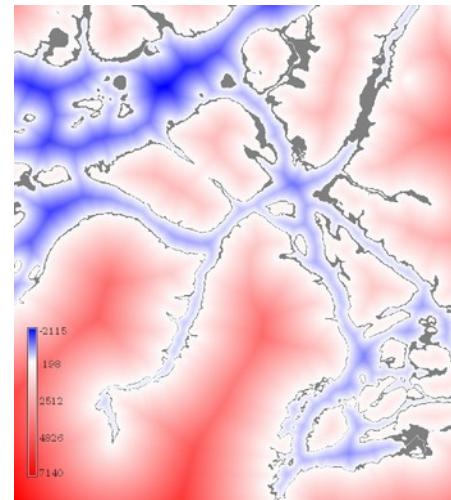
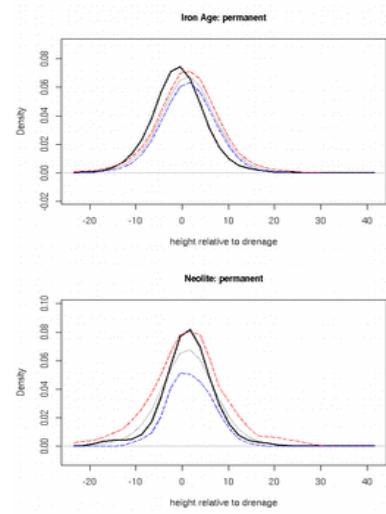
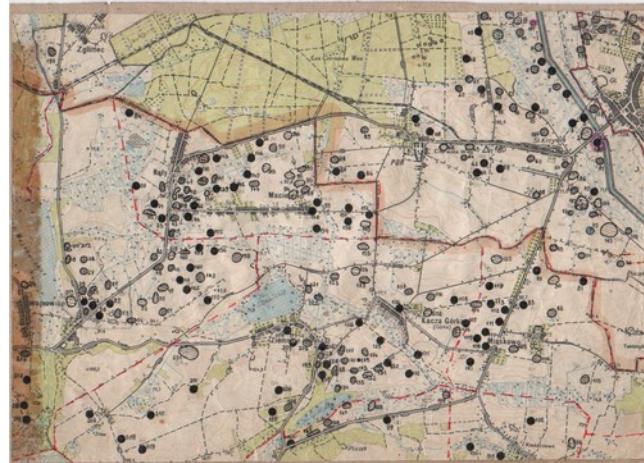
(b)

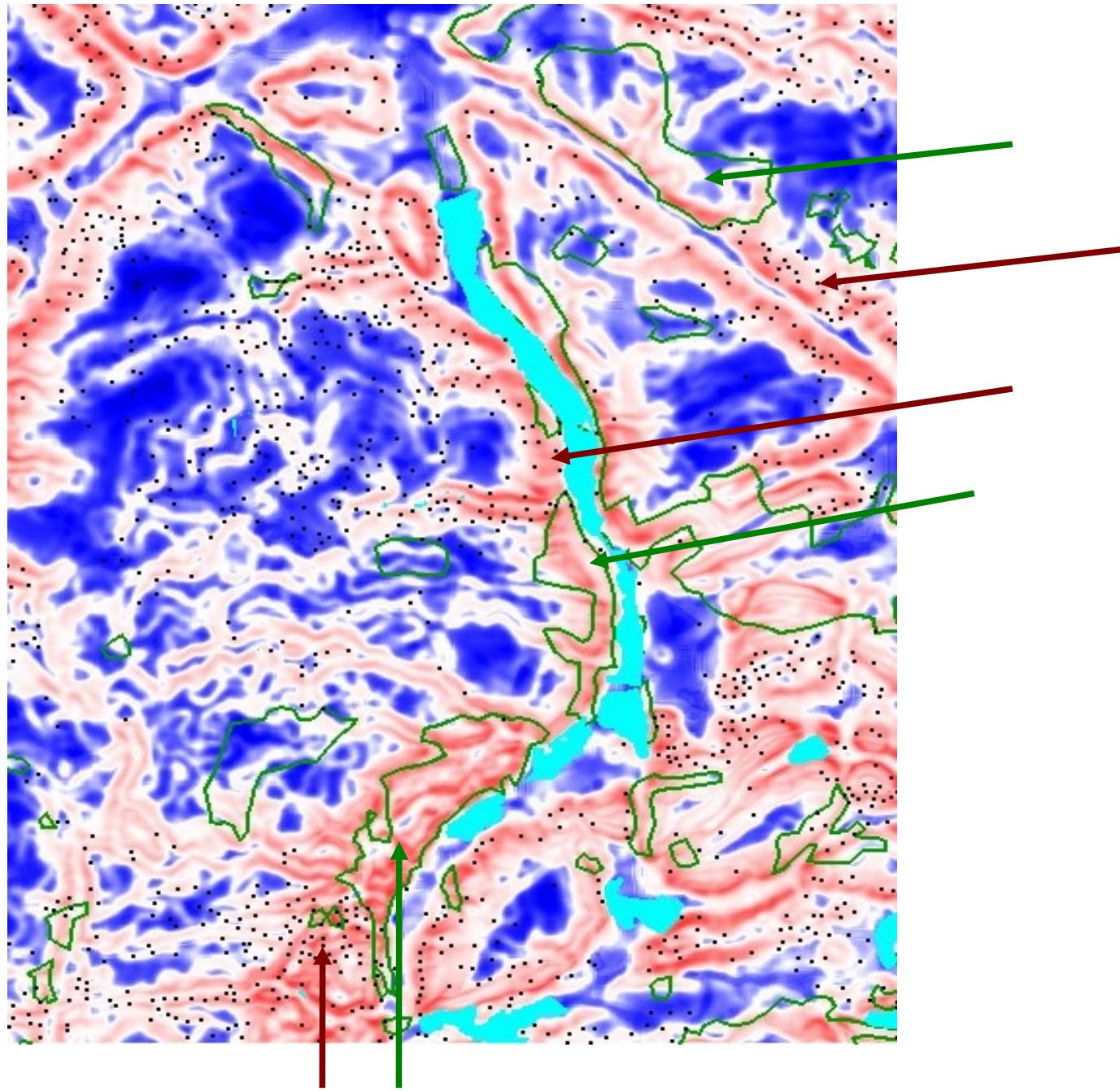


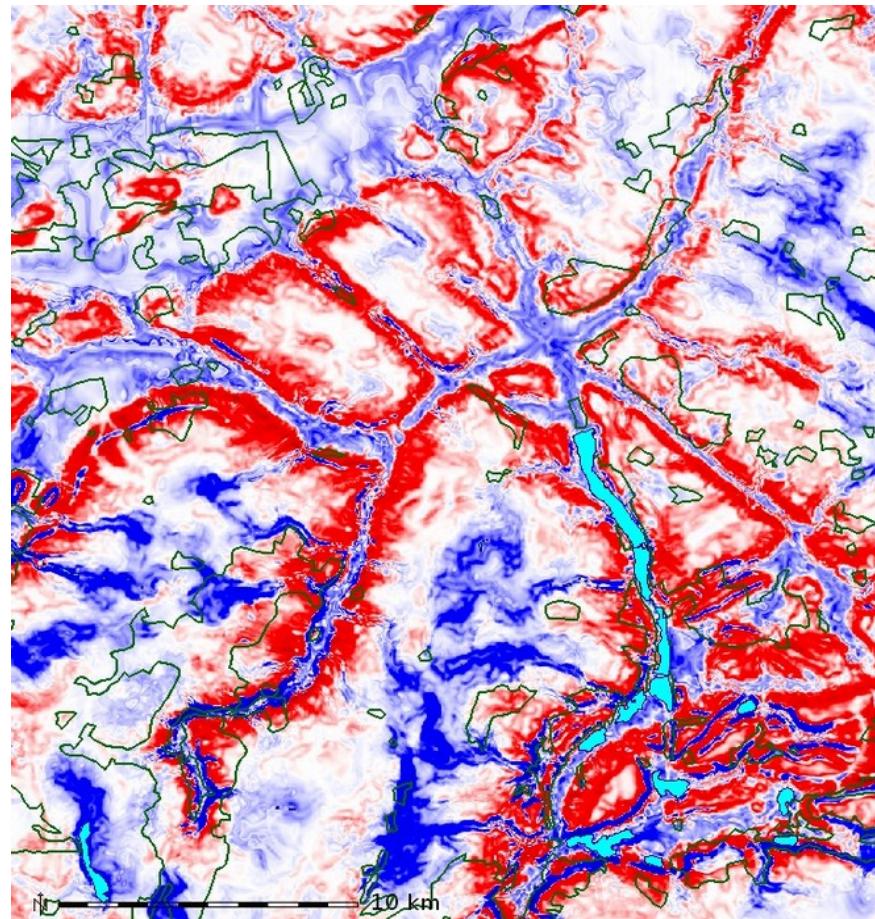
# Modelowanie parametrów gleb



# Preidykcje i retrodykcje zjawisk

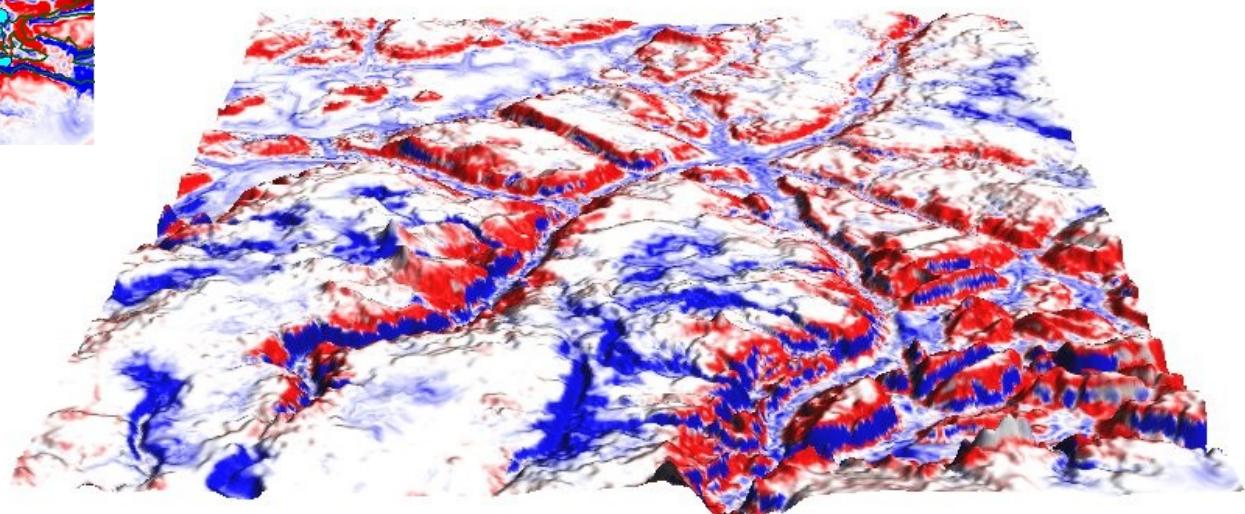






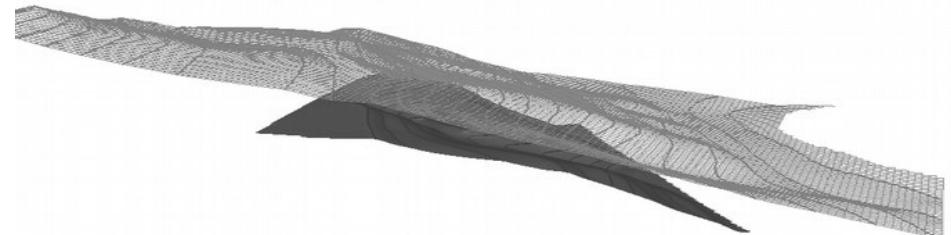
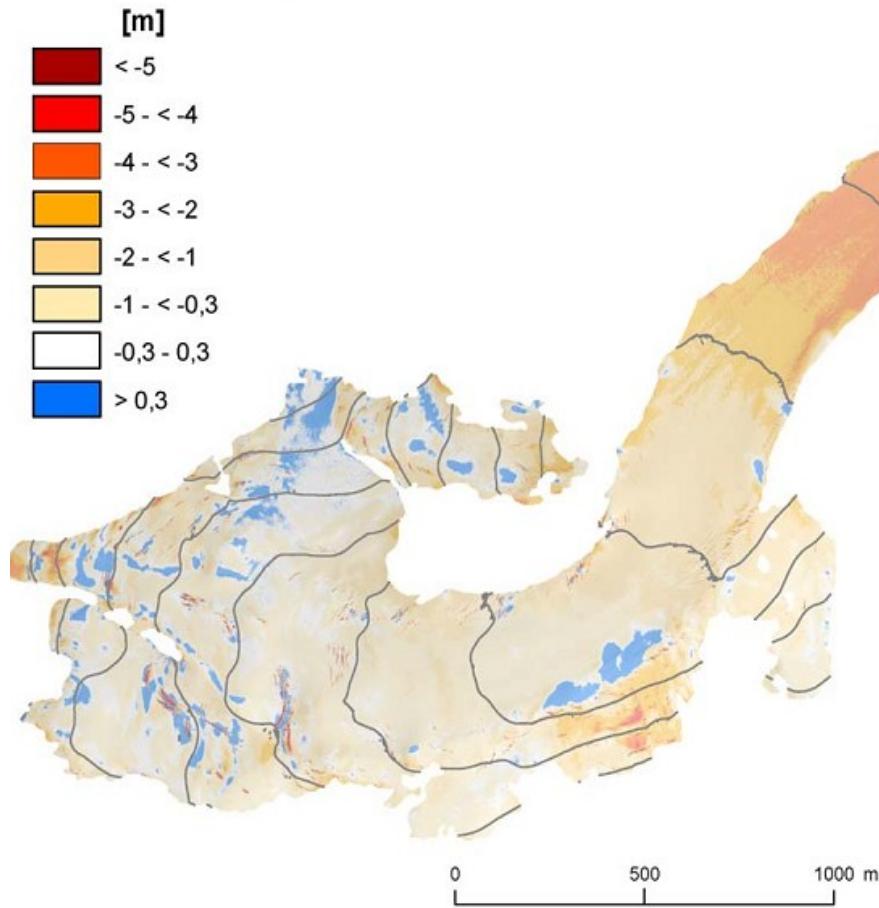
■ - wzrost intensywności osadnictwa  
w późnym średniowieczu

■ - spadek intensywności osadnictwa  
w późnym średniowieczu



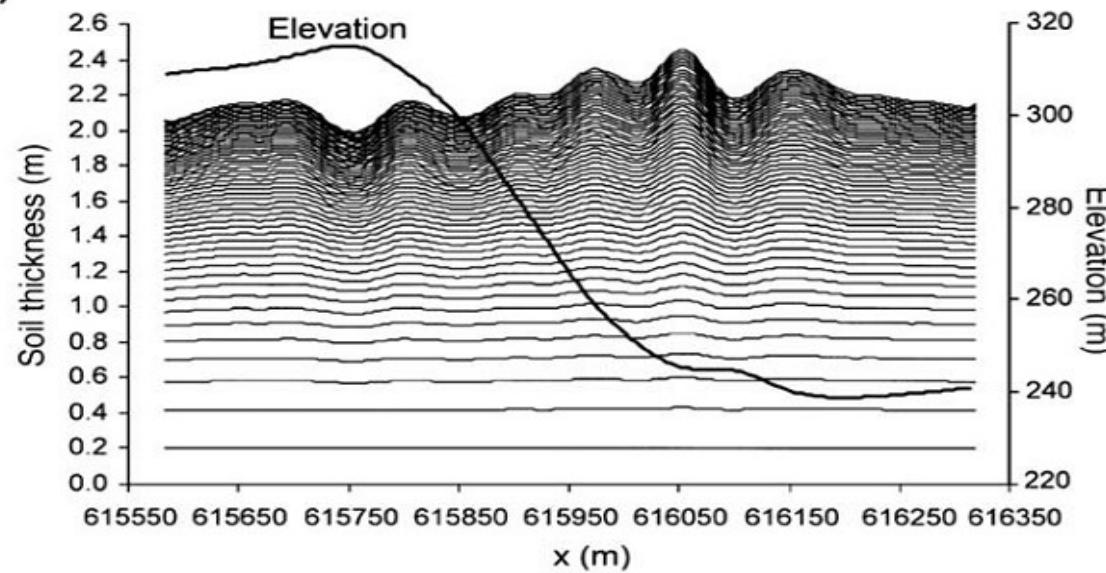
# Modelowanie zmian topografii i powierzchni kopalnych

Hintereisferner  
Elevation Change 2001 - 2002

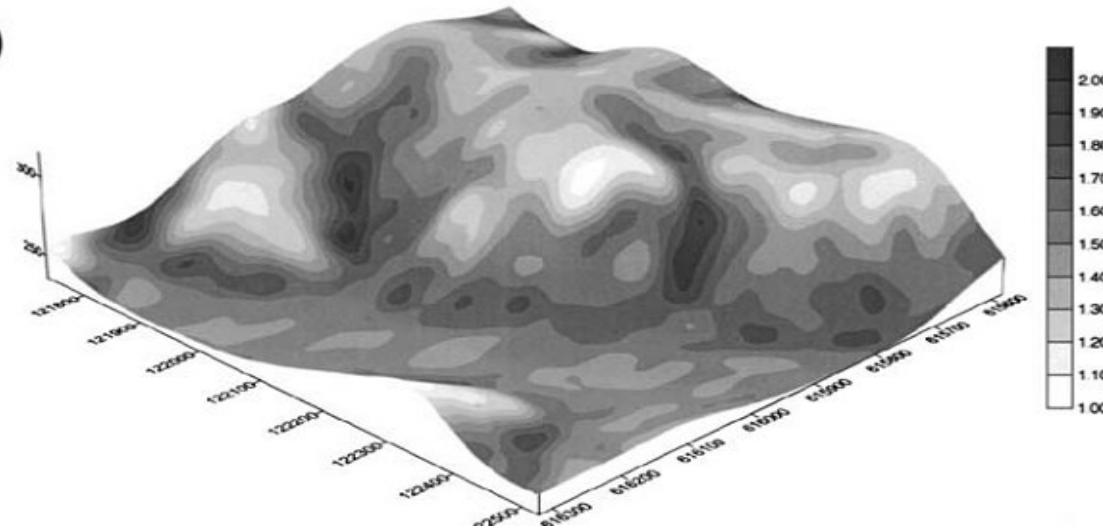


# Ewolucja stoku i miąższość pokrywy glebowej

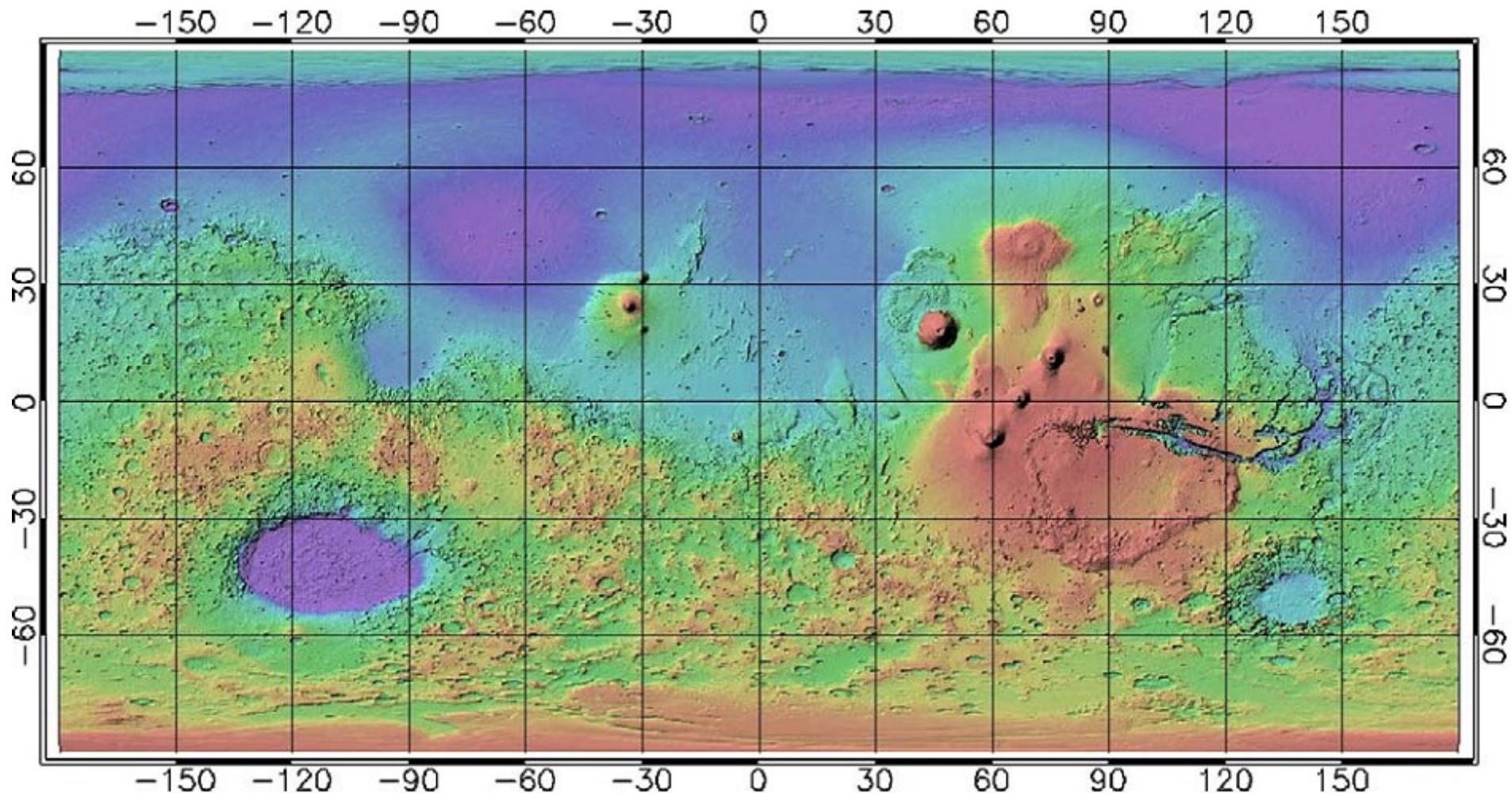
(a)



(b)



# Systemy pozaziemskie



# Wykrywanie kraterów

