

# **GRASS GIS and integrated analysis of watershed**

**Cornel TUDOSE**

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**Bucharest, 16<sup>th</sup> of May 2013**



# FOSS4G Central and Eastern Europe 2013

16th - 20th June, National Library of Romania, Bucharest, Romania

## About us



**Cornel** - Phd. Lecteur at the University of Bucharest, Faculty of Geography, Department of Geomorphology, Pedology, Geomatics. Cornel is specialized on raster modeling of relief, analysis of watersheds and 3D modeling of geographic reality. It promotes the use of open source solutions in universities. From 2010 Cornel is a board member of geo-spatial.org.



**Ionuț** - Phd. Lecteur at University of Bucharest, Faculty of Geography, and has over 13 years of experience in geospatial technology, advocate for using free and open source solutions in the public sector. Is member of the geo-spatial.org board and currently collaborates with the European Union External Action Service in EUMM Georgia.



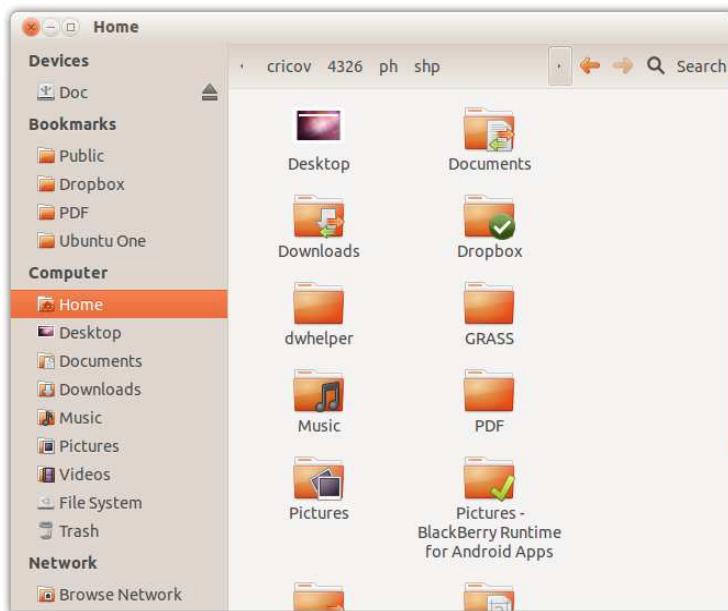
# FOSS4G Central and Eastern Europe 2013

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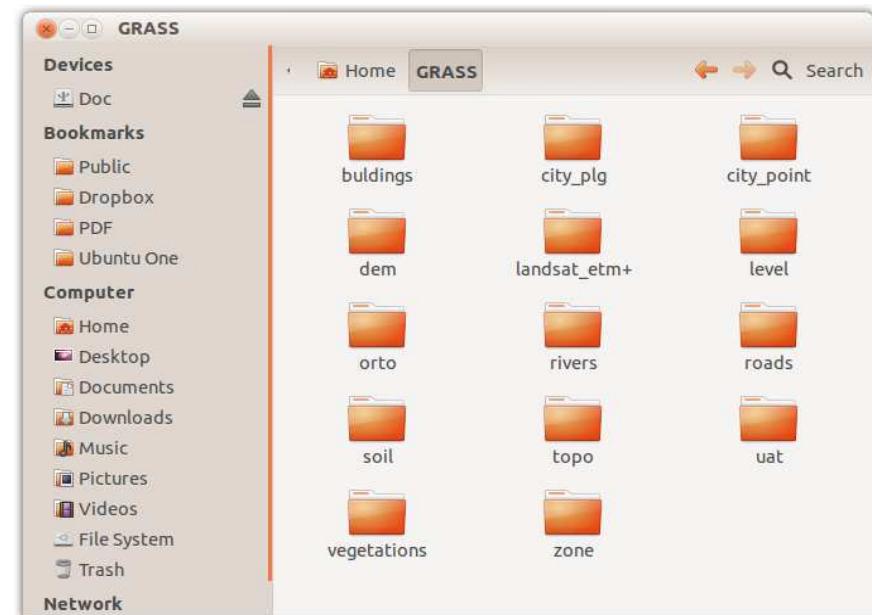
## Preliminary

## Data

### Home



### Home/GRASS





# Workshop schedule

- 1. Creating DEM**
- 2. Viewing DEM**
- 3. Setting DEM for modeling**
- 4. Basis parameter of DEM**



# Workshop schedule

**5. DEM and hydrological elements**

**6. Flood simulation**

**7. Query DEM - profiles**



# 1. Creating DEM



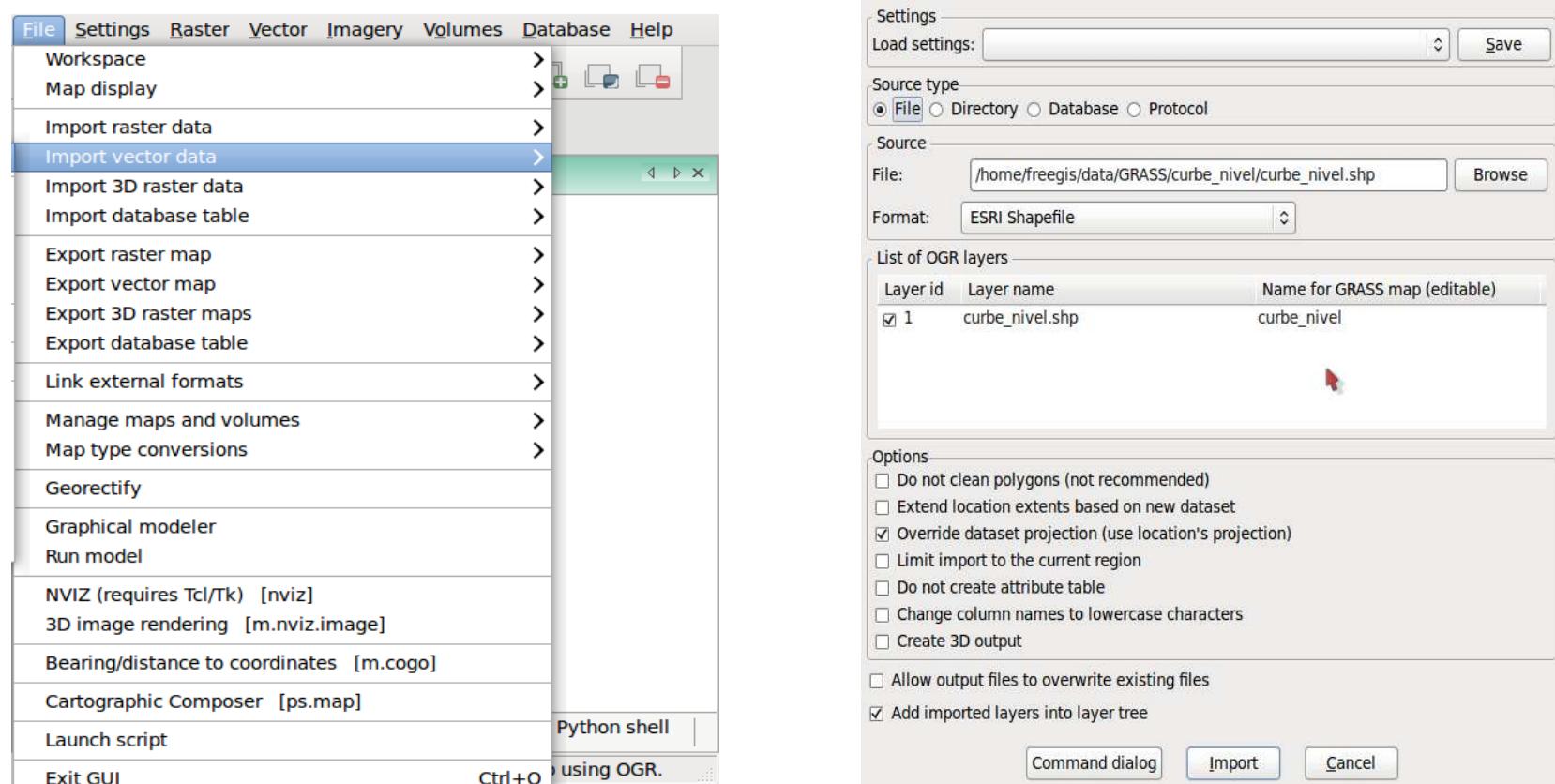
## Realizarea MNAT

### 1. Importul curbelor de nivel (linie – ESRI Shapefile):

File -> Import vector data -> Common import formats [v.in.ogr]

### 2. Select type of file: ESRI Shapefile

### 3. Select location: home/freewis/data/GRASS/curve\_nivel/curve\_nivel.shp

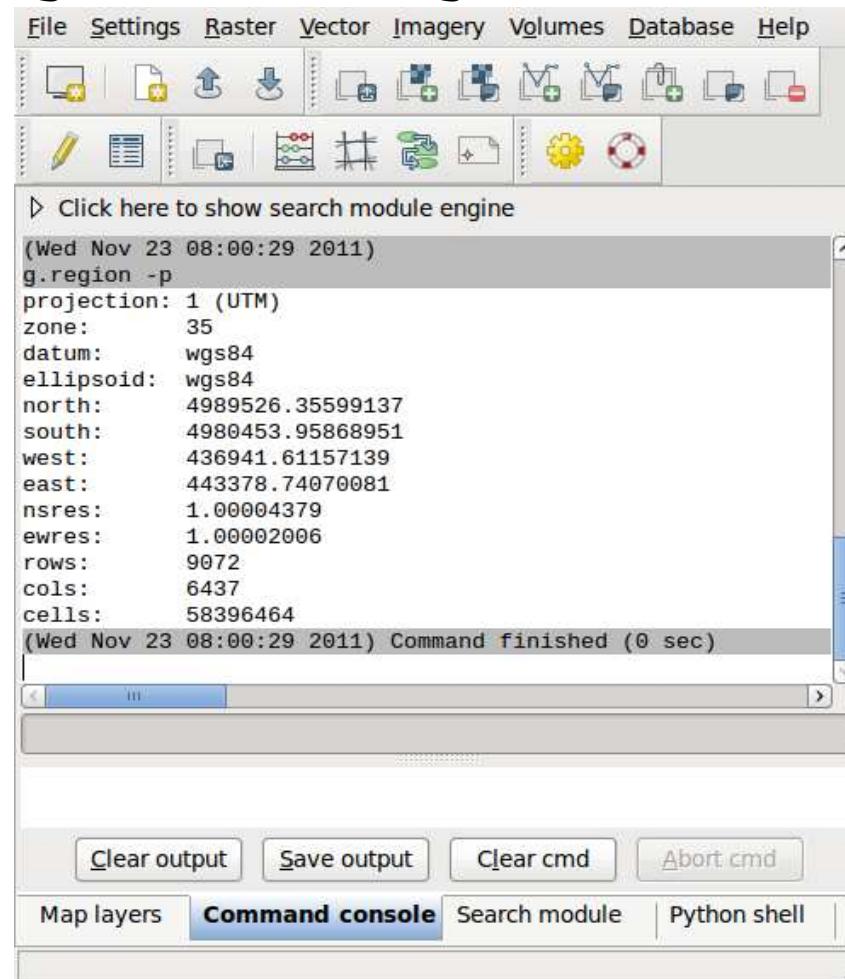




## Realizarea MNAT

Definim proprietatile mediului de lucru:

Settings -> Region -> Set region

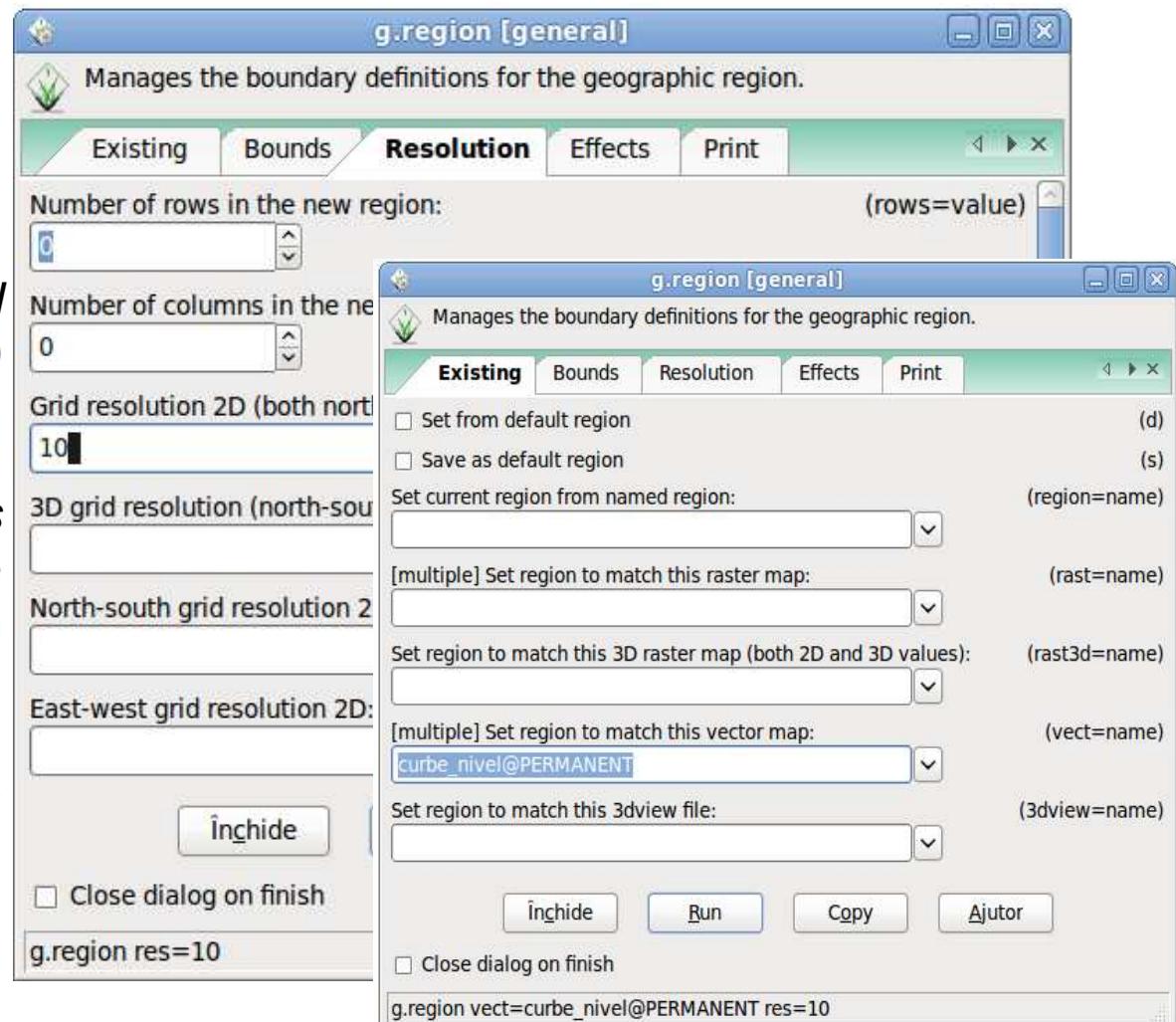




## Realizarea MNAT

Utilizam functia `g.region`:

- Selectam tab-ul: *Rezolution*.
- Setam rezoluția utilizand campul *Grid resolution 2D* introducerea valoarea 10 (unitatea de masura fiind metru).
- Selectam tab-ul: *Existing*
- introduem în *Set region to match this vector map* numele hărții vectoriale care trebuie să fie convertite într-un raster, în contururi cazul nostru. Odată ce ați terminat faceți clic pe *Run*. Acum, regiunea curentă acoperă întreaga hartă cu contururi rezoluție de 10 metri.





## Realizarea MNAT

### 3. Conversia vector in raster:

data/GRASS/curve\_nivel/curve\_nivel.shp

Utilizam functia v.to.rast: File -> Map type conversions -> Vector to raster

• Selectam tab-ul: *Required*.

• Introducem datele vectoriale  
(curve\_nivel)

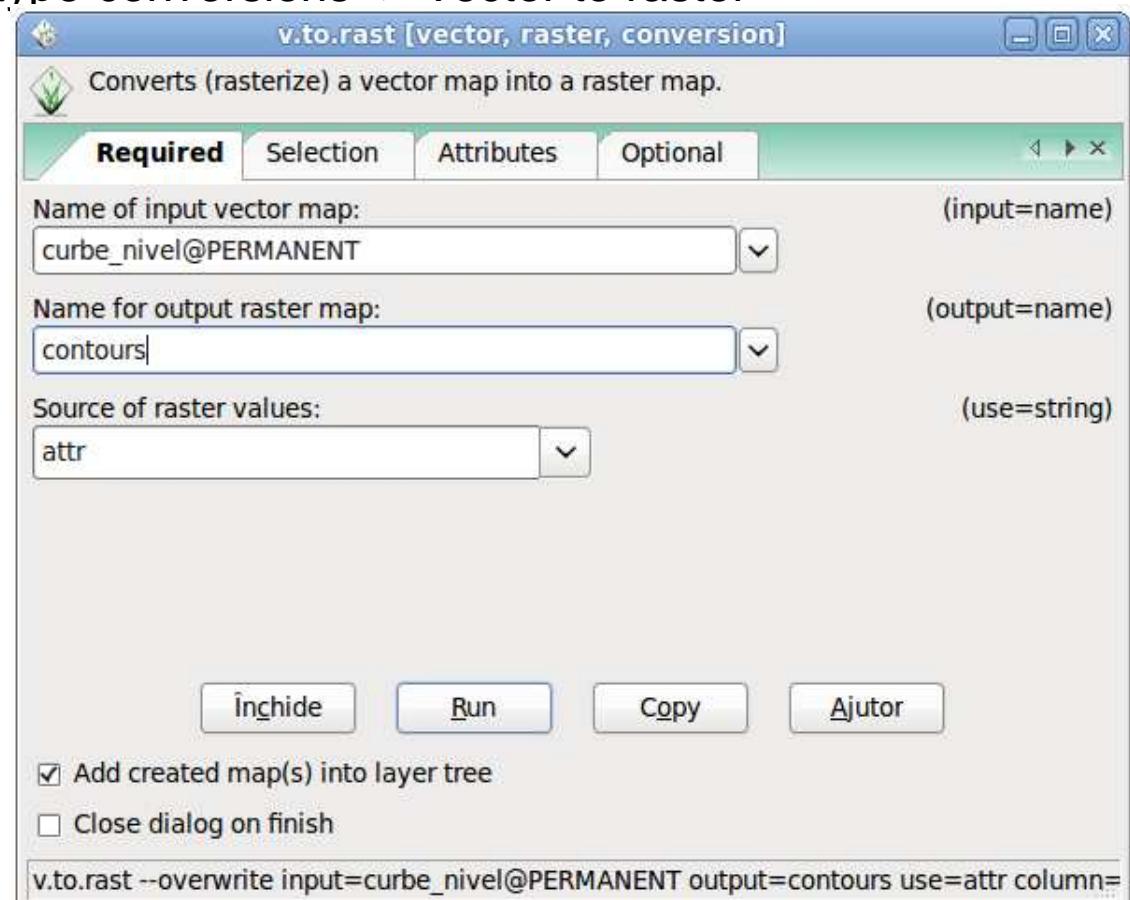
*Name of input vector map*

*(contours)*

*Name for output raster map*

*(attr)*

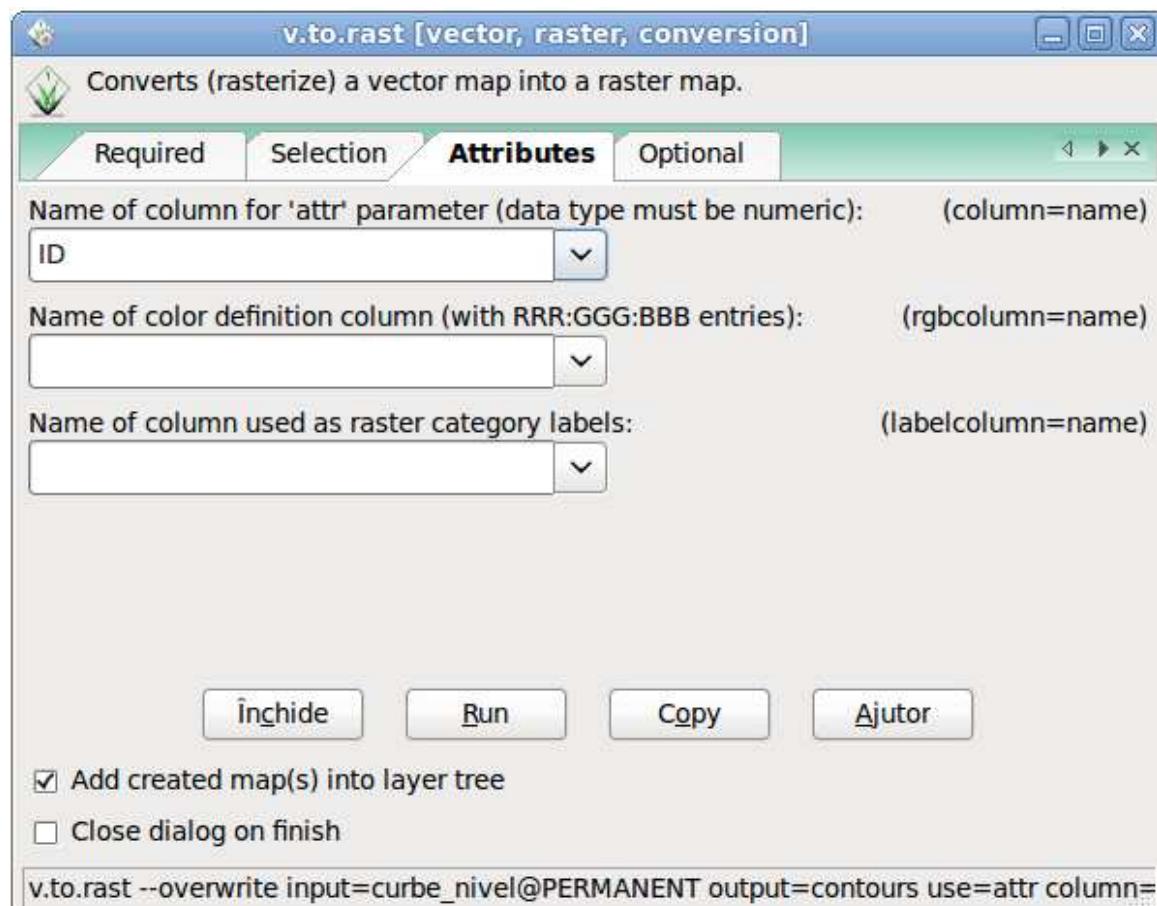
*Name of input vector map*





## Realizarea MNAT

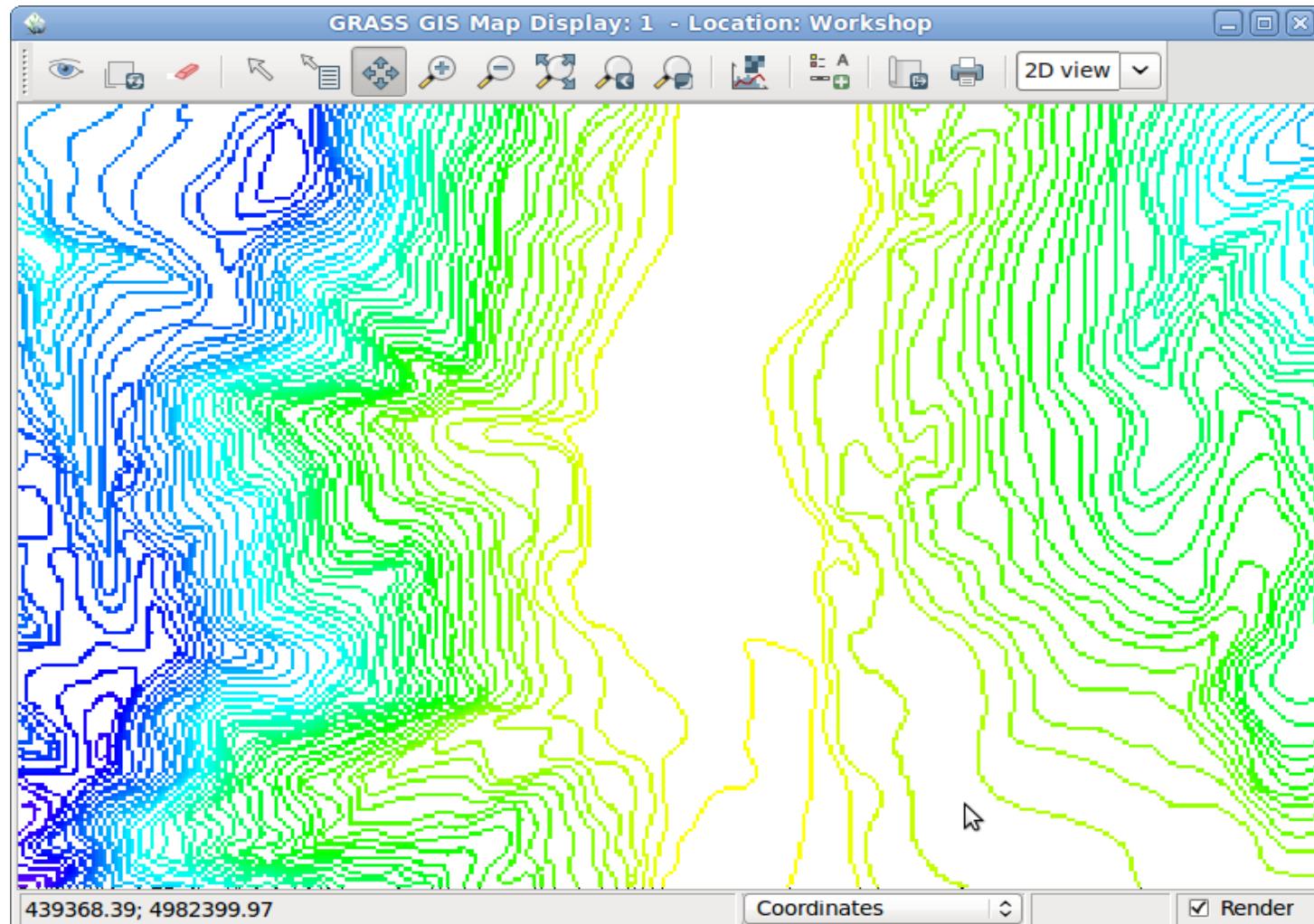
- Selectam tab-ul: *Attributes*  
*Name of column for 'attr' parameter*  
coloana după care se face conversia - altitudinea (ID)





# Realizarea MNAT

Rezultatul obtinut: harta a curbelor rasterizata



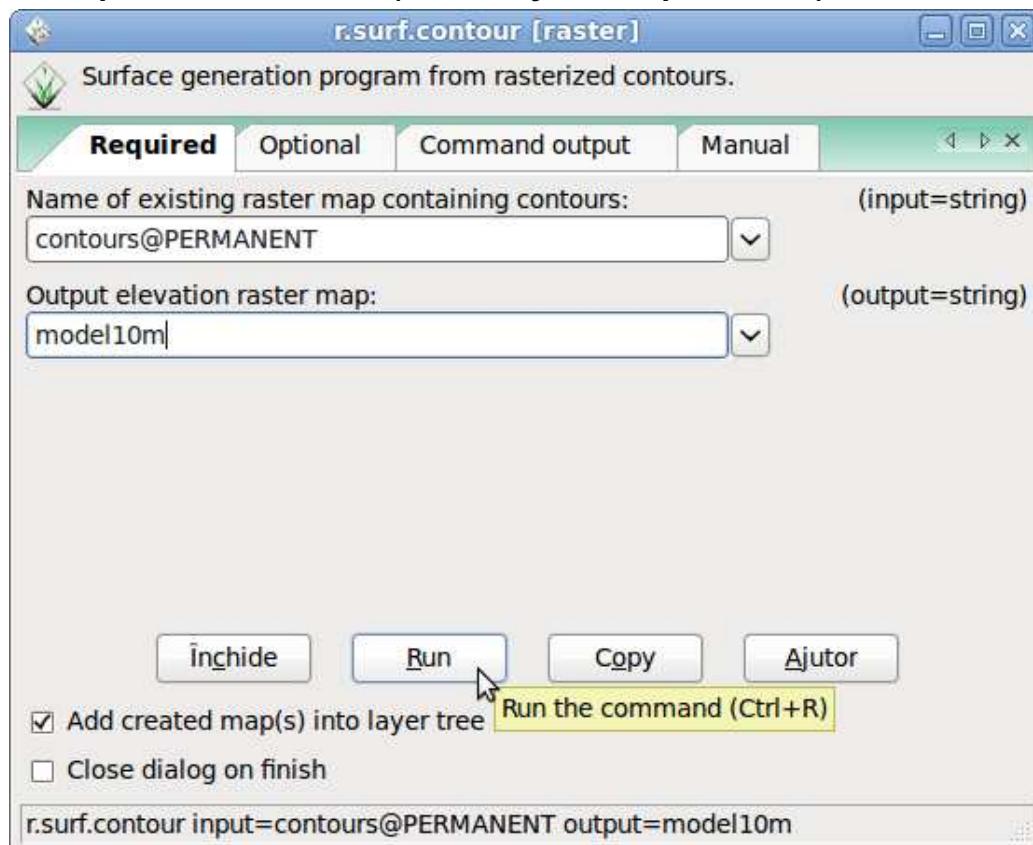


## Realizarea MNAT

4. Realizarea MNA - utilizam functia: `r.surf.contour`

Raster -> Interpolate surfaces-> Raster contours

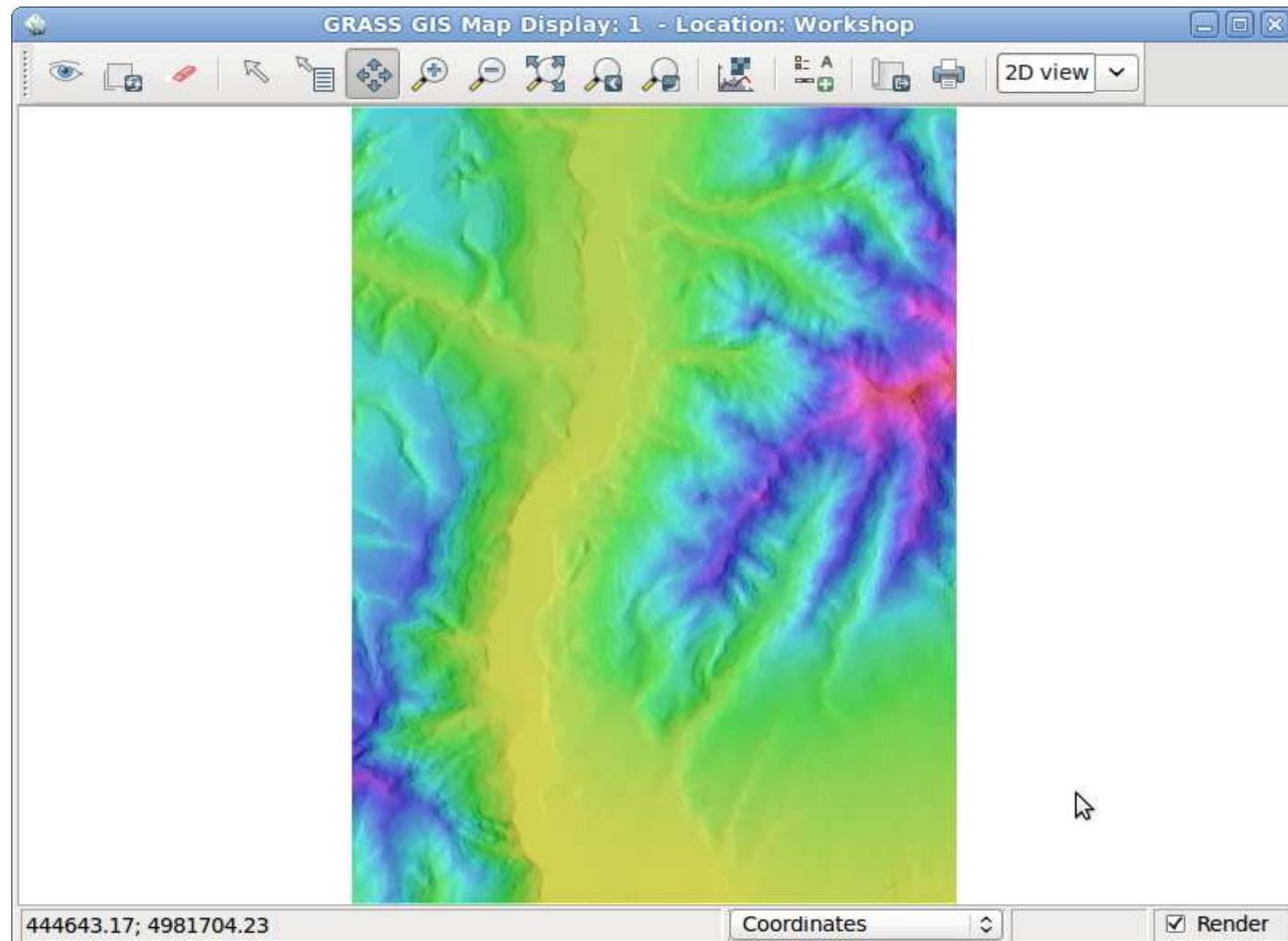
Functia `r.surf.contour` creează o hartă a altitudinilor dintr-o hartă a curbelor rasterizata.  
Algoritmul de interpolare: *interpolare liniara (linearly interpolates)*





# Realizarea MNAT

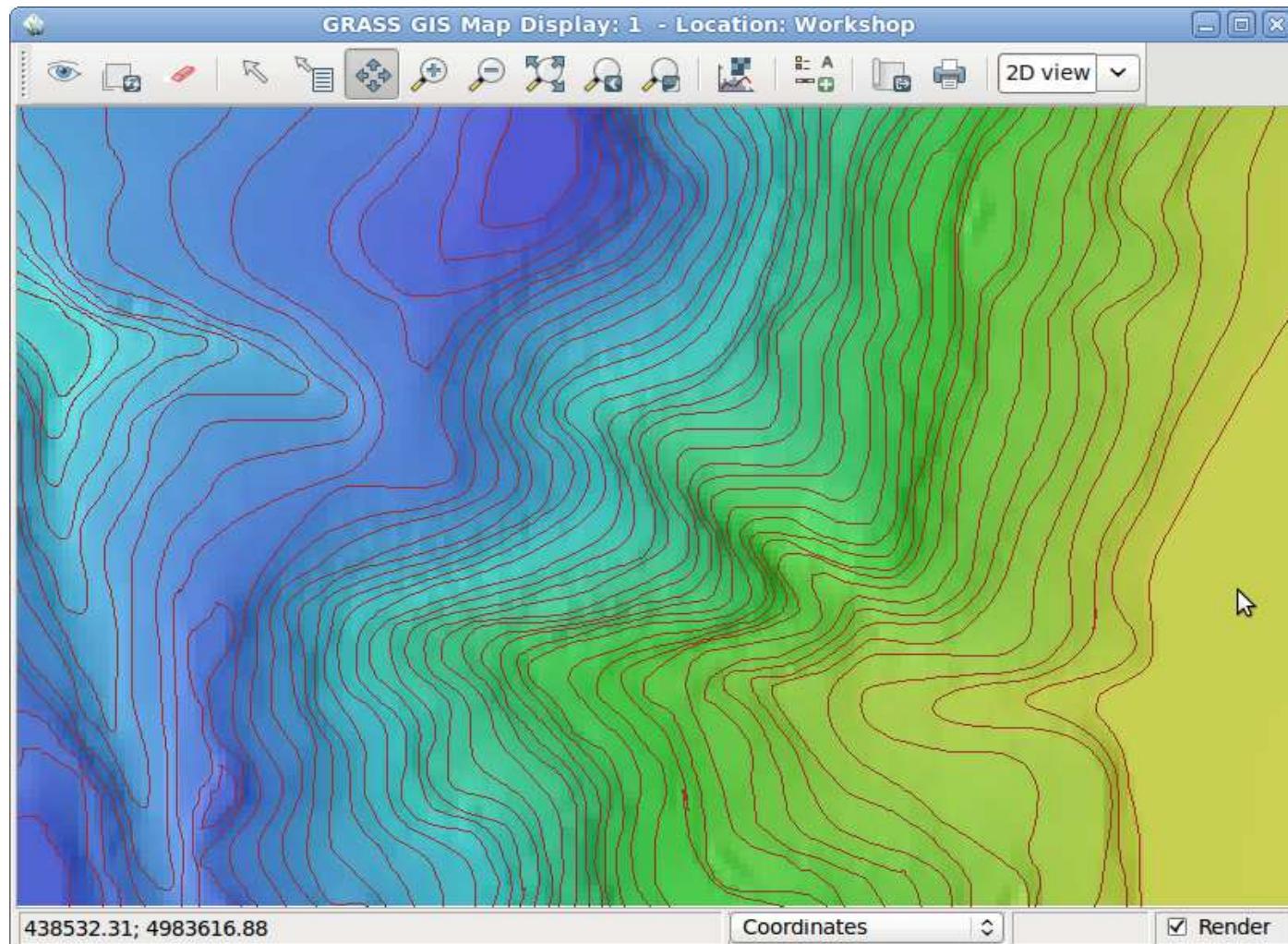
Rezultatul obtinut: Modelul Numeric Altimetric





# Realizarea MNAT

Rezultatul obtinut: Modelul Numeric Altimetric + curbele de nivel



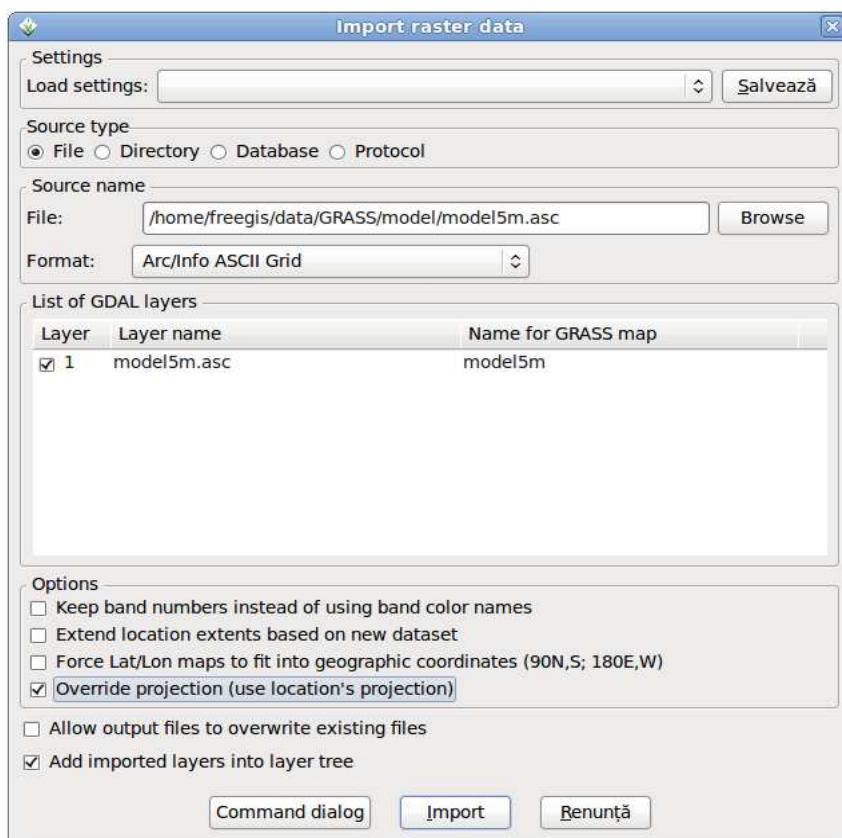


## 2. Vizualizarea MNAT

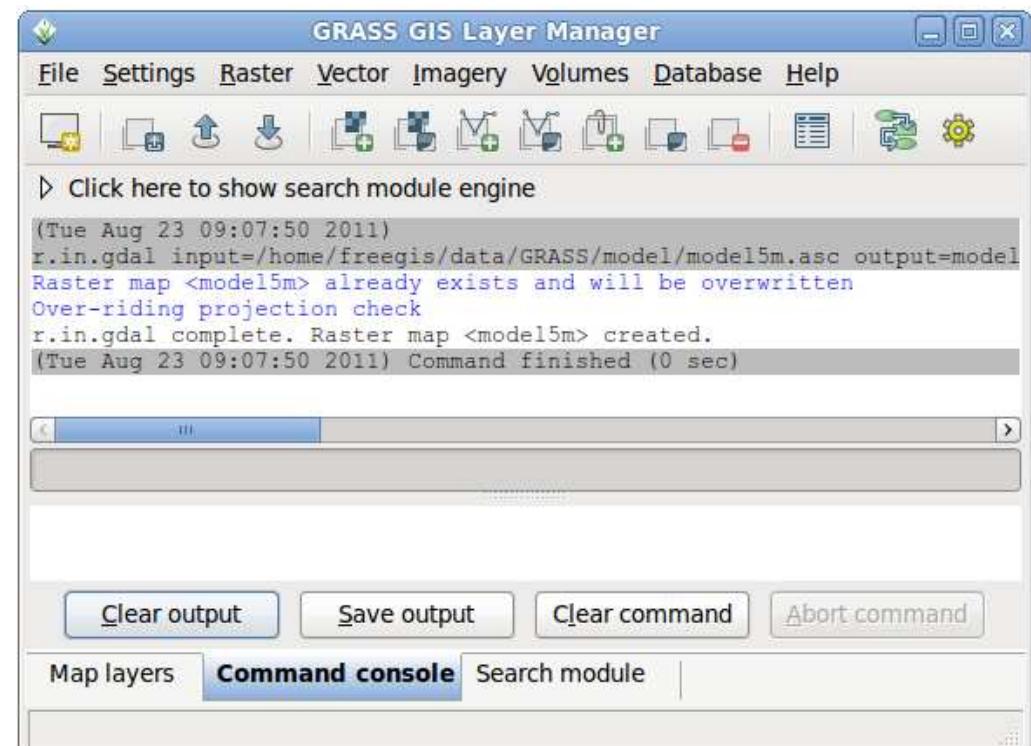


## Vizualizarea MNAT

1. Selectam tipul de fisier: Arc/Info ASCII Grid
2. Selectam locatia: home/freegis/data/GRASS/model/model5m.asc
3. Bifam: Override projection și Add Imported layers into layer tree
3. Apasam butonul: Import



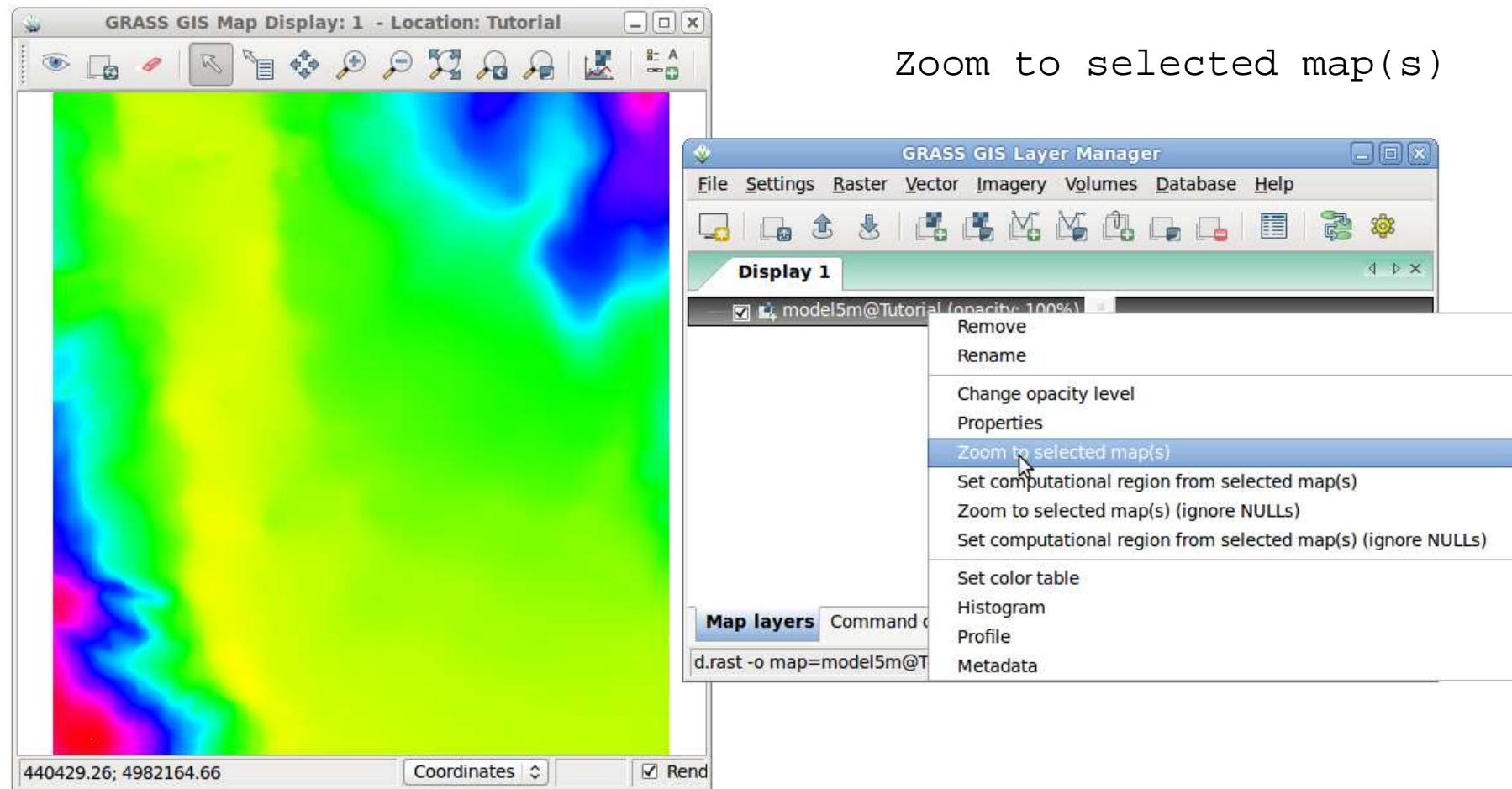
In fereastra GIS Layer Manager, la optiunea Command output, va apărea urmatorul mesaj:





## Vizualizarea MNAT

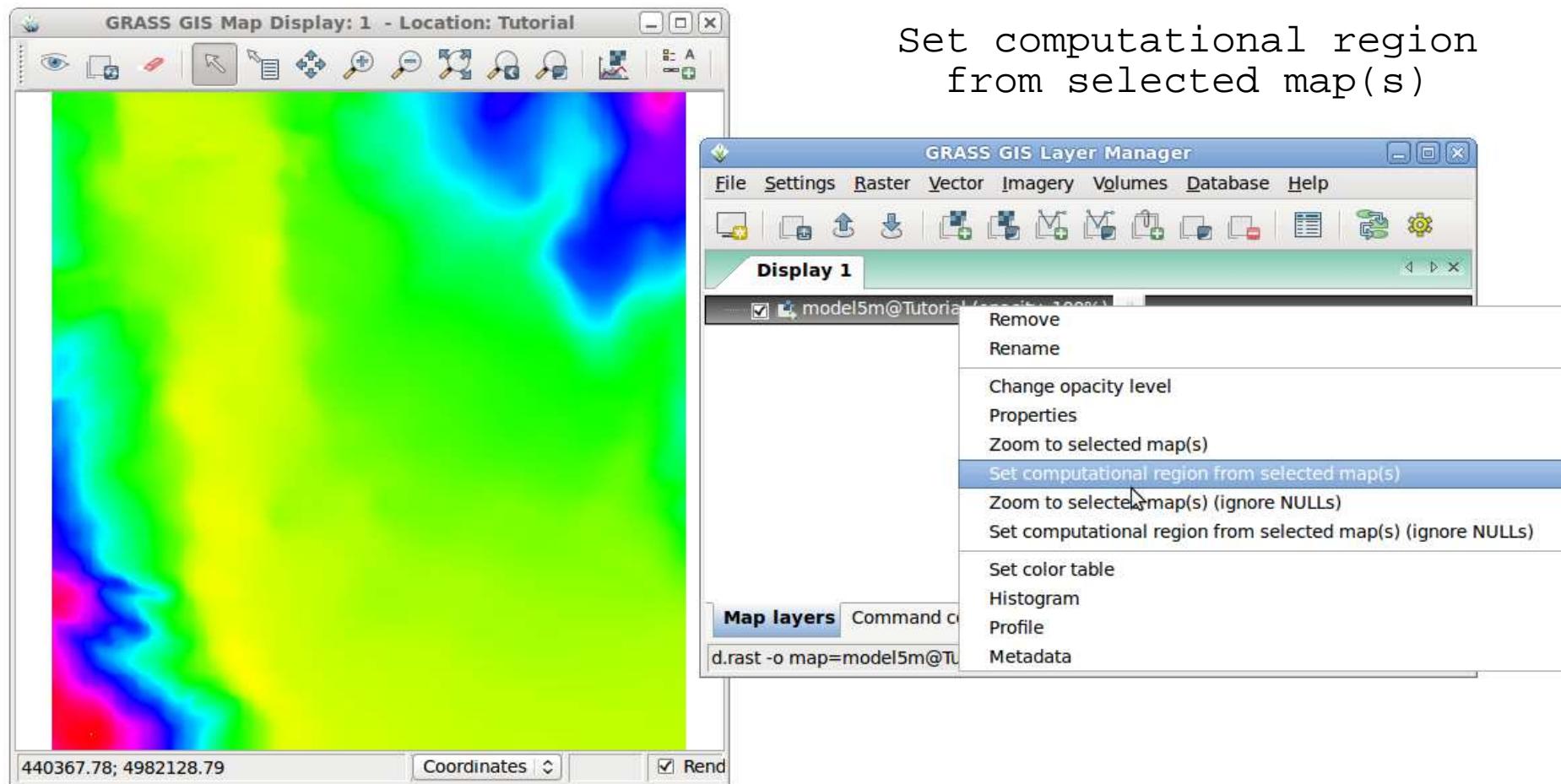
Pentru vizualizarea stratului: Click dreapta de mouse si din meniul contextual alegem:





## Vizualizarea MNAT

Pentru selectarea zonei: Click dreapta de mouse si din meniul contextual alegem

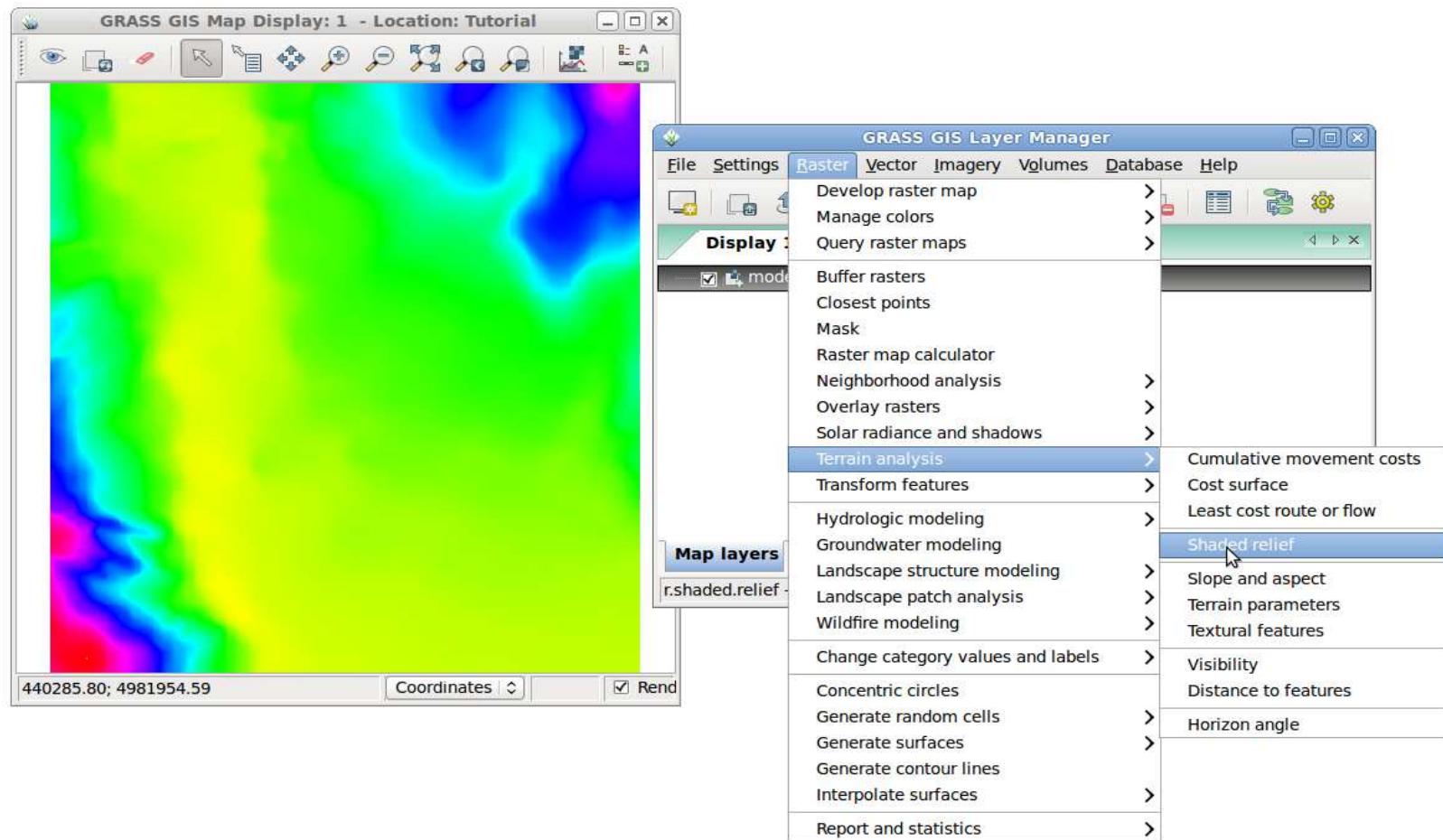


Set computational region  
from selected map(s)



## Vizualizarea MNAT

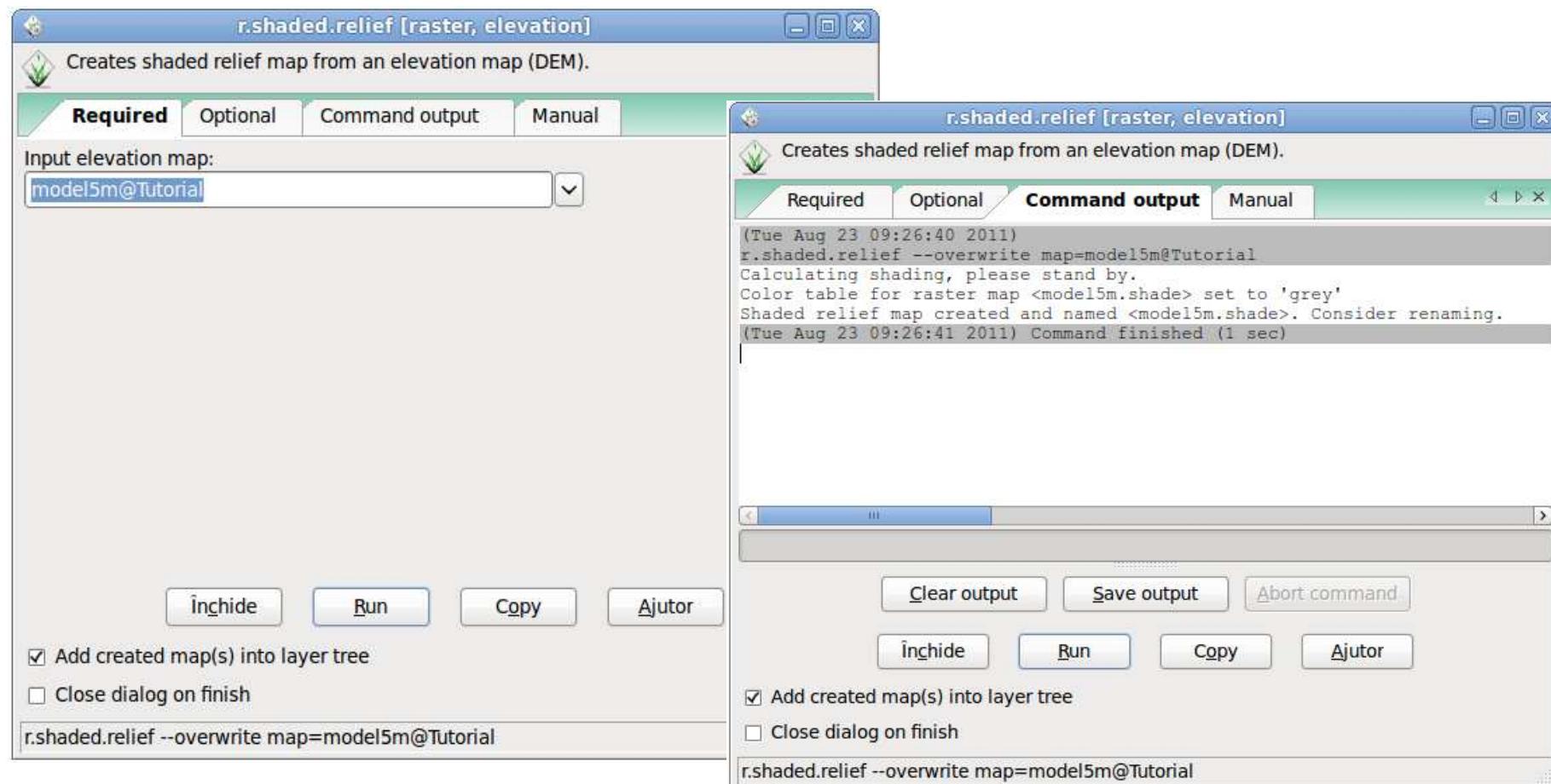
Raster > Terrain analysis > Shaded relief





## Vizualizarea MNAT

La Input elevation map alegem: model5m@PERMANENT si apasam Run apoi Close

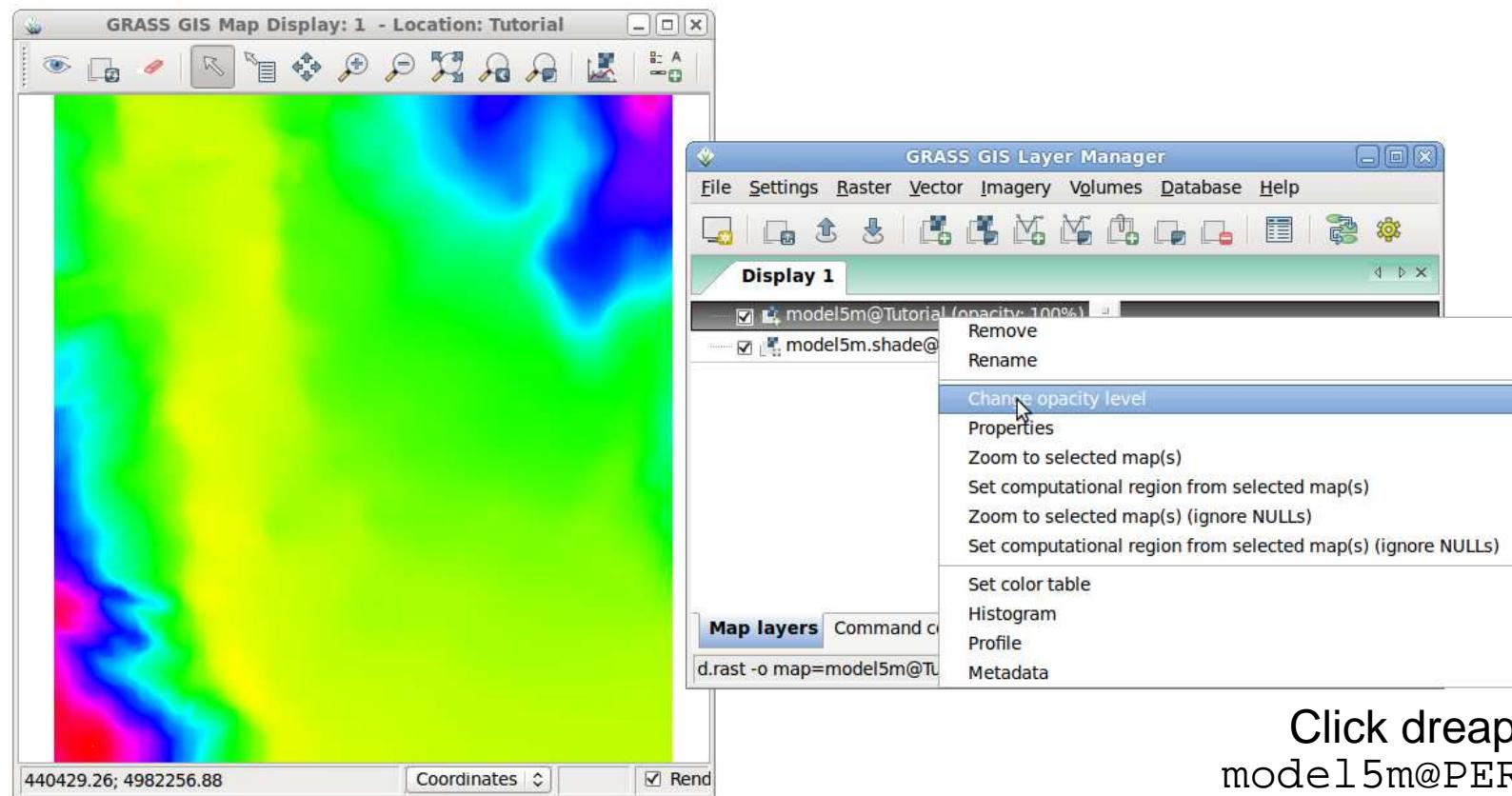




## Vizualizarea MNAT

In fereastra GRASS GIS Layer Manager, schimbam ordinea de afisare a straturilor astfel:

1. model5m@PERMANENT
2. model5m.shade@PERMANENT

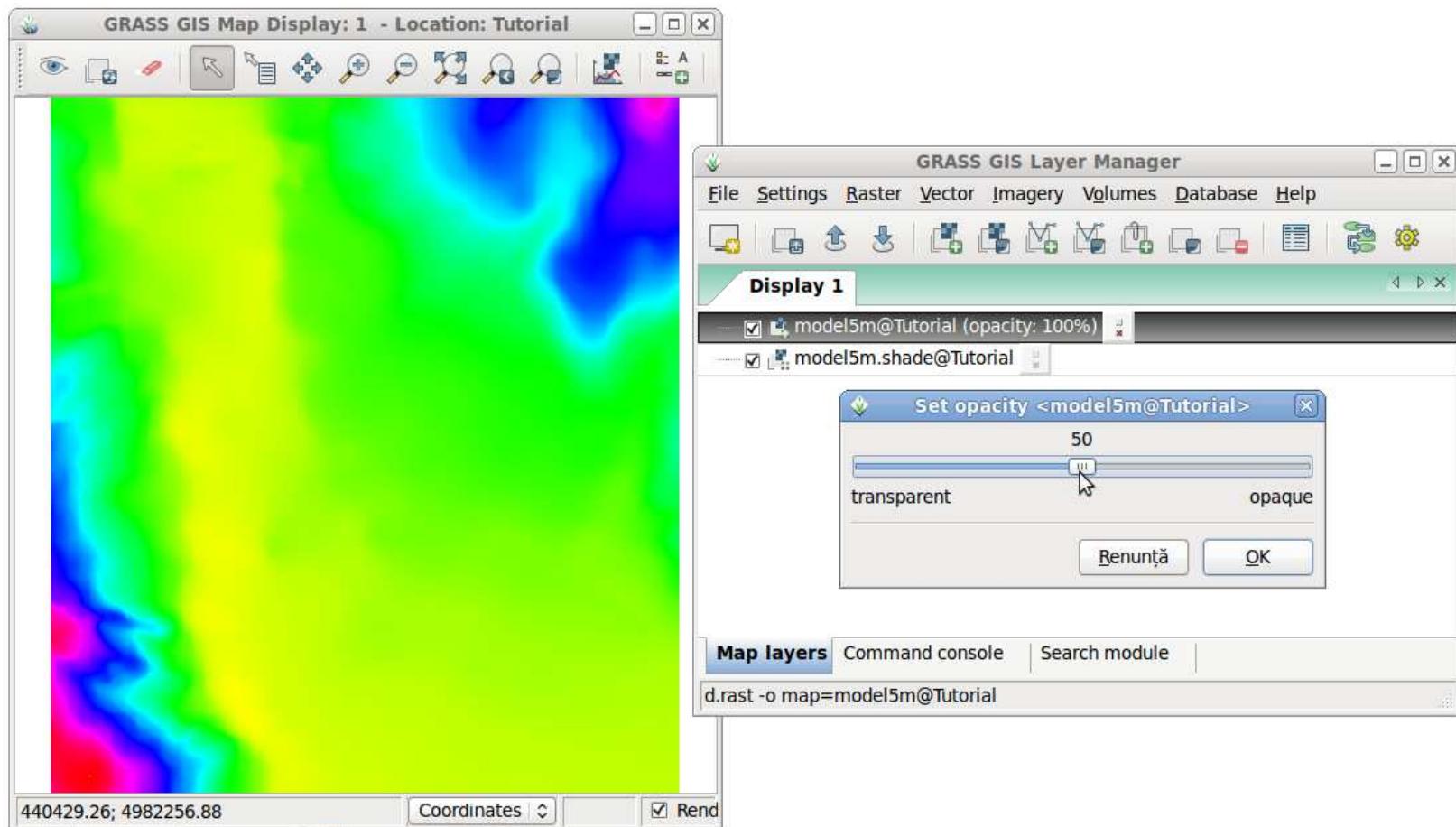


Click dreapta pe  
model5m@PERMANENT  
si alegem  
Change opacity level



## Vizualizarea MNAT

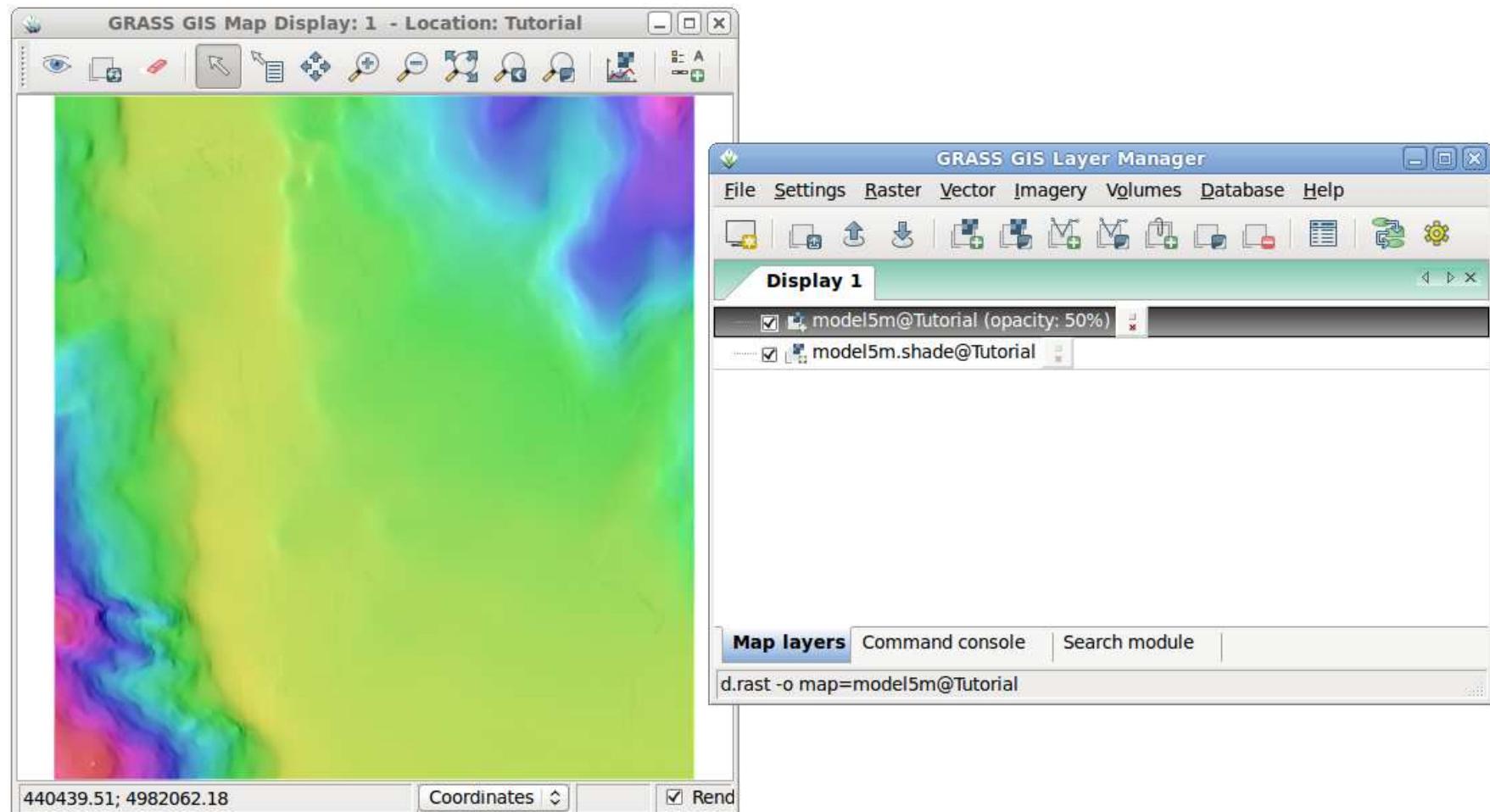
In fereastra Set opacity, selectam opacitatea la 50 unitati





## Vizualizarea MNAT

Rezultatul final

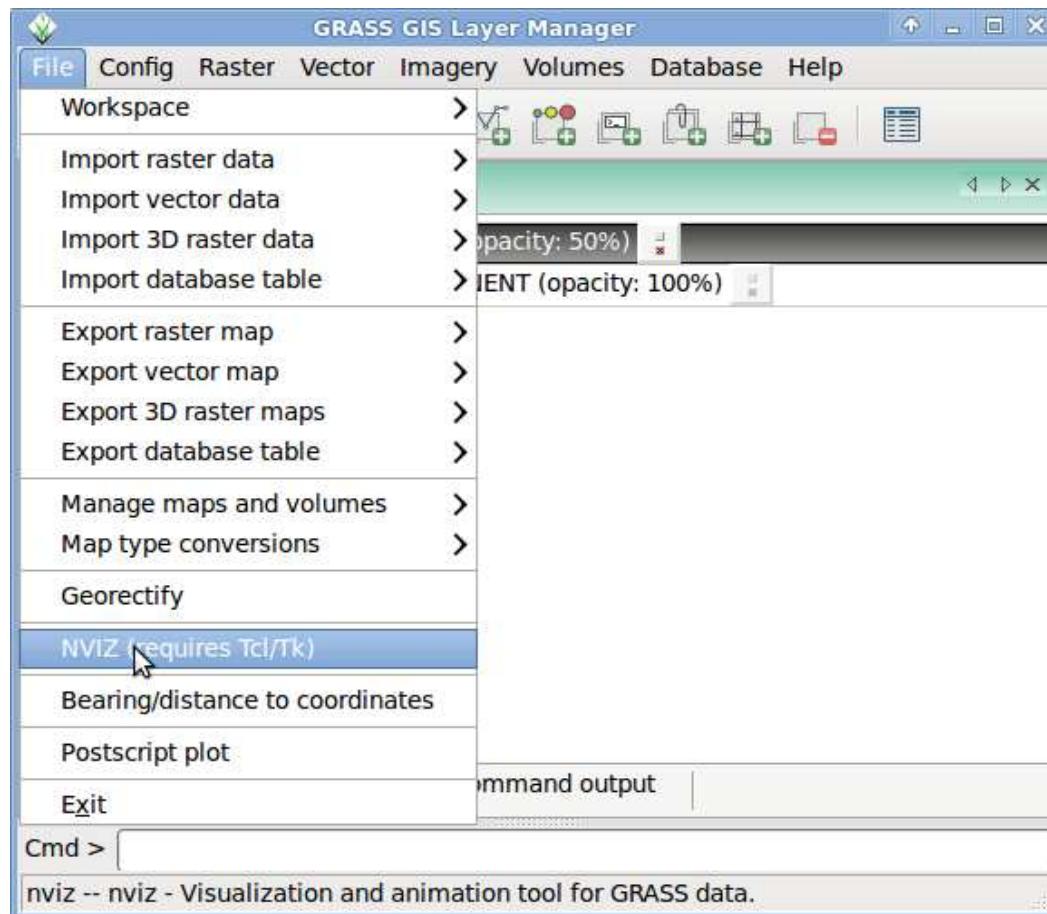




## Vizualizarea MNAT

### Vizualizare 3D

In fereastra GRASS GIS Layer Manager efectuam: File > NVIZ

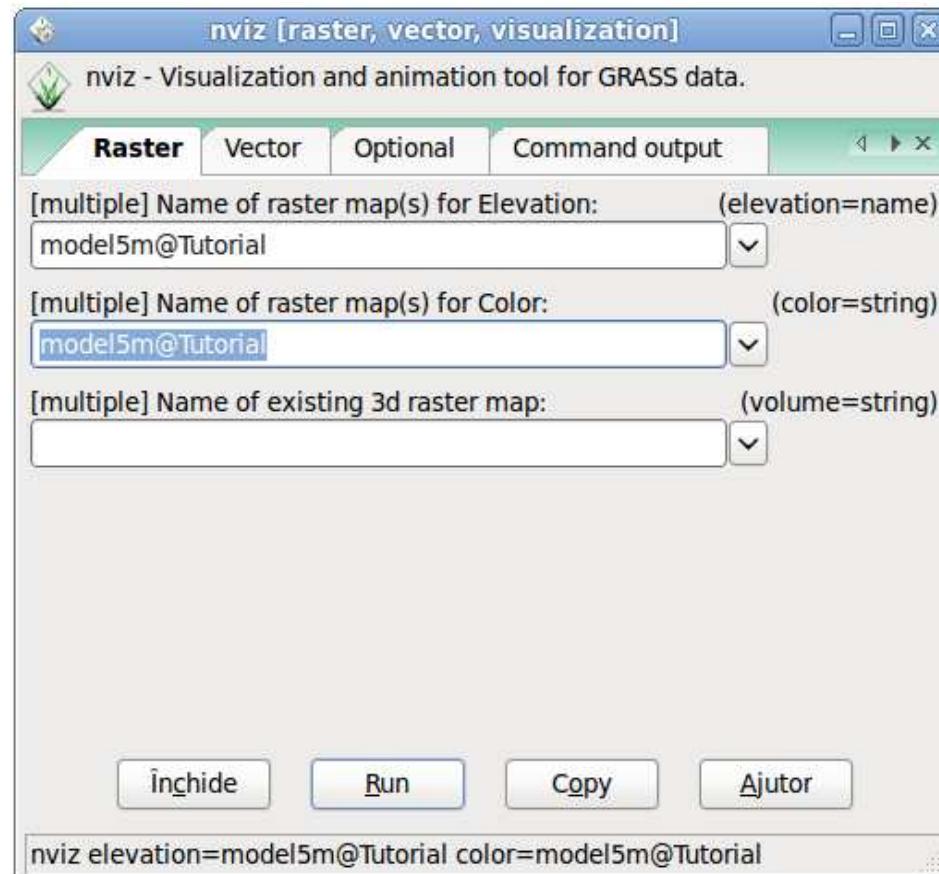




## Vizualizarea MNAT

### Vizualizare 3D

Alegem la Name of raster(s) for Elevations: model5m@PERMANENT, iar la Name of raster map(s) for Color: model@PERMANENT si rulam comanda.

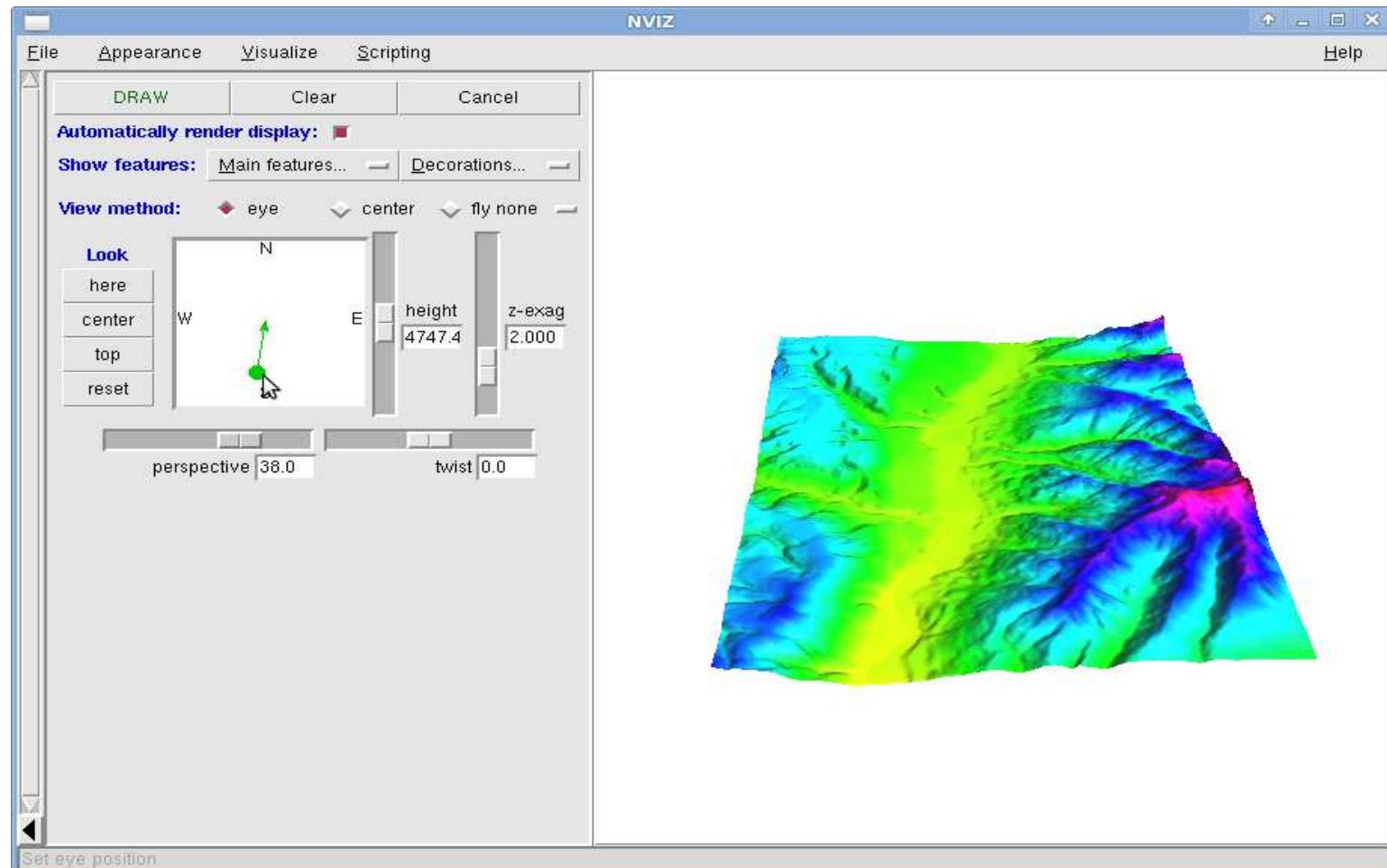




## Vizualizarea MNAT

### Vizualizare 3D

Rezultatul final:



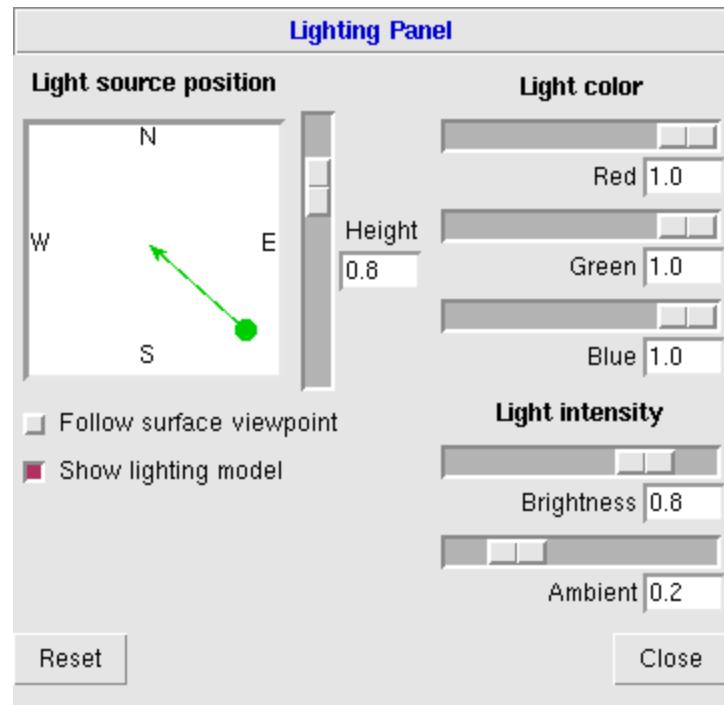


## Vizualizarea MNAT

### Vizualizare 3D

Schimbarea proprietatilor de vizualizare

Se face cu optiunea Lighting Panel : Apparence > Lighting



Light source position: directia de iluminare

Light color: modifica nuantele de culoare

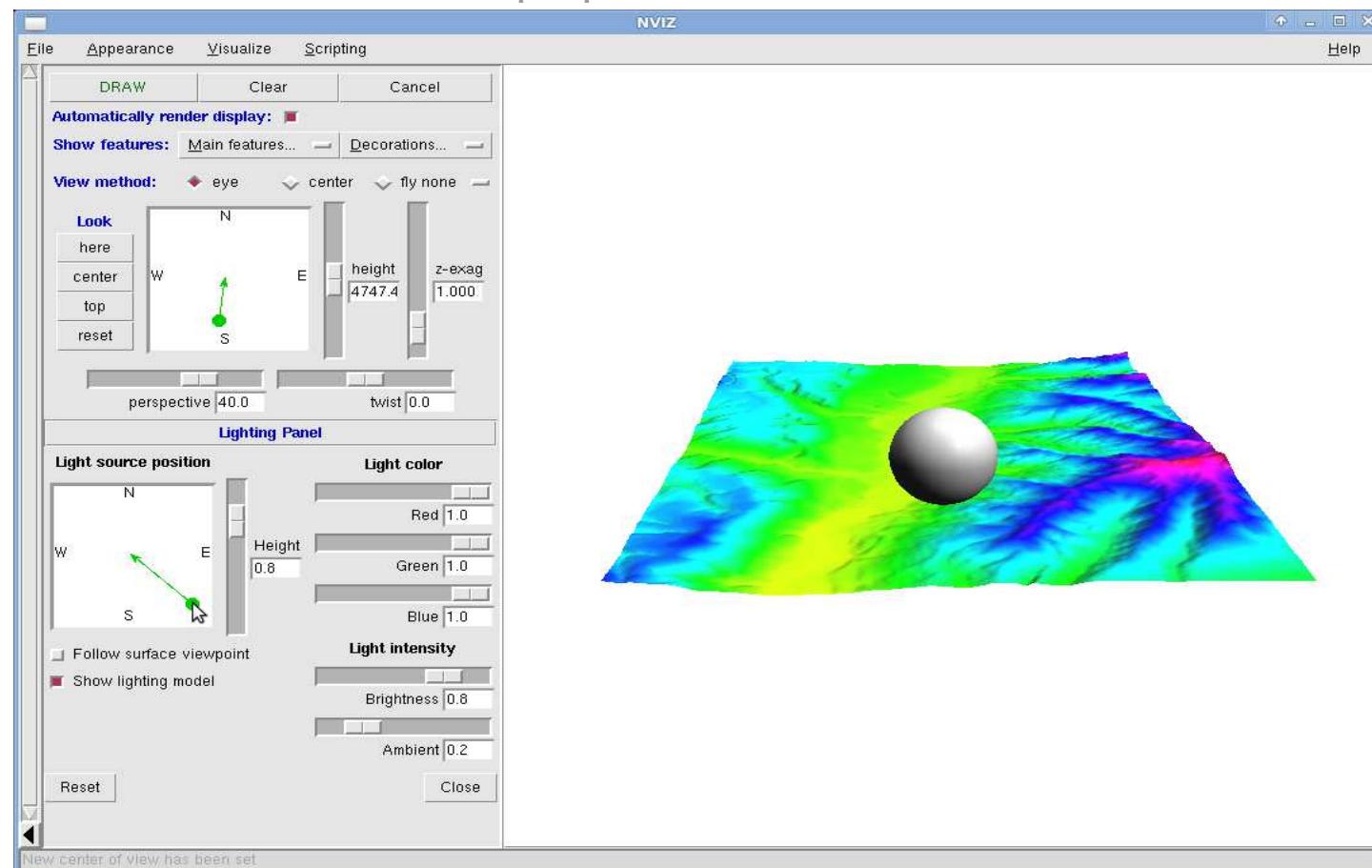
Light intensity: modifica intensitatea luminii



## Vizualizarea MNAT

### Vizualizare 3D

Schimbarea proprietatilor de vizualizare





# 3. Pregătirea MNAT pentru modelare raster



## Pregatirea MNAT pentru modelare

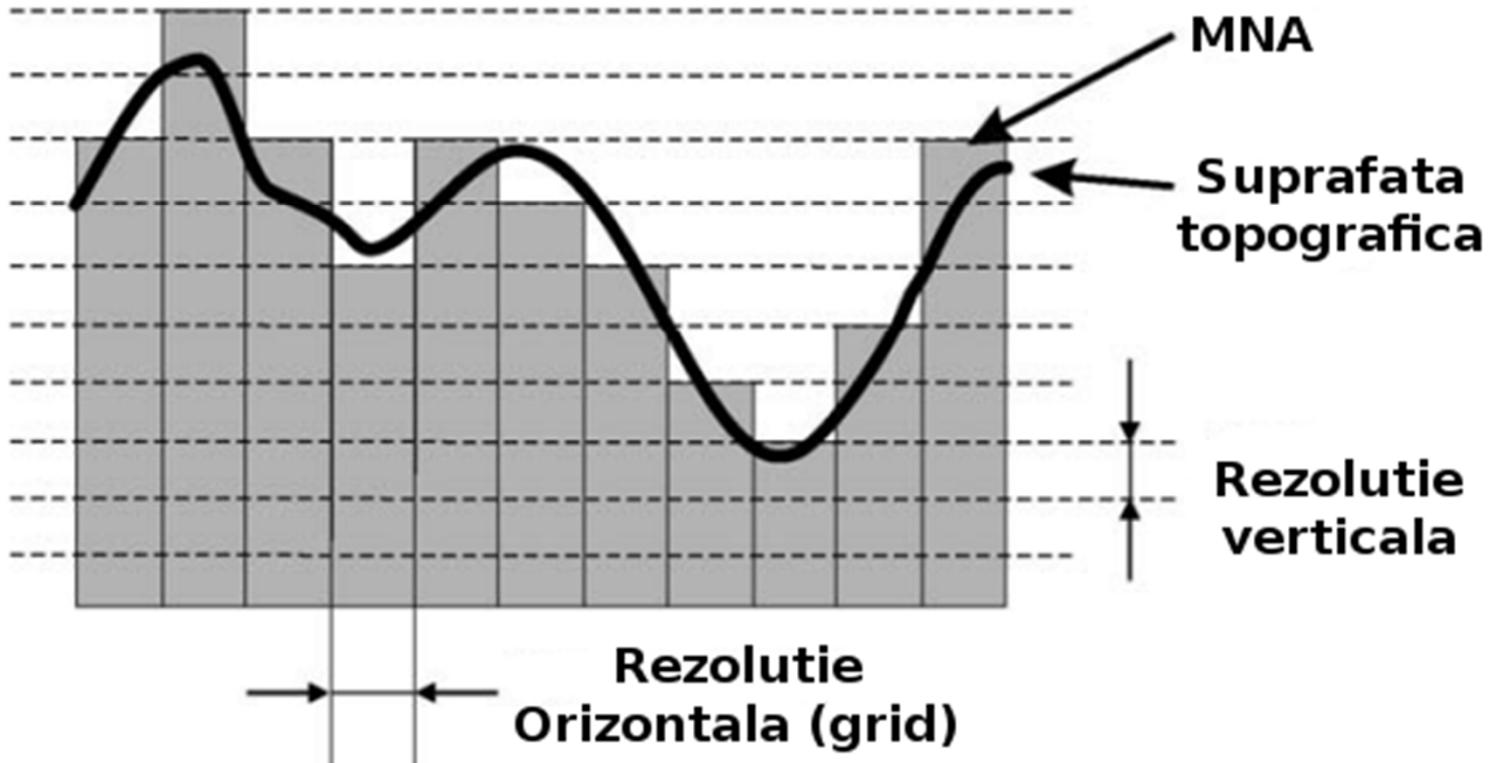
**Calitatea MNA determină calitatea analizei geomorfologice.**  
**Chiar și cei mai sofisticăți algoritmi de procesare sunt în imposibilitate de a rectifica erorile din MNA de intrare. Calitatea parametrilor suprafetei pentru aplicațiile geomorfologice depind de mai mulți factori**

(Accuracy of local topographic variables derived from digitalelevation models, Igor Florinsky, 1998):

- rugozitatea suprafetei terenului;
- densitatea de prelevare a probelor;
- algoritmul de obținere a MNA;
- rezoluția verticală;
- tipul de analiză geomorfologică.



## Pregatirea MNAT pentru modelare



**Elementele MNA**



## Pregatirea MNAT pentru modelare

**Chiar și cei mai exacti algoritmi vor avea ca rezultat în ieșiri eonate  
în cazul în care MNA de intrare este de proastă calitate sau  
necorespunzătoare pentru aplicatiile alese.**

**Înainte de realizarea diversilor parametrii ai terenului  
Trebuie urmate diverse proceduri pentru a îmbunătăți calitatea MNA.**

**Aceste proceduri sunt disponibile în multe pachete de programe sub numele  
de *DEM processing* sau *DEM preparation*.**

**In GRASS GIS - *Fill NULL cells***



## Pregatirea MNAT pentru modelare

**În principiu, orice prelucrare de MNA are trei obiective principale:**

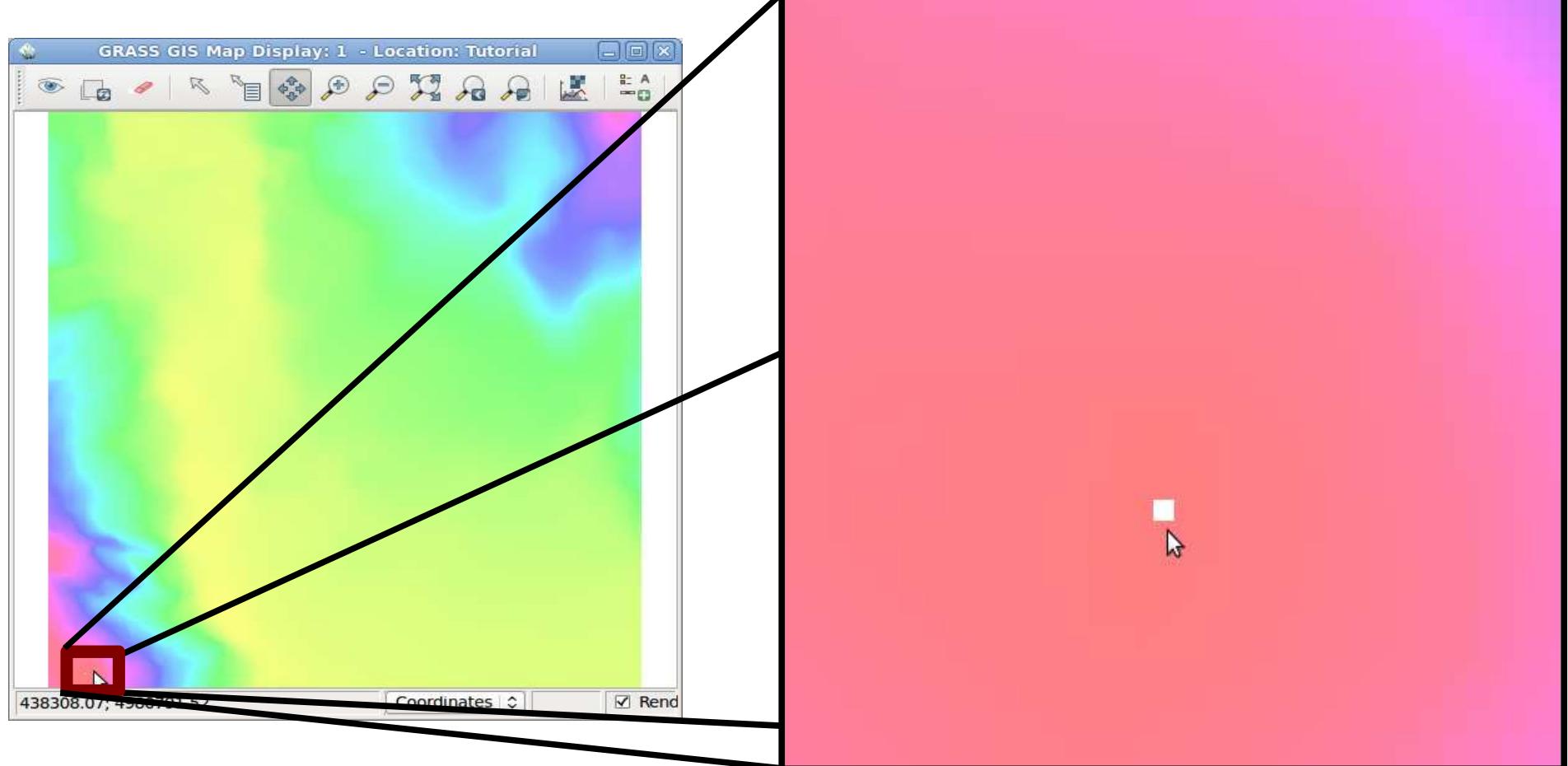
- **eliminarea erorilor,**
- **o aproximare mai bună a suprafeței terenului,**
- **o aproximare mai bună a proceselor hidrologice / ecologice (cum ar fi debit, radiații etc).**



## Pregatirea MNAT pentru modelare

### Identificarea erorilor:

In SE regiunii se afla un gol





## Pregatirea MNAT pentru modelare

**Umplerea "golurilor"**

**Nivelarea "vârfurilor"**

**Golurile (sinks) sunt elementele care au fost  
introduse la generarea MNA.**

**Eliminarea golurilor este un pas de pre-procesare, determinată  
în principal de către aplicațiile hidrologice în care o rețea  
hidrologică corectă este cea care simulează fluxul de apă  
pe suprafața solului**

(Tarboton, D. G., R. L. Bras and I. Rodriguez-Iturbe, (1991), "On the Extraction of Channel Networks from Digital Elevation Data," *Hydrologic Processes*, 5(1): 81-100).

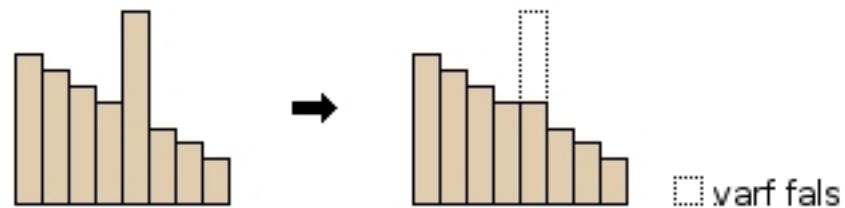
**Golurile sunt completeate progresiv (prin creșterea cotei lor)  
până la atingerea punctului cel mai mic scurgere este atins**



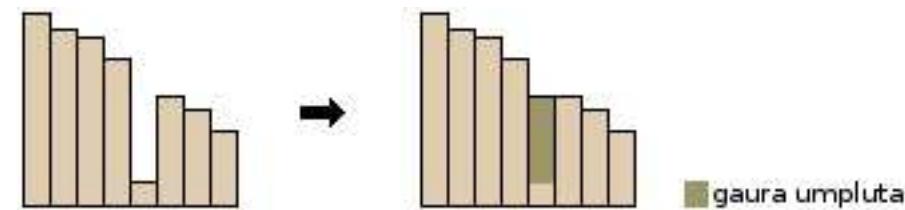
## Pregatirea MNAT pentru modelare

Umplerea "golurilor"

Nivelarea "vârfurilor"



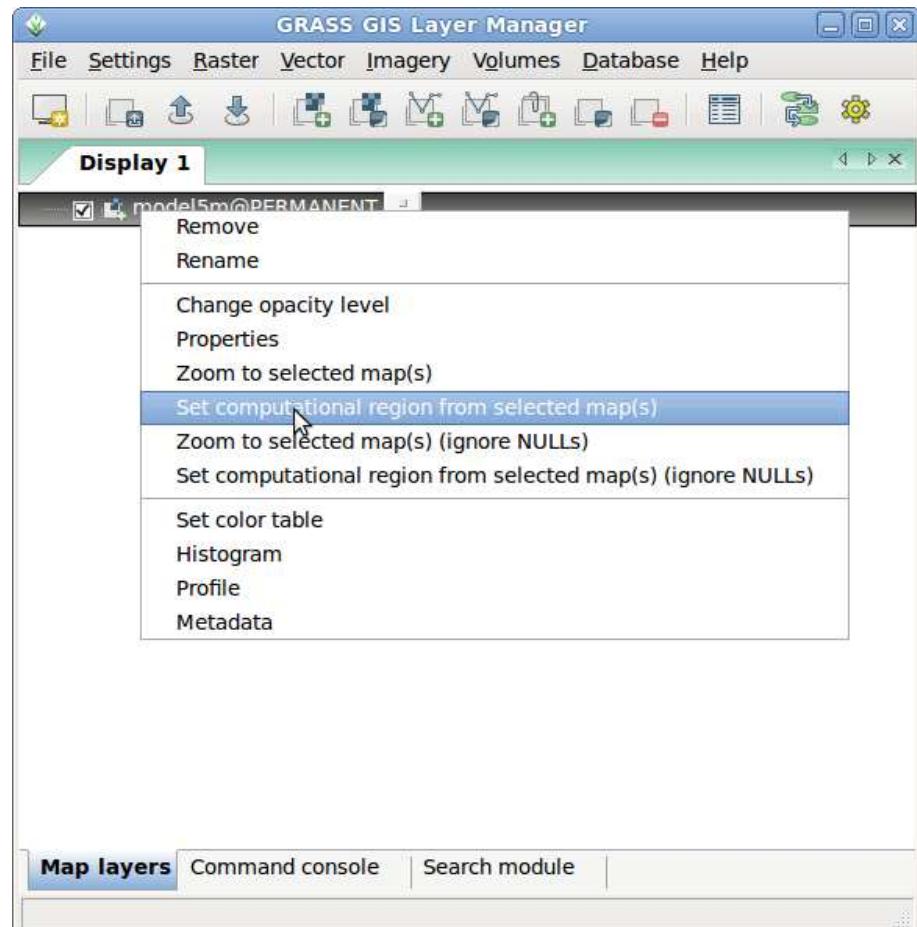
varf fals



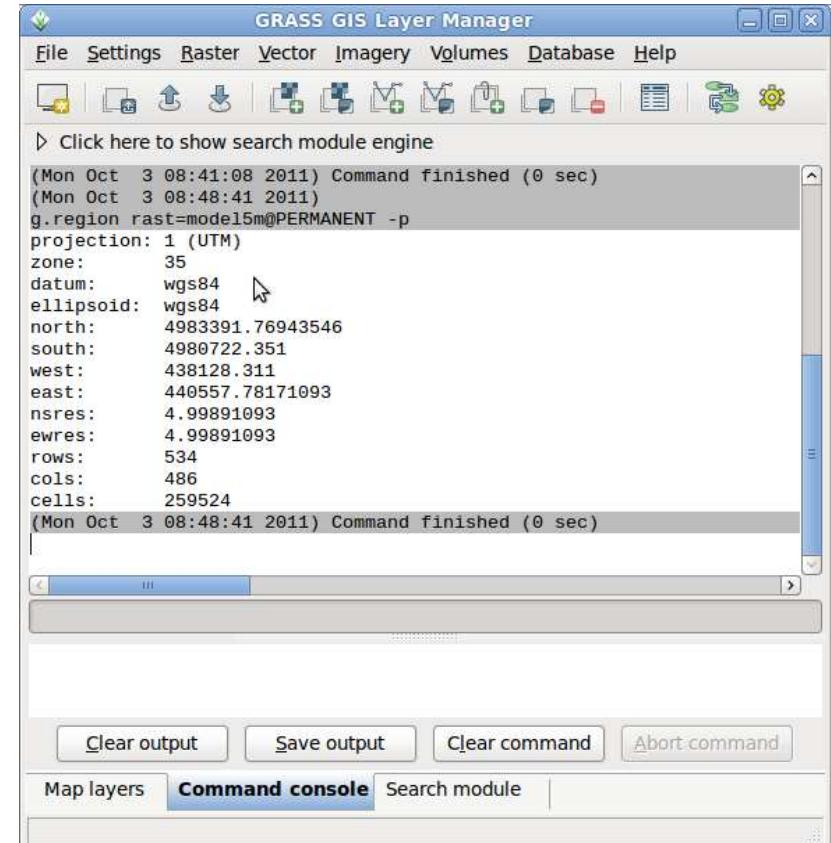
gaura umpluta



## Pregatirea MNAT pentru modelare



### Definirea zonei de procesare



In fereastra de manipulare (Layer Manager) click dreapta pe strat>

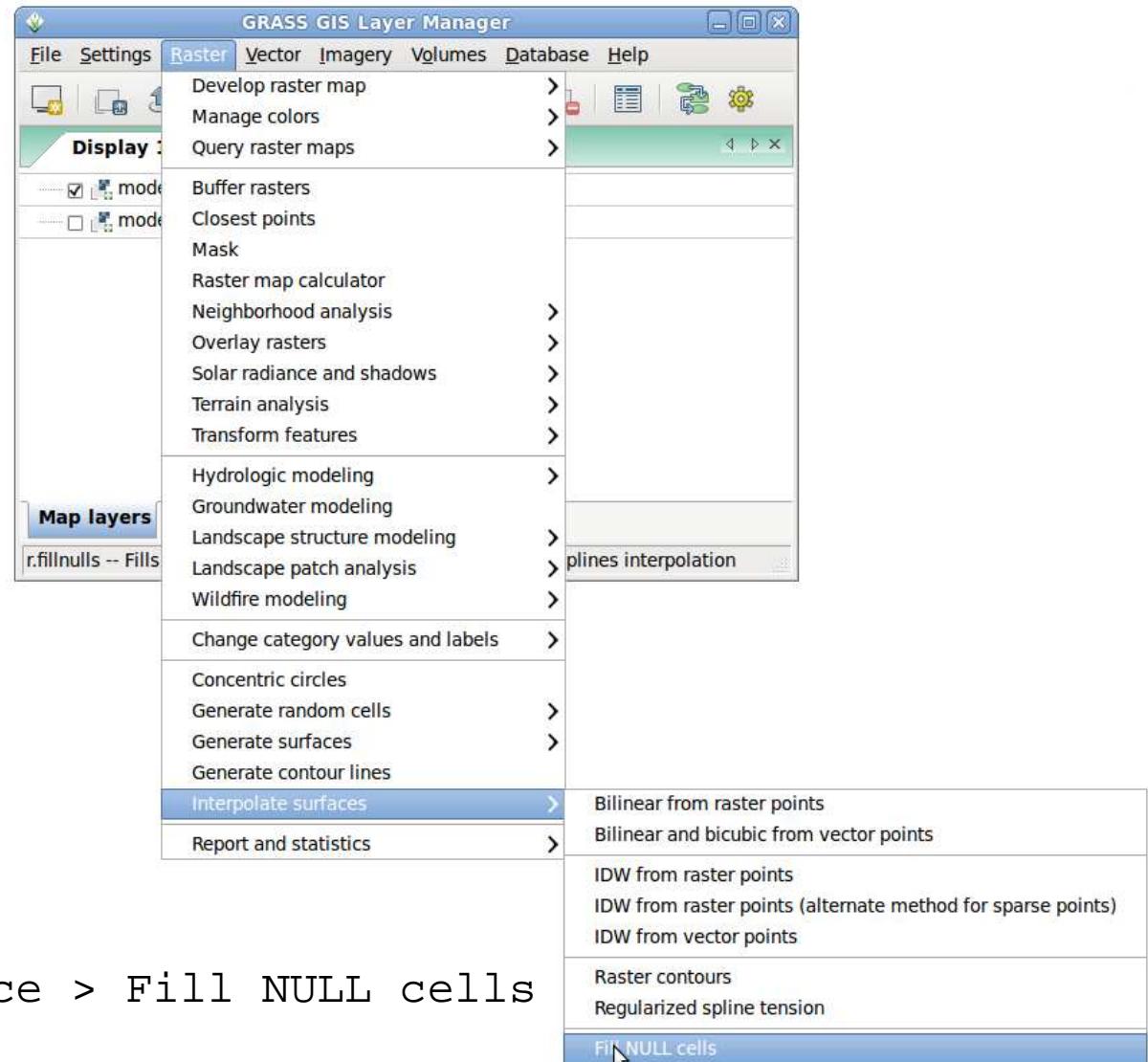
Set computational region from selected map(s)



# Pregatirea MNAT pentru modelare

Umplerea "golurilor"  
Nivelarea "vârfurilor"

**GRASS GIS > r.fillnulls**  
umește pixelii din zonele fără date



Se face cu opțiunea  
Raster > Interpolate surface > Fill NULL cells



# 4. Parametrii de bază ai MNAT



## Parametrii de bază ai MNAT

### Raster > Terrain analysis

Cumulative movement costs

Cost surface

Least cost route or flow

Shaded relief

Slope and aspect

Terrain parameters

Textural features

Visibility

Distance to features

Horizon angle



## Parametrii de bază ai MNAT

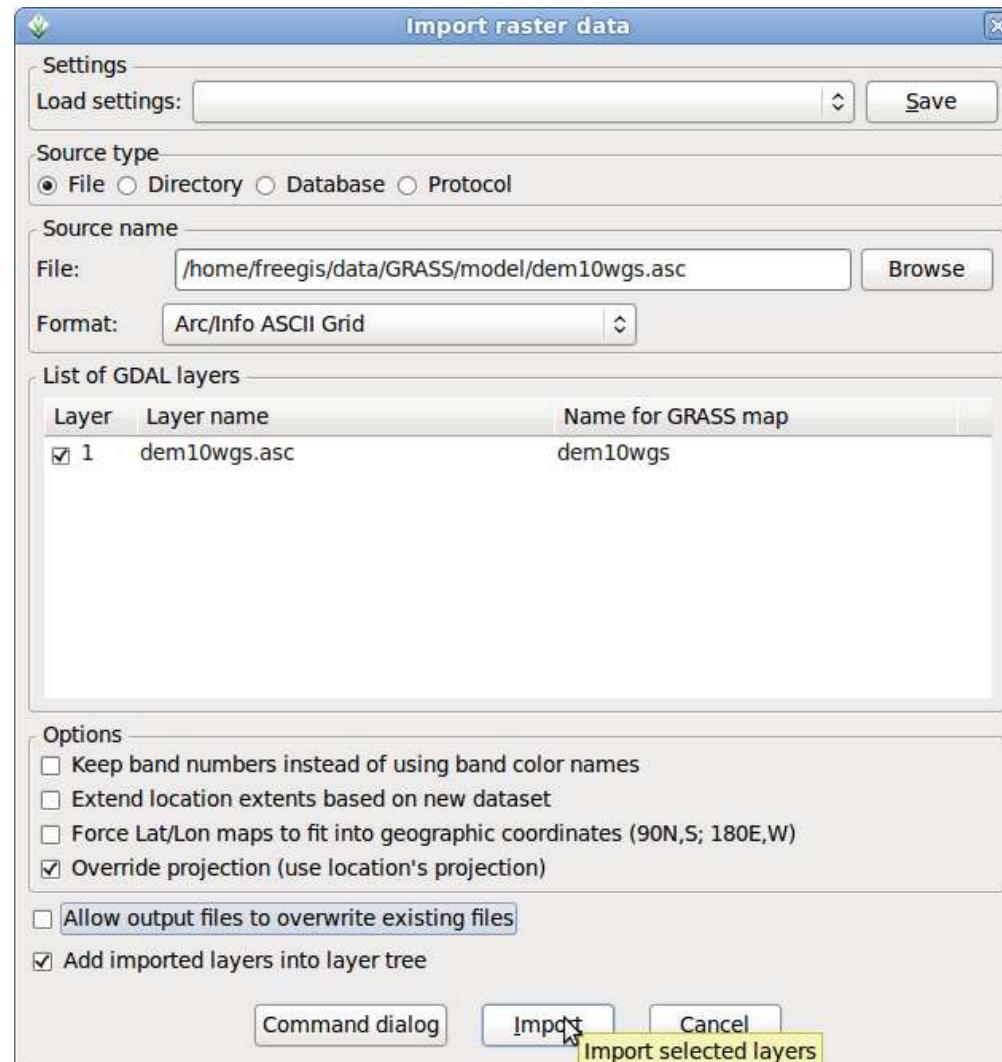
**Parametrii de baza ai MNA  
pot fi derivați direct dintr-un MNA fără a cunoaște zona reprezentată**

Parametru	Descriere
Hipsometria	Distribuția de valori altitudinale
Panta	Înclinarea suprafeței
Orientarea versanților	Direcția versanților în funcție de punctele cardinale
Curbura în plan (orizontală, tangențială)	Reflectă schimbarea orientării versanților și influentează convergența/divergența curgerii apei (Primul mecanism al acumulării)
Curbura în profil (verticală)	Reflectă schimbarea unghiului pantei care controlează deplasarea maselor în lungul acesteia (Al doilea mecanism al acumulării)
Exponerea vizuală	Întinderea zonei vizibile



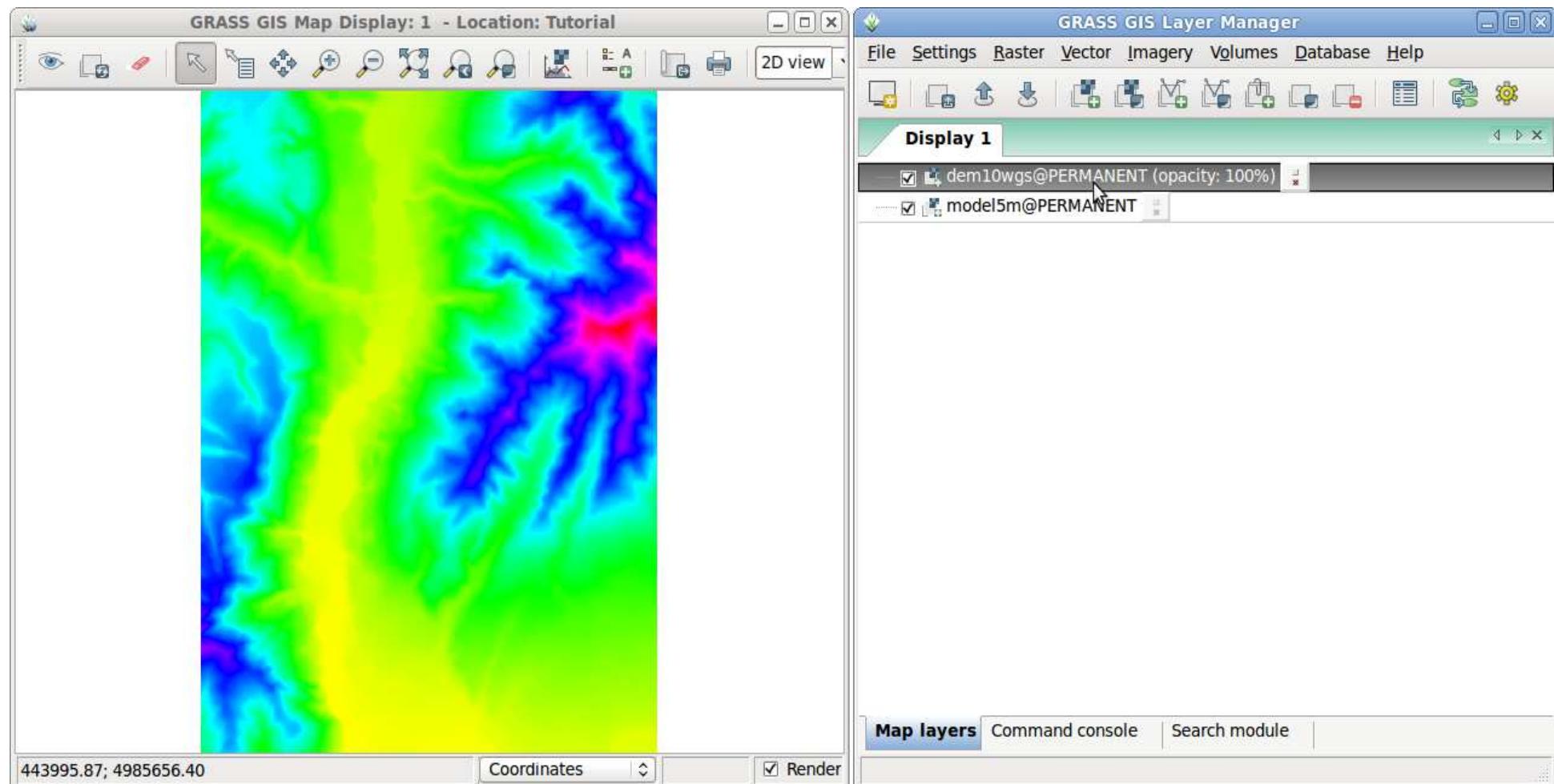
## Parametrii de bază ai MNAT

Importam zona de lucru : File > Import raster data > Common import formats



## Parametrii de bază ai MNAT

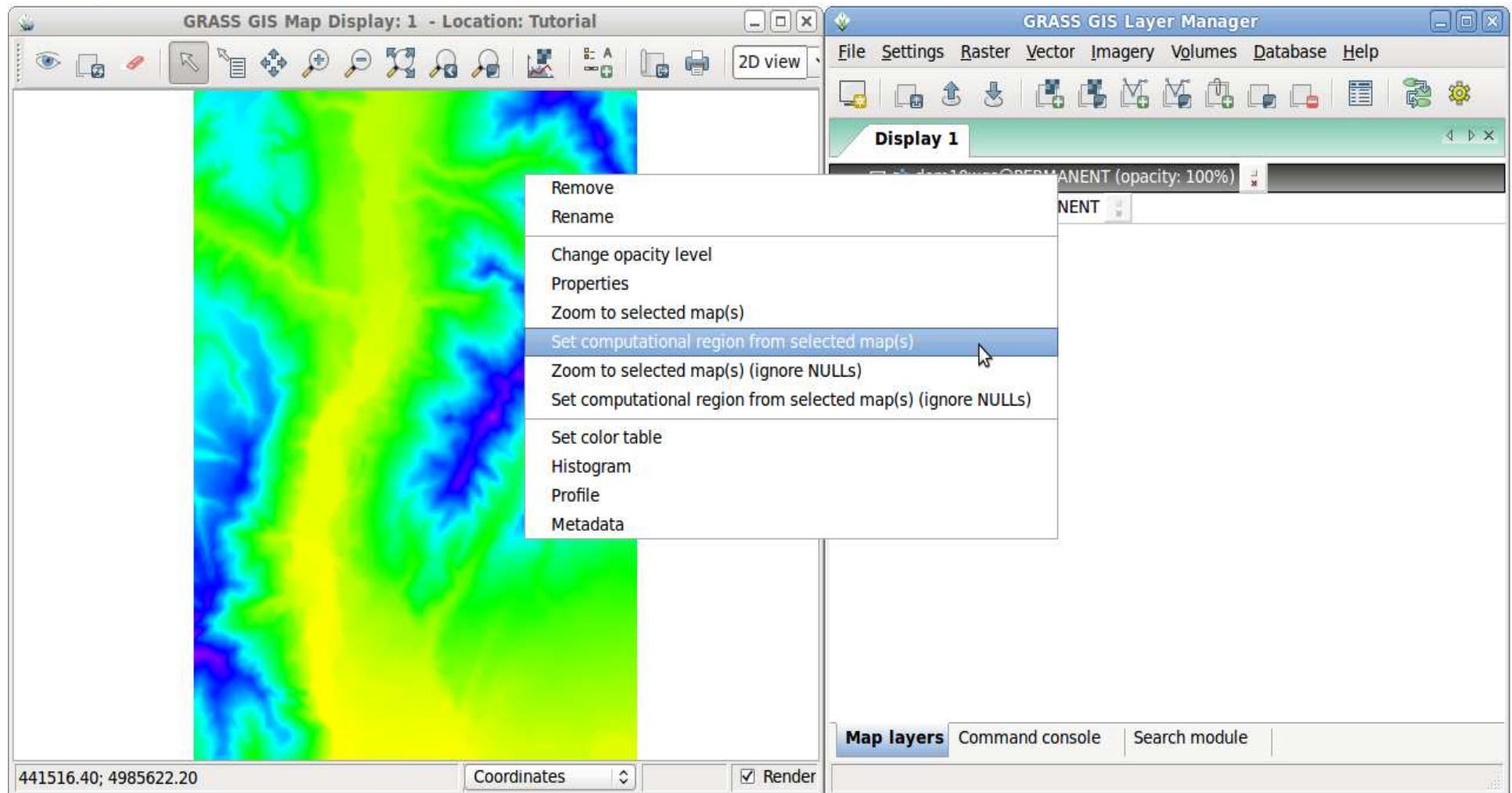
Importam zona de lucru : File > Import raster data > Common import formats





## Parametrii de bază ai MNAT

Importam zona de lucru : File > Import raster data > Common import formats

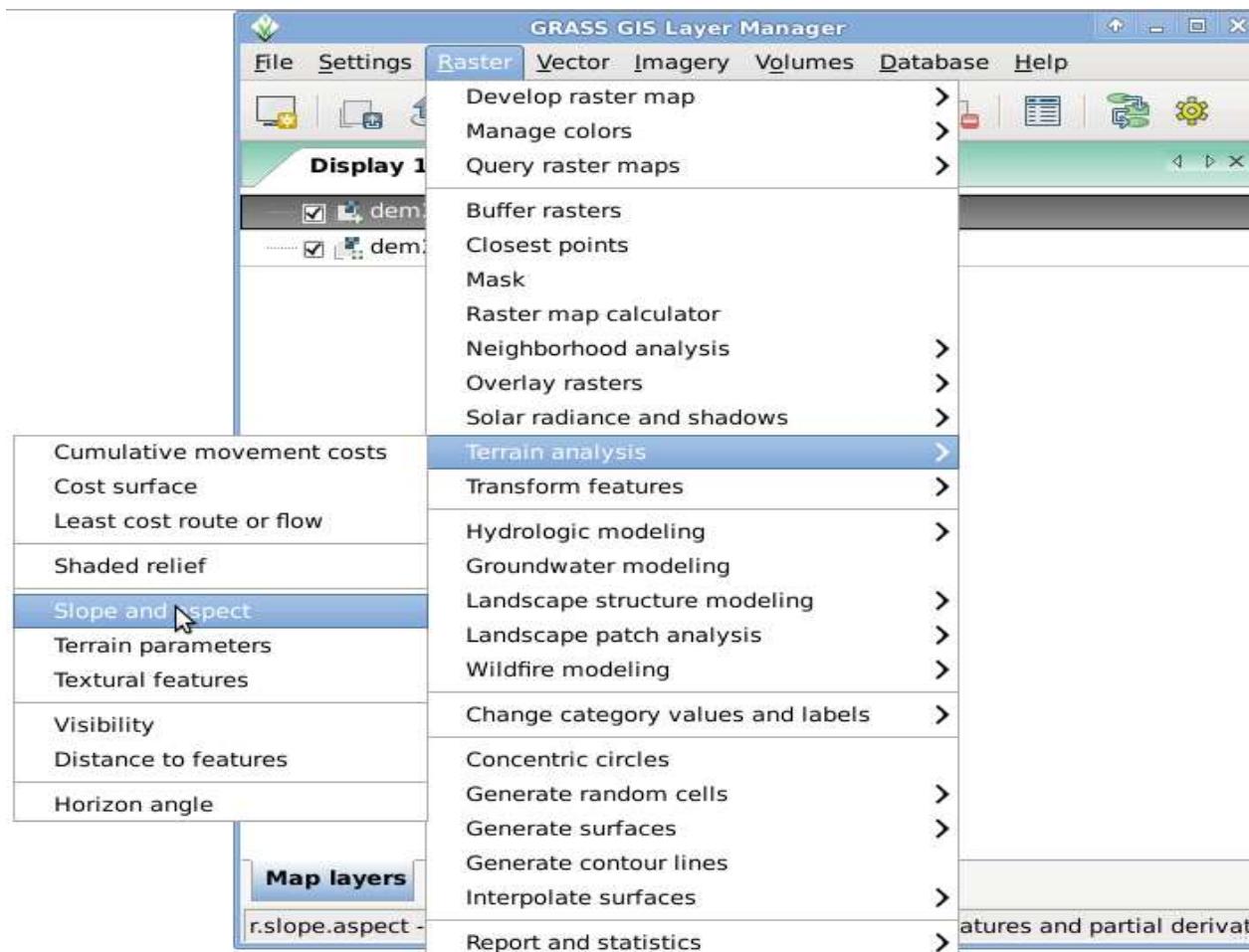




## Parametrii de bază ai MNAT

### Interogarea datelor raster – harti geomorfologice

Executam: Raster > Terrain analysis > Slope and Aspect

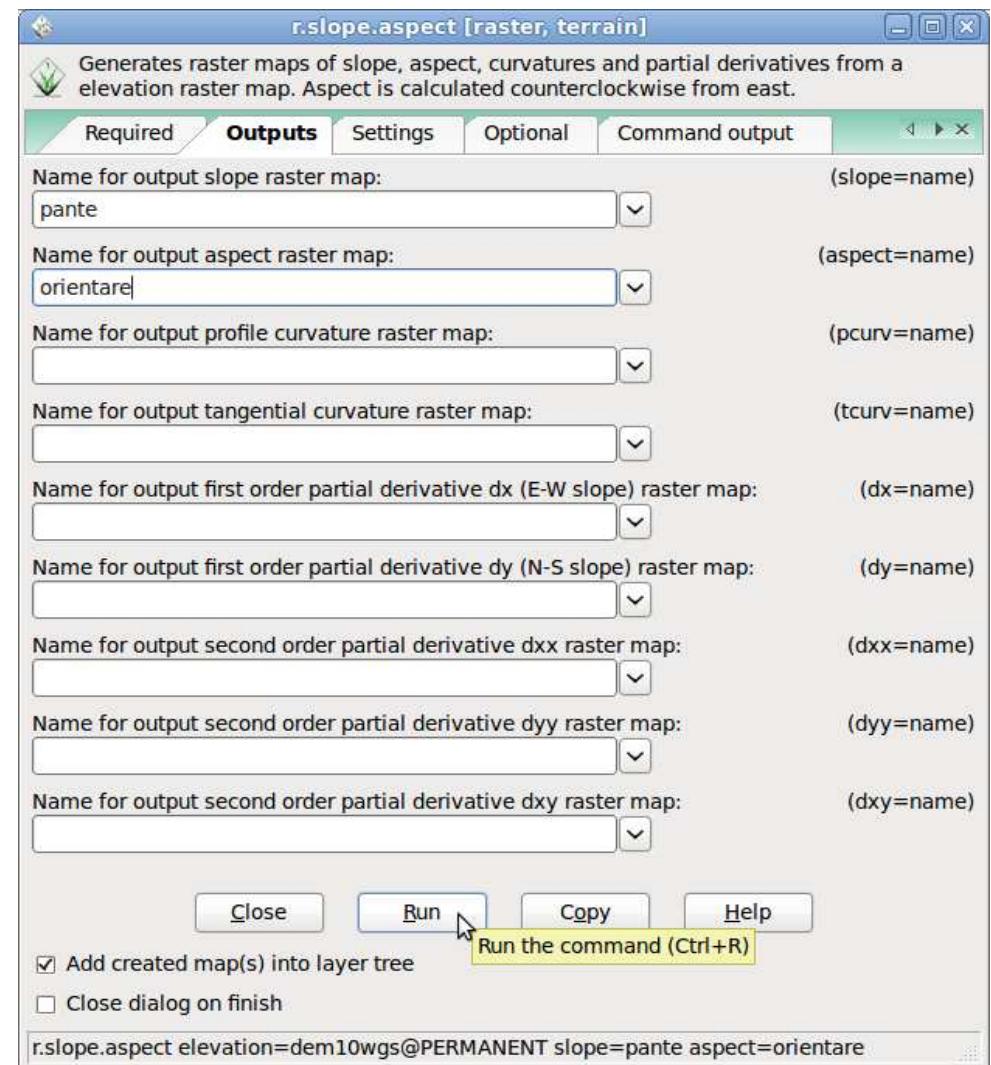




## Parametrii de bază ai MNAT

### Interogarea datelor raster – harti geomorfologice

Completam cerințele obligatorii: la name of elevation raster map alegem model5m@Tutorial , numele stratelor de ieșire...

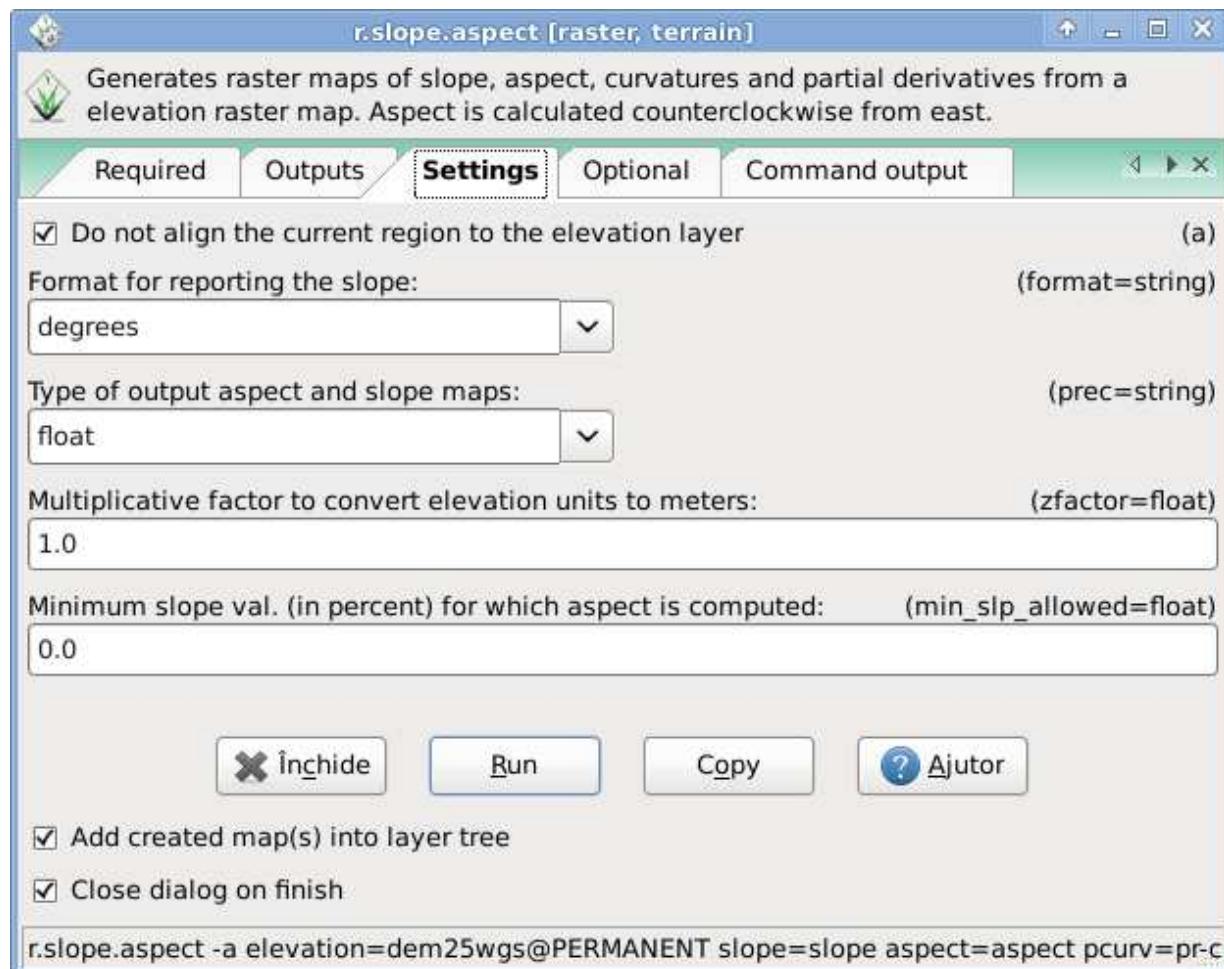




## Parametrii de bază ai MNAT

### Interogarea datelor raster – harti geomorfologice

... si parametrii de calcul: Settings



Rulam comanda...

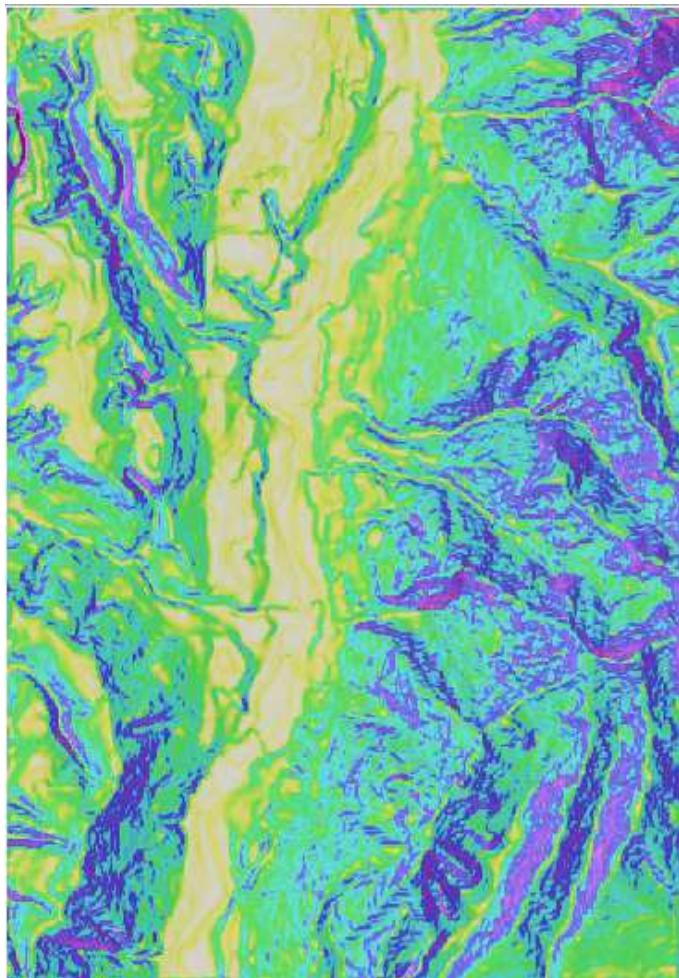


## Parametrii de bază ai MNAT

Rezultate

### Interogarea datelor raster – harti geomorfologice

Pantele



Expozitia versantilor





# Parametrii de bază ai MNAT

**Parametrii de baza ai MNA  
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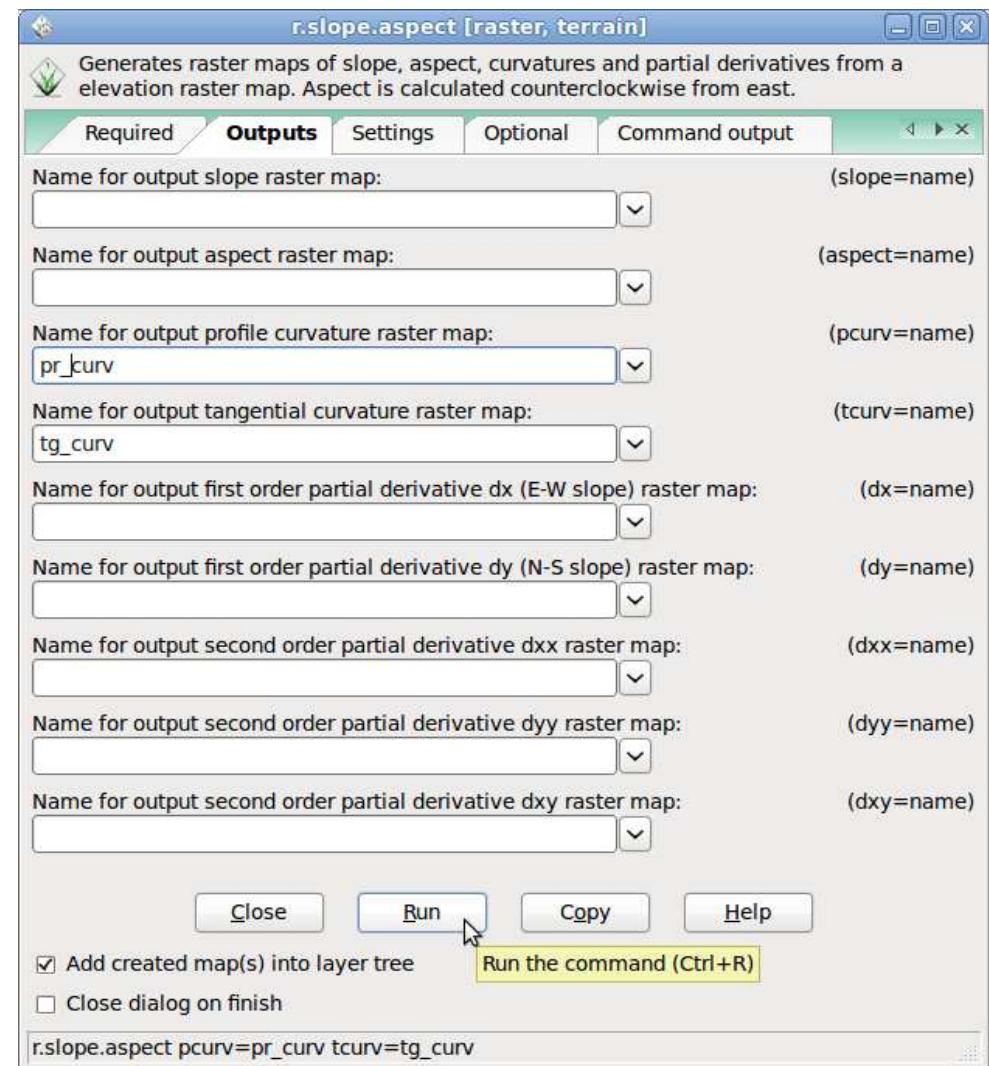
Parametru	Descriere
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Exponerea vizuală	Întinderea zonei vizibile



## Parametrii de bază ai MNAT

### Interogarea datelor raster – harti geomorfologice

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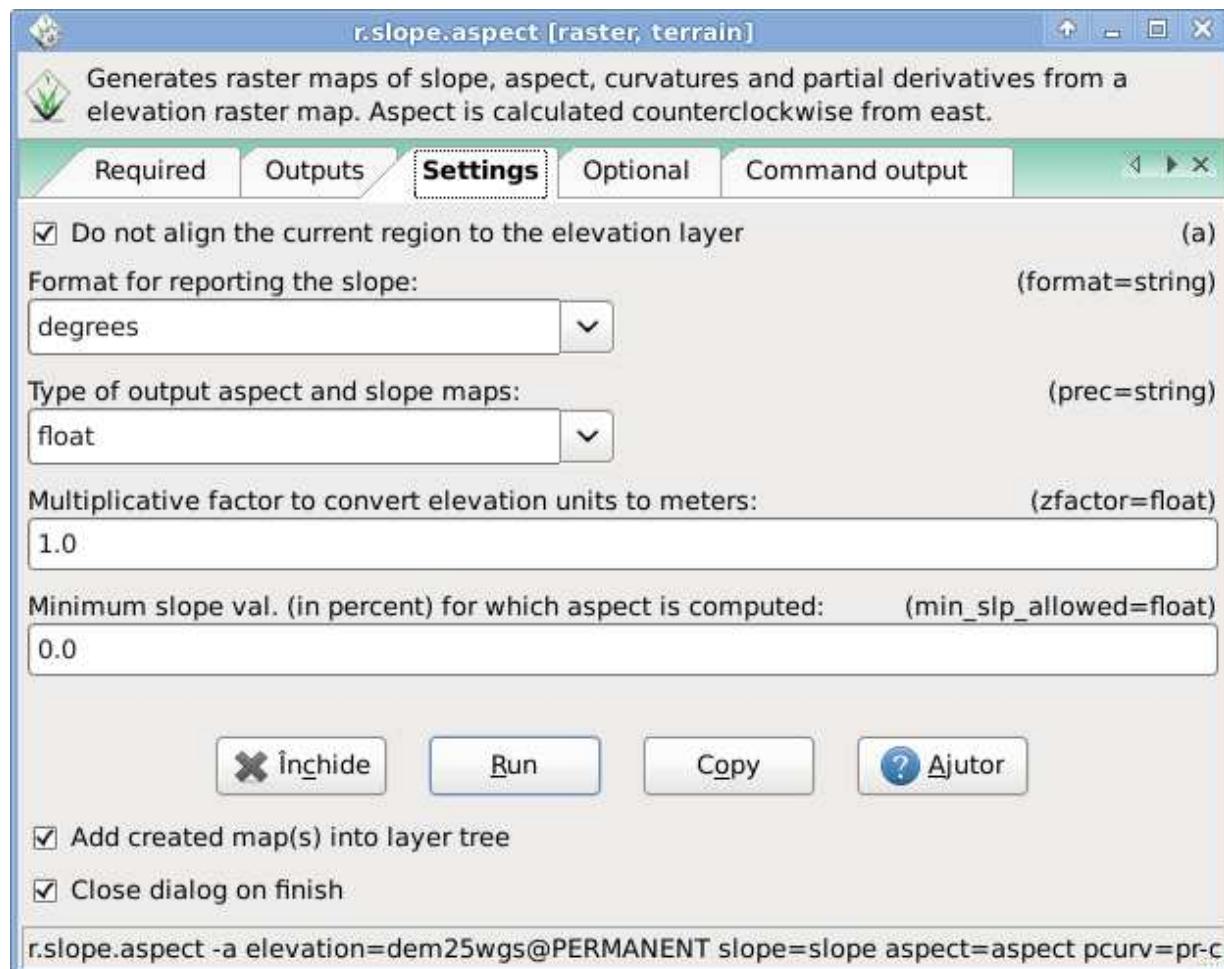




## Parametrii de bază ai MNAT

### Interogarea datelor raster – harti geomorfologice

... si parametrii de calcul: Settings



Rulam comanda...

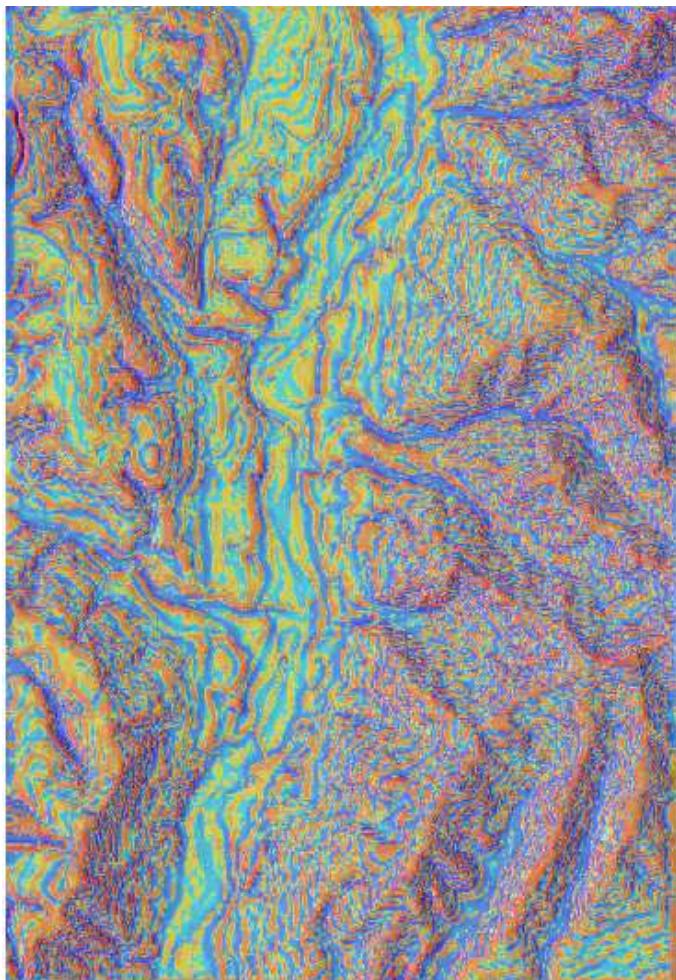


## Parametrii de bază ai MNAT

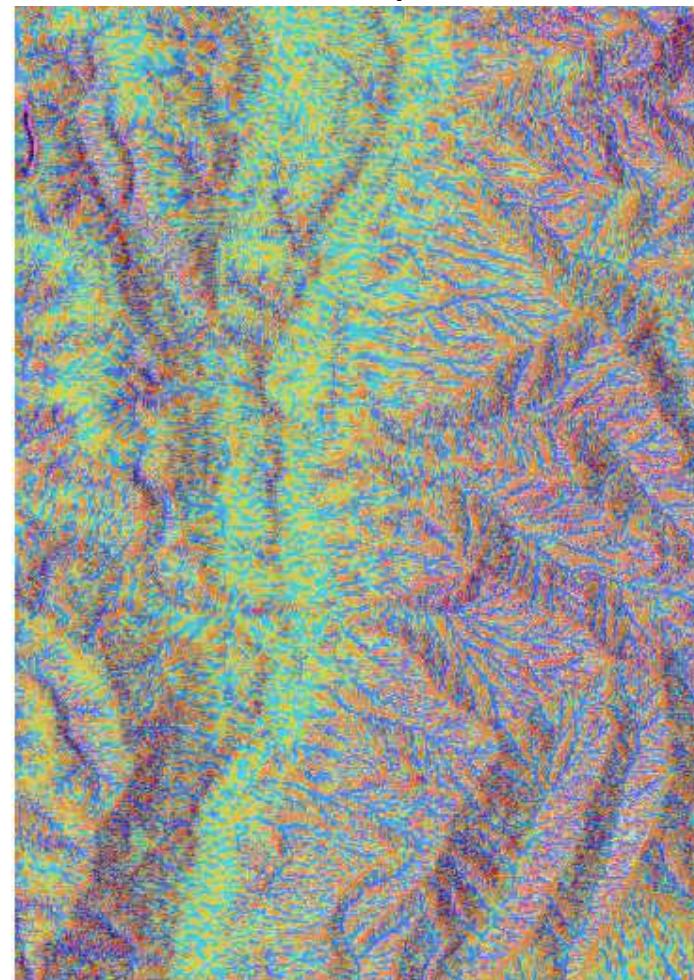
Rezultate

### Interogarea datelor raster – harti geomorfologice

Curbura in plan



Curbura in profil





## Parametrii de bază ai MNAT

**Parametrii de baza ai MNA  
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Curbura în profil (verticală)	Reflectă schimbarea unghiului pantei care controlează deplasarea maselor în lungul acesteia (Al doilea mecanism al acumulării)
Exponerea vizuală	Întinderea zonei vizibile



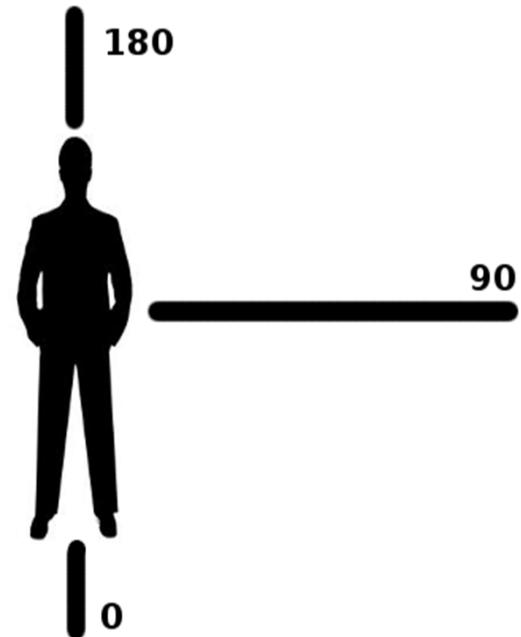
## Parametrii de bază ai MNAT

### Interogarea datelor raster – vizibilitatea

r.los - Line-of-sight

r.los generează o hartă raster, în care celulele care sunt vizibile dintr-o poziție a observatorului sunt marcate cu unghiul vertical (în grade).

Valoarea 0 (zero) este direct în jos,  
90 este la orizontală și 180 este deasupra observatorului.





## Parametrii de bază ai MNAT

### Interogarea datelor raster – vizibilitatea

The screenshot shows two instances of the QGIS processing dialog for the 'r.los [raster]' tool.

**Left Dialog (Default Configuration):**

- Required:** Name of elevation raster map: dem10wgs@PERMANENT
- Optional:** Name for output raster map: Visibility
- Coordinate identifying the viewing position:** 439532.82,4980936.85
- Buttons:** Close, Run, Copy
- Checkboxes:** Add created map(s) into layer tree (checked), Close dialog on finish (unchecked)
- Command Line:** r.los --overwrite input=dem10wgs@PERMANENT output=Visibility

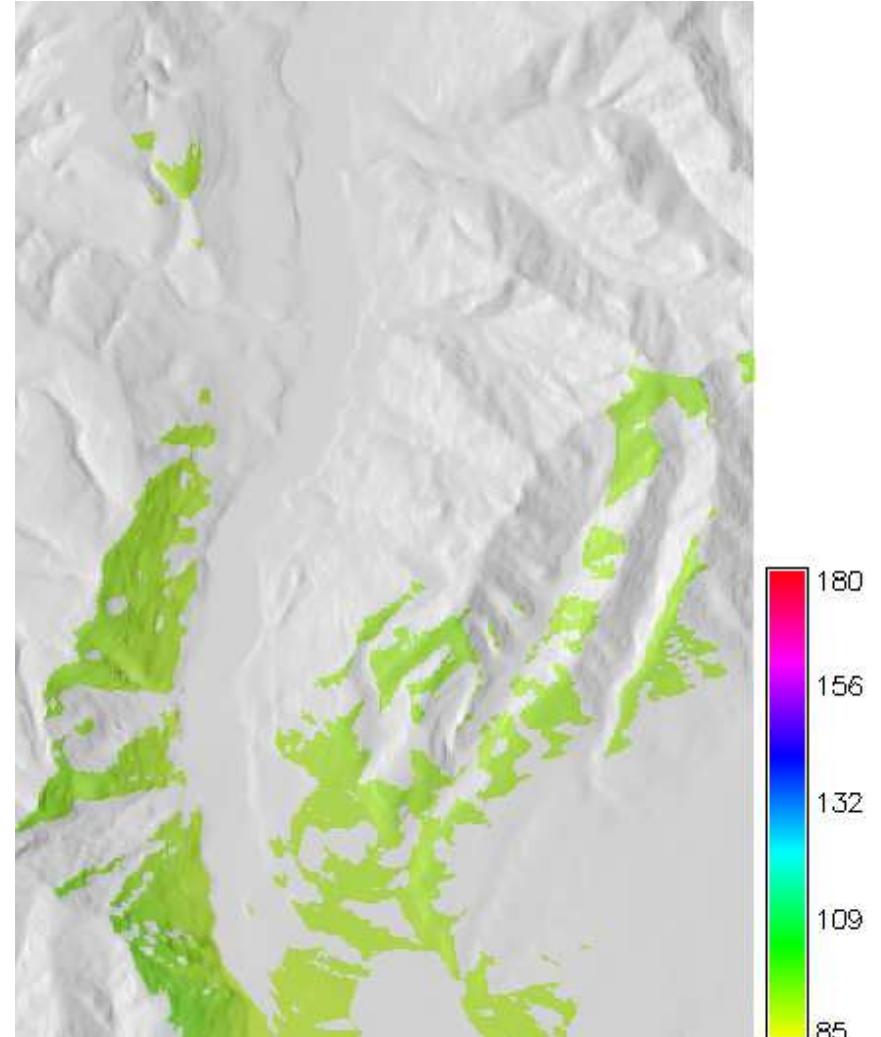
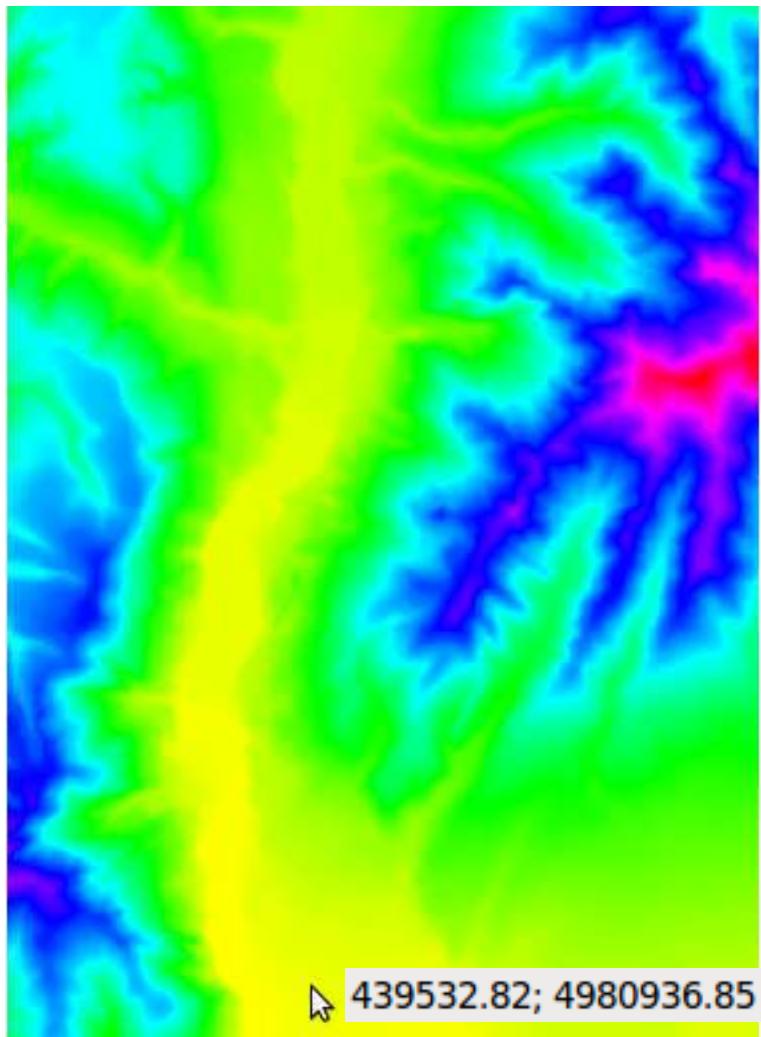
**Right Dialog (Advanced Configuration):**

- Required:** Name of elevation raster map: dem10wgs@PERMANENT
- Optional:** Consider earth curvature (current ellipsoid) (unchecked), Allow output files to overwrite existing files (checked), Verbose module output (unchecked), Quiet module output (unchecked)
- Binary (1/0) raster map to use as a mask:** (patt\_map=name)
- Viewing position height above the ground:** (obs\_elev=float) 1.75
- Maximum distance from the viewing point (meters) (valid range 0-5000000):** (max\_dist=float) 10000
- Buttons:** Close, Run, Copy, Help
- Checkboxes:** Add created map(s) into layer tree (checked), Close dialog on finish (unchecked)
- Command Line:** r.los --overwrite input=dem10wgs@PERMANENT output=Visibility coordinate=439532.82,4980936.85



## Parametrii de bază ai MNAT

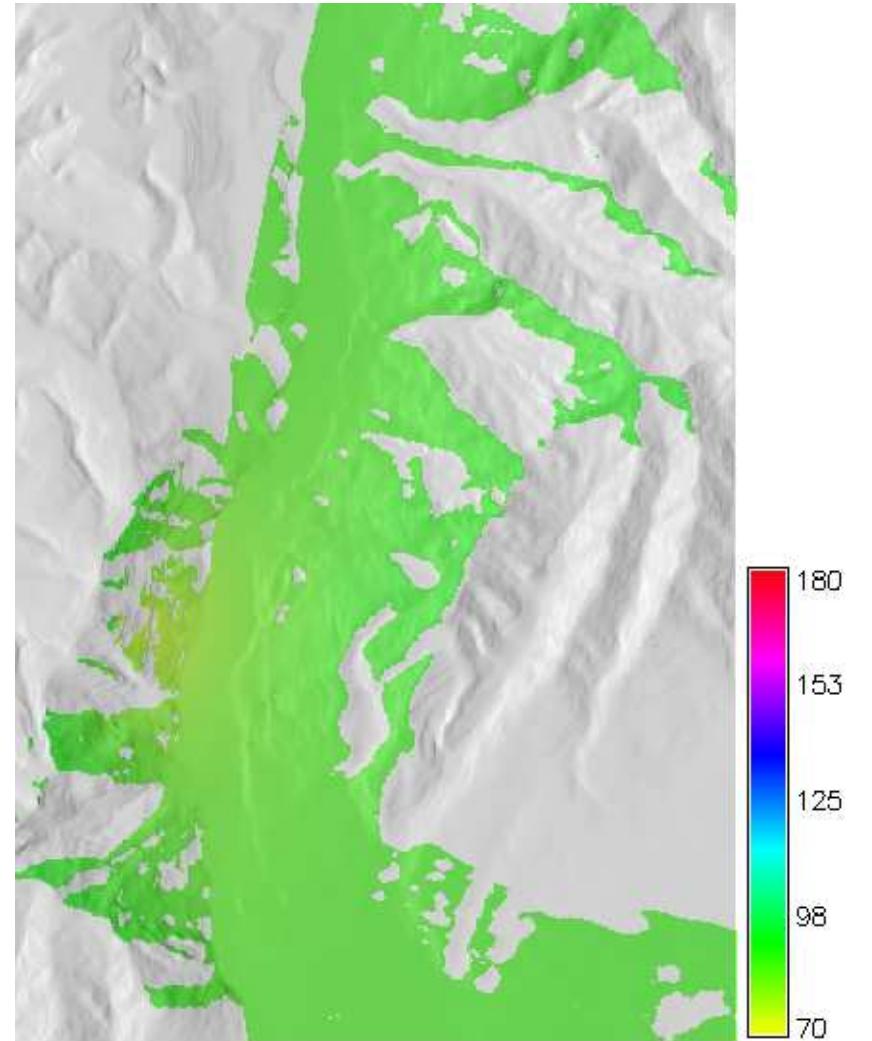
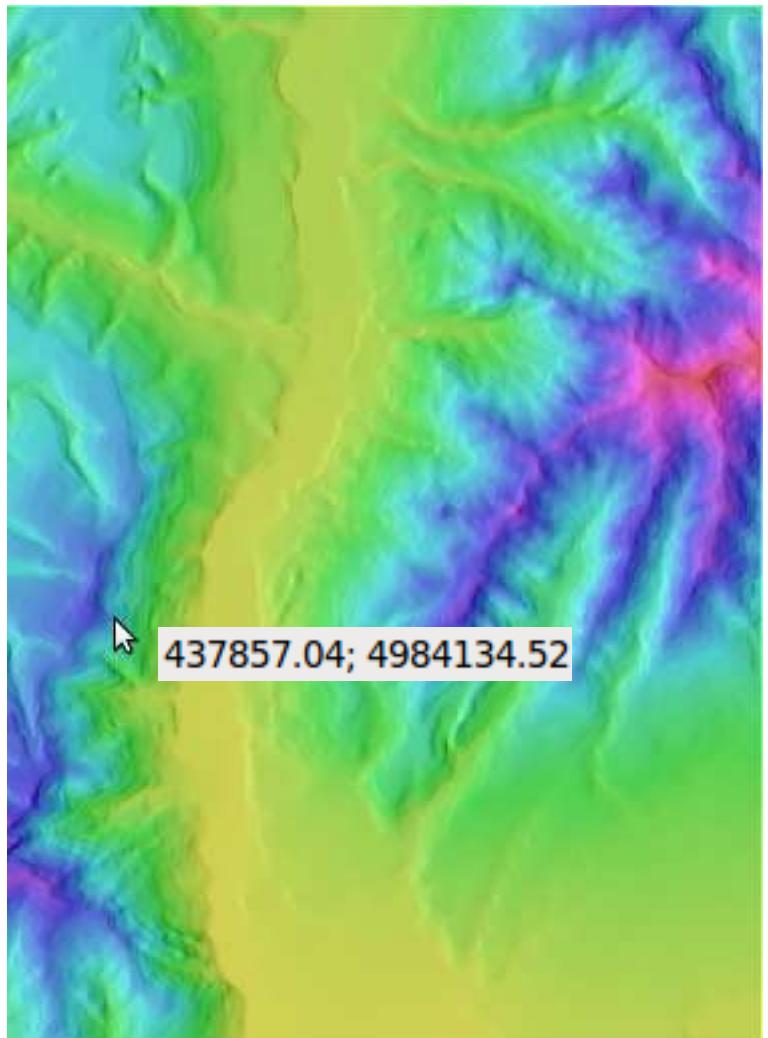
Interrogarea datelor raster – vizibilitatea





## Parametrii de bază ai MNAT

Interrogarea datelor raster – vizibilitatea





## Parametrii de bază ai MNAT

### Caracterizarea geomorfologică a MNAT

Modulul r.param.scale extrage forme de relief de baza din MNAT cum ar fi varfurile, interfluviile, trecatorile, vaile etc.

Acest modul este bazat pe lucrarea lui Joo Wood

(1996 - The geomorphological characterisation of digital elevation models.

Ph.D. Thesis. Department of Geography, University of Leicester,  
Leicester, UK, 185 pp.).

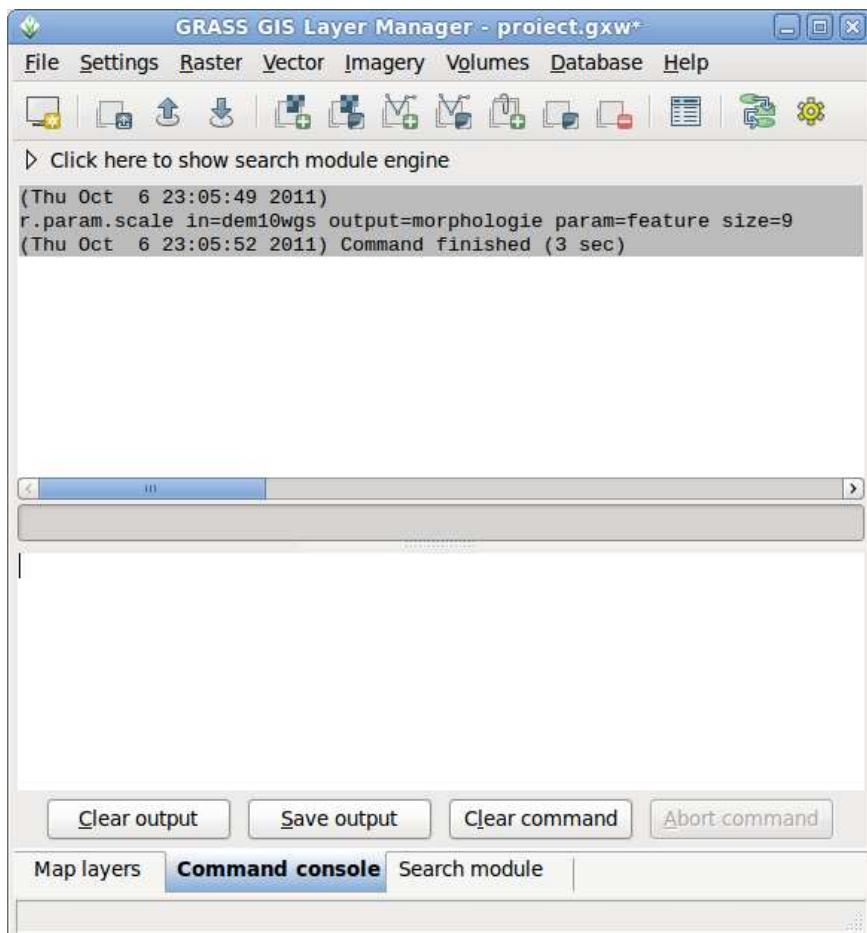


## Parametrii de bază ai MNAT

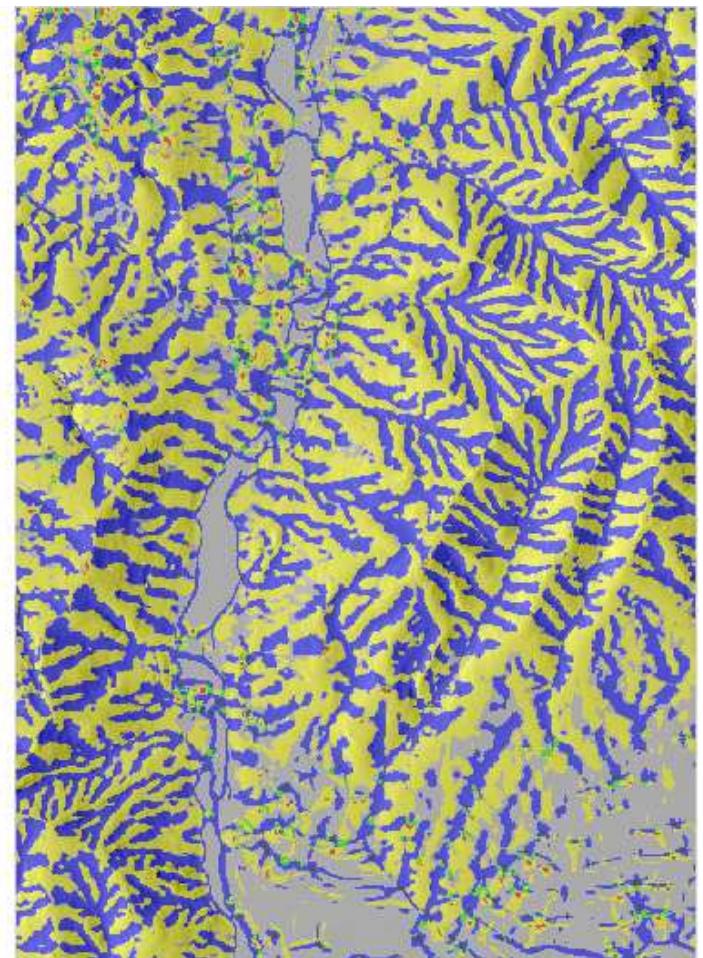
### Caracterizarea geomorfologică a MNAT

Scriem în **Command console**:

```
r.param.scale in=dem10wgs output=morphologie param=feature size=9
```



- 0
- 1) Planar
- 2) Pit
- 3) Channel
- 4) Pass (saddle)
- 5) Ridge
- 6) Peak





# 5. Parametrii MNAT și elemente de hidrologie



## Elemente de hidrologie

### Raster > Hydrologic modeling

[Carve stream channels](#)

[Fill lake](#)

[Depressionless map and flowlines](#)

[Flow accumulation](#)

[Flow lines](#)

[SIMWE Overland flow modeling](#)

[SIMWE Sediment flux modeling](#)

[Topographic index map](#)

[TOPMODEL simulation](#)

[Watershed subbasins](#)

[Watershed analysis](#)

[Watershed basin creation](#)



## Elemente de hidrologie

Modelarea hidrologică este una dintre cele mai importante aplicații ale GRASS GIS.

### Elemente analizate

- 1. Directia de scurgere (flow direction)**
- 2. Acumularea scurgerii (flow accumulation)**
- 3. Indicele de convergenta topografica (topographic convergence index)**
- 4. Analiza bazinelor hidrografice**



## Elemente de hidrologie

### 1. Directia de scurgere (flow direction)

Determină directia de curgere a apei pe un versant.

### 2. Acumularea scurgerii (flow accumulation)

Determină regiunea acoperita de apa din precipitatii, ninsoare, etc.

Sinonime: Contributing area, upslope area

### 3. Indicele de convergenta topografica (topographic convergence index)

Logaritmul raportului dintre acumularea scurgerii și panta locală



## Elemente de hidrologie

r.terraflow - Flow computation for massive grids (float version).

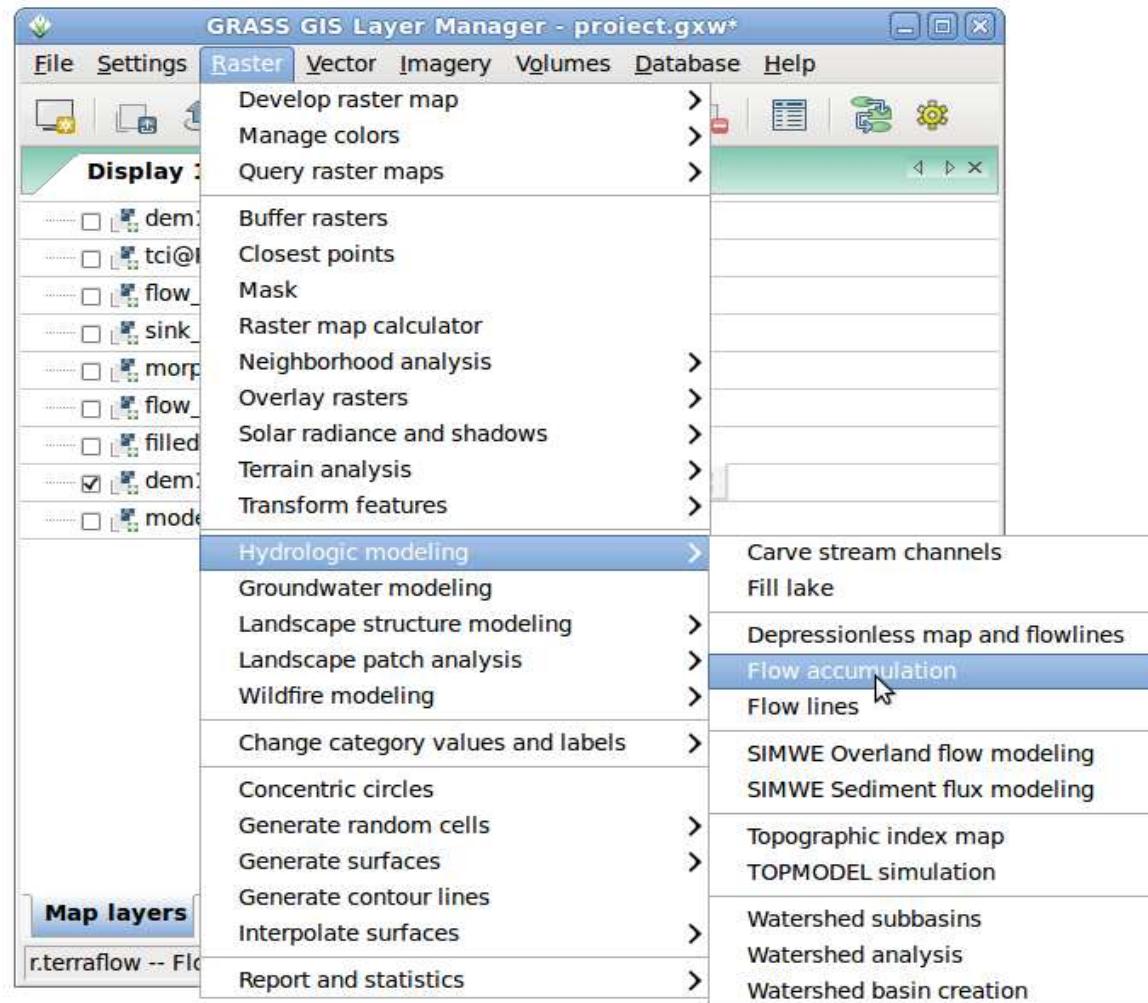
r.terraflow are ca intrare un model date raster de elevatie (MNAT) și calculează direcția de curgere și acumularea fluxului, precum și zonele inundate, "gropile" din bazinel hidrografice și TCI de (indicele de convergență topografica) .

Executam: Raster > Hydrologic modeling > Flow accumulation



## Elemente de hidrologie

Executam: Raster > Hydrologic modeling > Flow accumulation





## Elemente de hidrologie

r.terraflow

The screenshot shows two side-by-side instances of the r.terraflow dialog box. Both instances have a title bar 'r.terraflow [raster]' and a main panel for 'Flow computation for massive grids'.

**Left Instance (Older Version):**

- Required:** Name of elevation raster map: dem10wgs@PERMANENT
- Optional:** Name for output filled (flooded) elevation: filled
- Optional:** Name for output flow direction raster: flow\_dir
- Optional:** Name for output sink-watershed raster: sink\_wat
- Optional:** Name for output flow accumulation raster: flow\_acc
- Optional:** Name for output topographic convergence index: tci

**Buttons at the bottom:** Close, Run, Copy, Help.

**Checkboxes at the bottom:** Add created map(s) into layer tree (checked), Close dialog on finish (unchecked).

**Text at the bottom:** r.terraflow elevation=dem10wgs@PERMANENT filled=filled direction=flow\_dir swat

**Right Instance (Newer Version):**

- Required:** Name of elevation raster map: dem10wgs@PERMANENT
- Optional:** Name for output filled (flooded) elevation: filled
- Optional:** Name for output flow direction raster: flow\_dir
- Optional:** Name for output sink-watershed raster: sink\_wat
- Optional:** Name for output flow accumulation raster: flow\_acc
- Optional:** Name for output topographic convergence index: tci

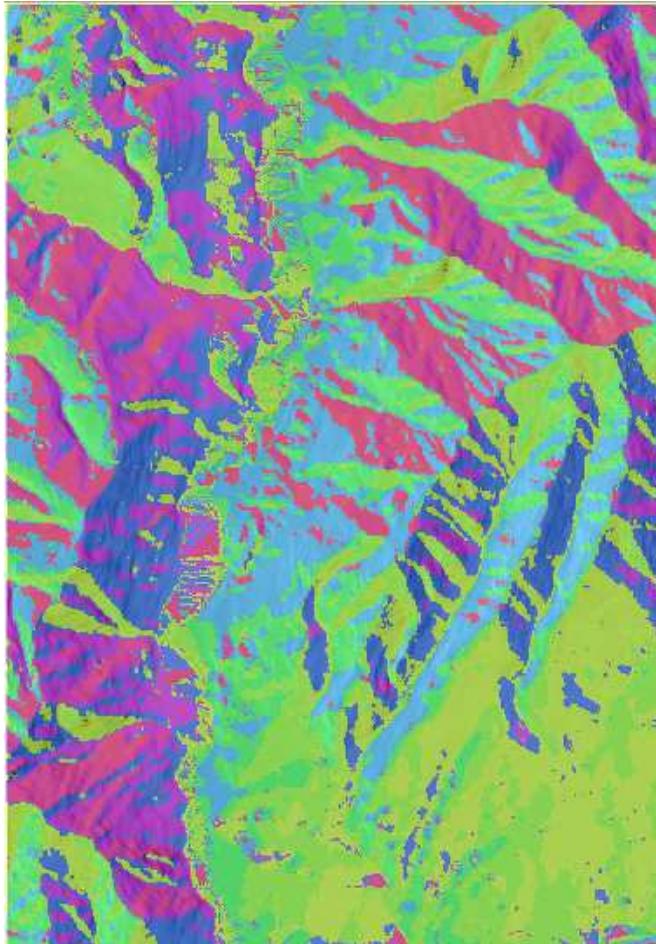
**Checkboxes at the bottom:** Add created map(s) into layer tree (checked), Close dialog on finish (unchecked).

**Text at the bottom:** r.terraflow elevation=dem10wgs@PERMANENT filled=filled direction=flow\_dir swat

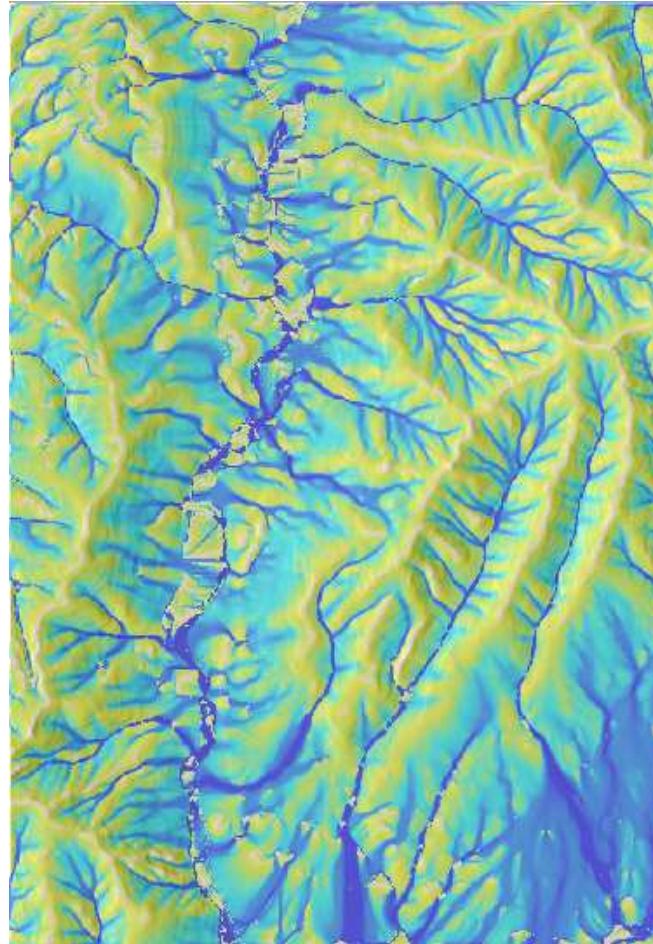


## Elemente de hidrologie

**Directia de scurgere**



**Acumularea scurgerii**



**Indicele de convergenta topografica**

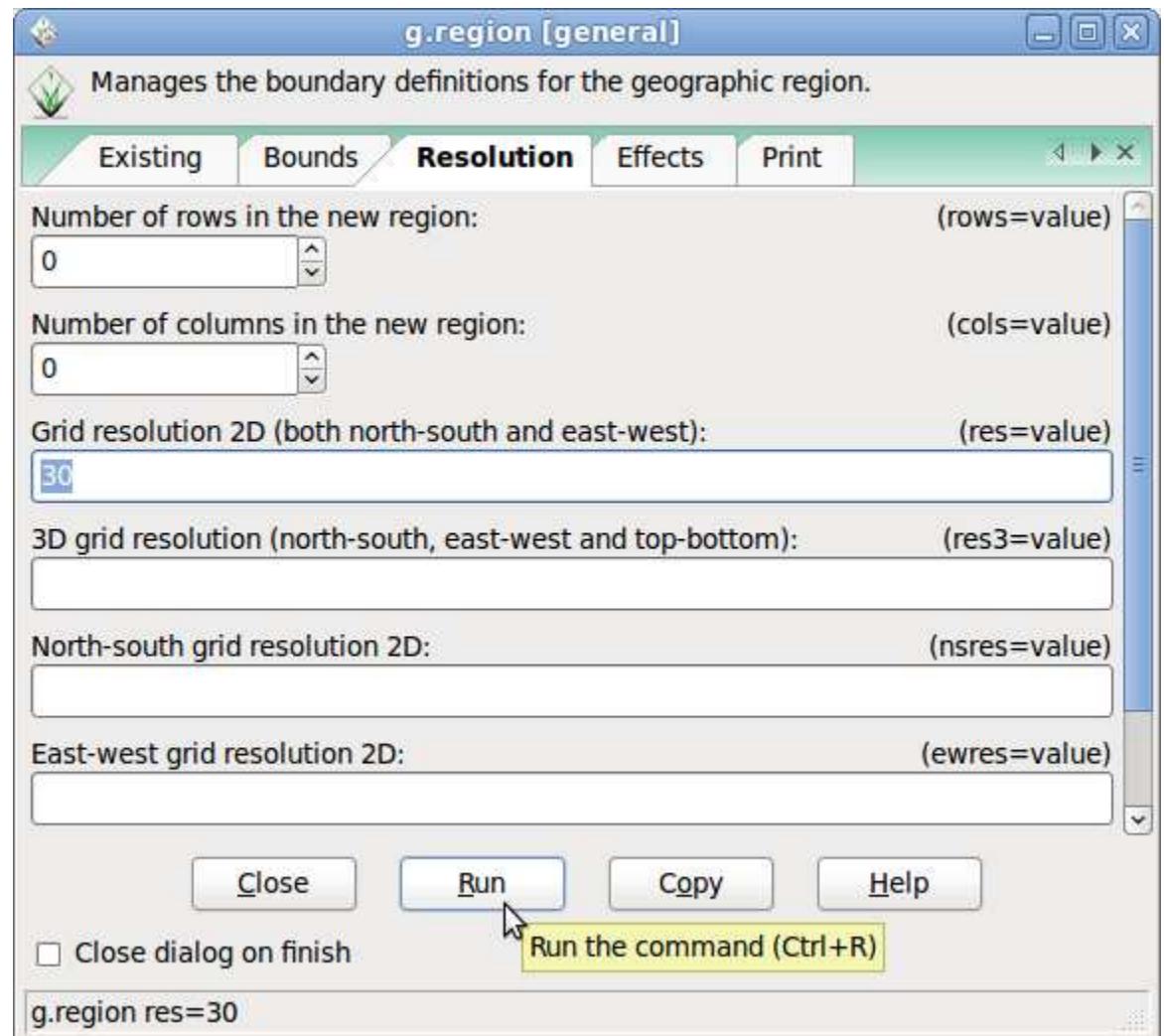




## Elemente de hidrologie

### 4. Analiza bazinelor hidrografice

Stabilim rezolutia regiunii cu  
g.region  
(stabilim valoarea 30 de metri,  
în tab-ul Resolution și  
rulam comanda).





## Elemente de hidrologie

### 4.1. Extragerea bazinelor hidrografice

r.watershed - Watershed basin analysis program

The figure displays three windows of the 'r.watershed' program, each showing a different tab of the dialog box:

- Required Tab:** Shows input parameters: 'Input map: elevation on which entire analysis' set to 'dem10wgs@PERMANENT'. Other inputs include 'Input map: locations of real depressions', 'Input map: amount of overland flow per cell', 'Input map or value: percent of disturbed land, for', 'Input map: terrain blocking overland surface flow', 'Input value: minimum size of exterior watershed' set to '1000', and 'Input value: maximum length of surface flow, for'.
- Input\_options Tab:** Shows additional input parameters: 'Input map: drainage direction' and 'Output map: unique label for each watershed basin' set to 'bazin'.
- Output\_options Tab:** Shows output parameters: 'Output map: number of cells that drain through each cell' set to 'acumulare' (with '(accumulation=name)' note), 'Output map: stream segments' set to 'rauri' (with '(drainage=name)' note), 'Output map: each half-basin is given a unique value', 'Output map: useful for visual display of results', 'Output map: slope length and steepness (LS) factor for USLE', and 'Output map: slope steepness (S) factor for USLE'.

At the bottom of each window, there are 'Close', 'Run', and 'Help' buttons. Checkboxes for 'Add created map(s) into layer tree' and 'Close dialog on finish' are also present.

Command lines at the bottom of each window:

- Left: r.watershed elevation=dem10wgs@PERMANENT
- Middle: r.watershed --overwrite elevation=dem10wgs@P
- Right: r.watershed --overwrite elevation=dem10wgs@PERMANENT accumulation=acumulare b



## Elemente de hidrologie

### 4.1. Extragerea bazinelor hidrografice



n=1000

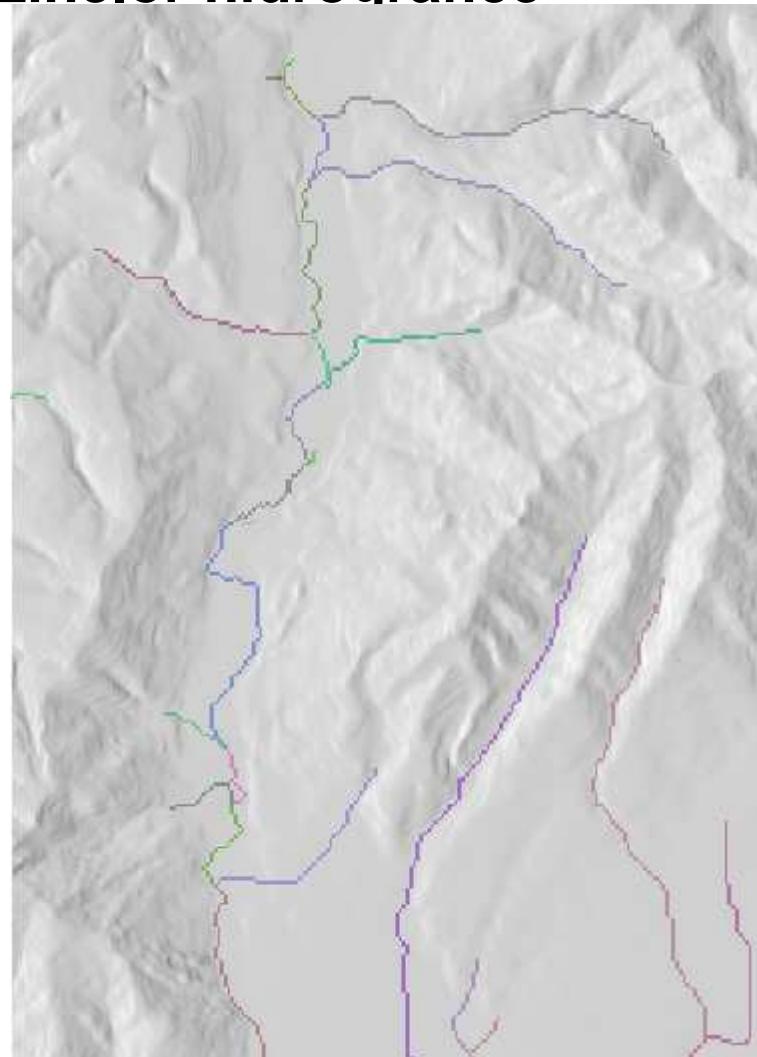
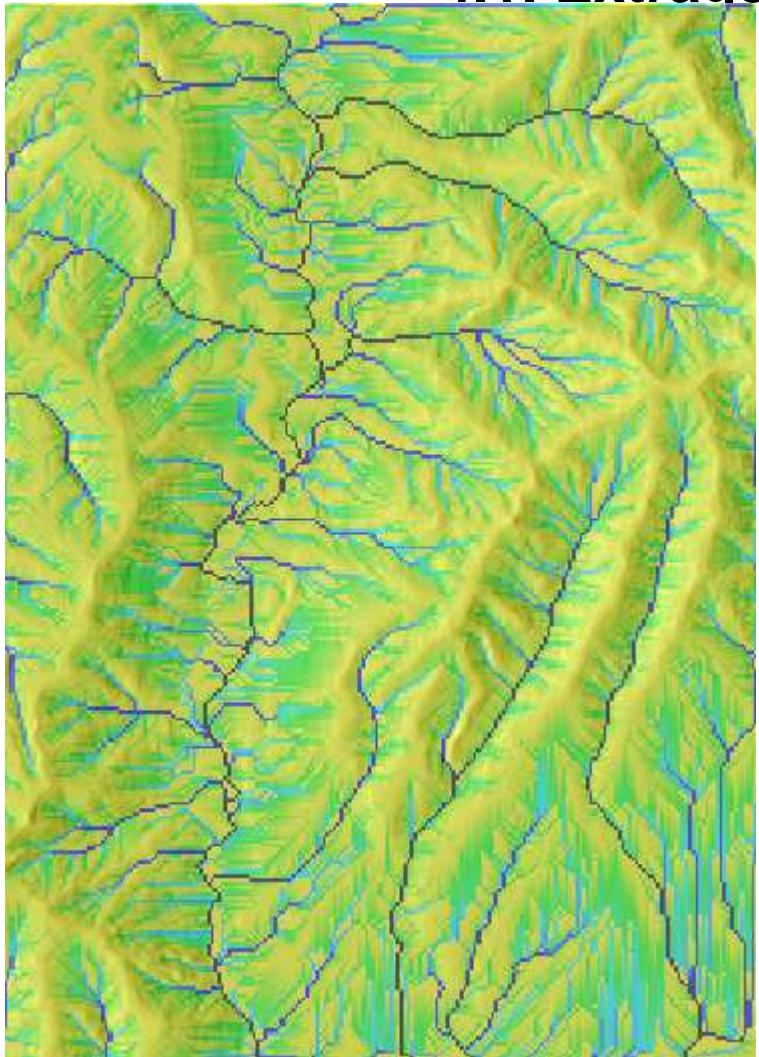


n=5000



## Elemente de hidrologie

### 4.1. Extragerea bazinelor hidrografice

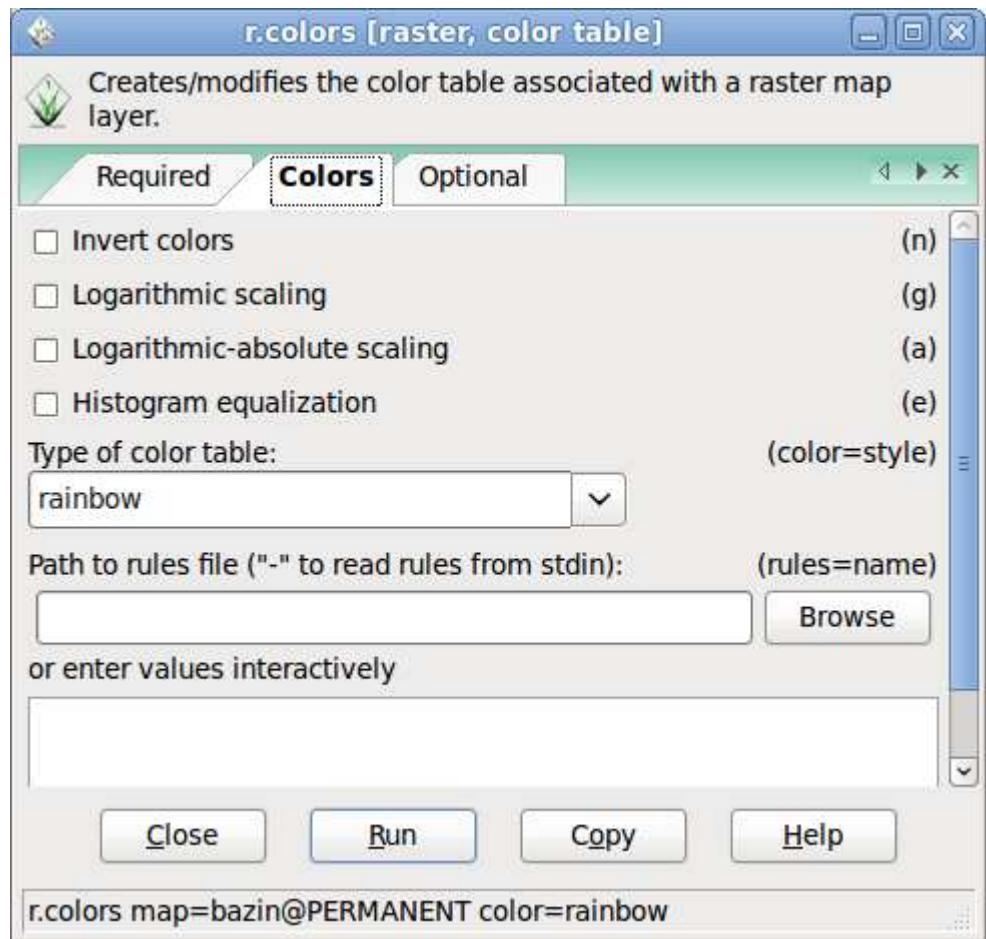




## Elemente de hidrologie

### 4.1. Extragerea bazinelor hidrografice

Utilizand modulul `r.colors` (Raster -> Manage colors -> Color tables),





## Elemente de hidrologie

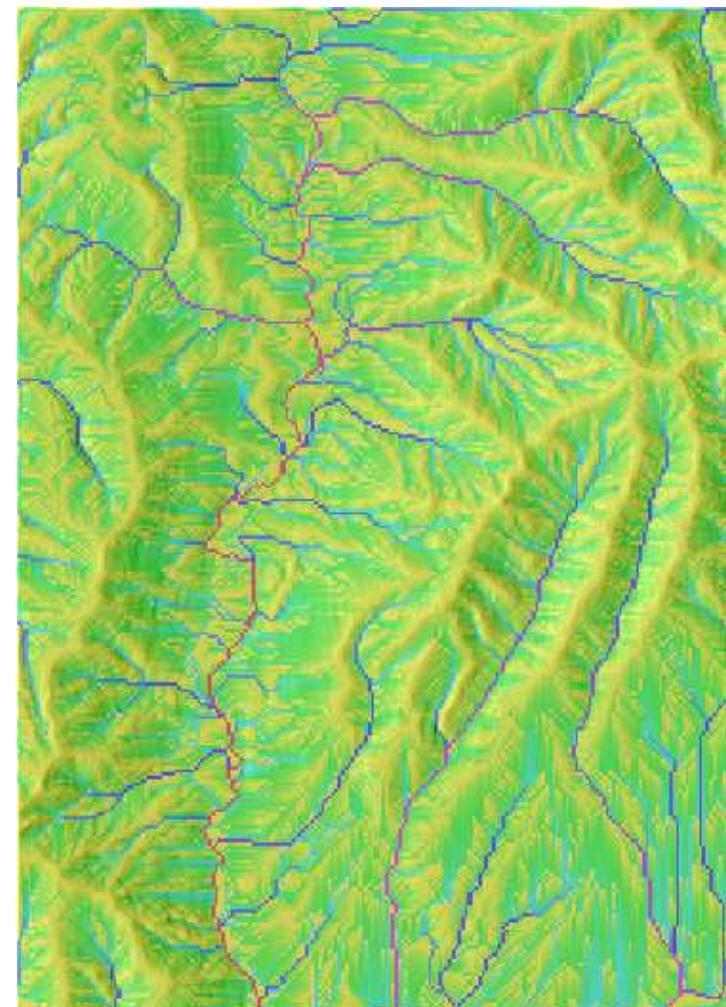
### 4.2. Extragerea retelei hidrografice

Scriem in **Command console**: `>r.mapcalc log_acumulare=log(abs(acumulare)+1)`

The screenshot shows the GRASS GIS Layer Manager interface. The title bar says "GRASS GIS Layer Manager - project.gxw\*". The menu bar includes File, Settings, Raster, Vector, Imagery, Volumes, Database, and Help. Below the menu is a toolbar with various icons. A search bar says "Click here to show search module engine". The main area contains a command history window with the following text:

```
> r.mapcalc acumulare2=log(abs(acumulare)+1)
(Tue Oct 4 12:37:24 2011) Command finished (0 sec)
(Tue Oct 4 12:54:43 2011)
r.mapcalc log_accumulation=log(abs(acumulare)+1)
(Tue Oct 4 12:54:43 2011) Command finished (0 sec)
(Tue Oct 4 12:59:53 2011)
r.mapcalc inf_rivers;if(log_accumulation>6)
(Tue Oct 4 12:59:54 2011) Command finished (0 sec)
(Tue Oct 4 13:00:20 2011)
r.mapcalc inf_rivers;if(log_accumulation>6)
(Tue Oct 4 13:00:20 2011) Command finished (0 sec)
```

Below the history window is a command input field containing `r.mapcalc log_acumulare=log(abs(acumulare)+1)`. At the bottom are buttons for Clear output, Save output, Clear command, Abort command, Map layers, Command console (which is selected), and Search module.





## Elemente de hidrologie

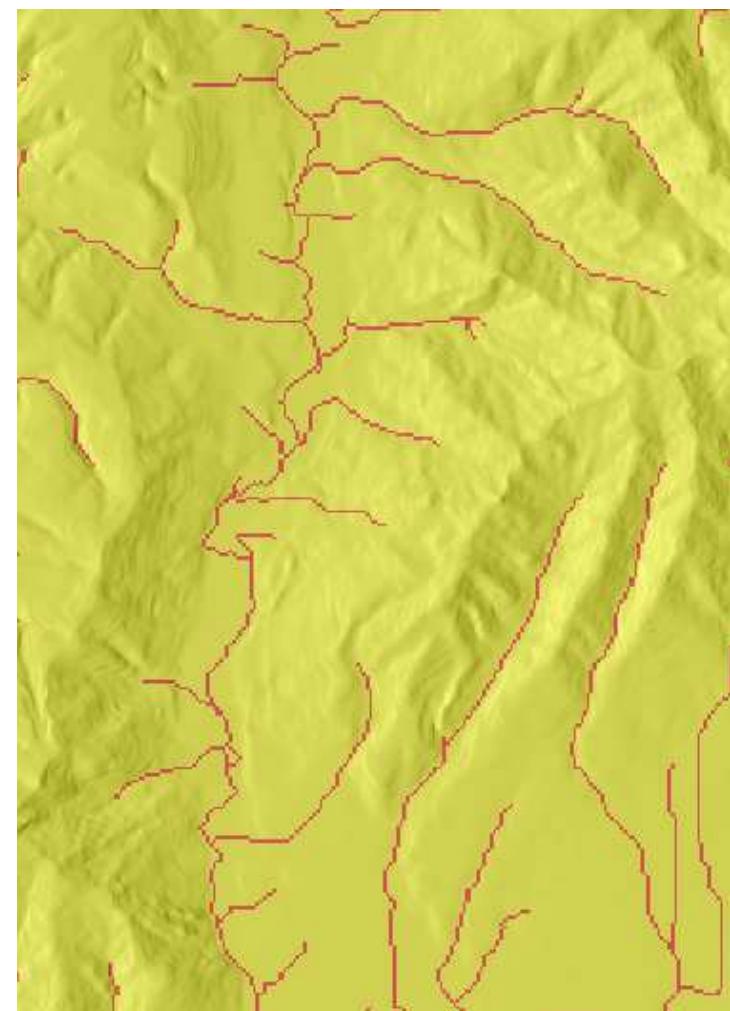
### 4.2. Extragerea retelei hidrografice

Scriem in **Command console**: `r.mapcalc rau_raster;if(log_acumulare>6)`

The screenshot shows the GRASS GIS Layer Manager interface. The title bar says "GRASS GIS Layer Manager - project.gxw\*". The menu bar includes File, Settings, Raster, Vector, Imagery, Volumes, Database, and Help. Below the menu is a toolbar with various icons. A message bar says "Click here to show search module engine". The main area contains a scrollable text window showing command history:

```
r.mapcalc log_accumulation=log(abs(acumulare)+1)
(Tue Oct 4 12:54:43 2011) Command finished (0 sec)
(Tue Oct 4 12:59:53 2011)
r.mapcalc inf_rivers;if(log_accumulation>6)
(Tue Oct 4 12:59:54 2011) Command finished (0 sec)
(Tue Oct 4 13:00:20 2011)
r.mapcalc inf_rivers;if(log_accumulation>6)
(Tue Oct 4 13:00:20 2011) Command finished (0 sec)
(Tue Oct 4 13:05:34 2011)
r.mapcalc log_acumulare=log(abs(acumulare)+1)
(Tue Oct 4 13:05:35 2011) Command finished (0 sec)
```

Below the history is a command input field containing `r.mapcalc rau_raster;if(log_acumulare>6)`. At the bottom are buttons for Clear output, Save output, Clear command, Abort command, Map layers, Command console (which is selected), and Search module.

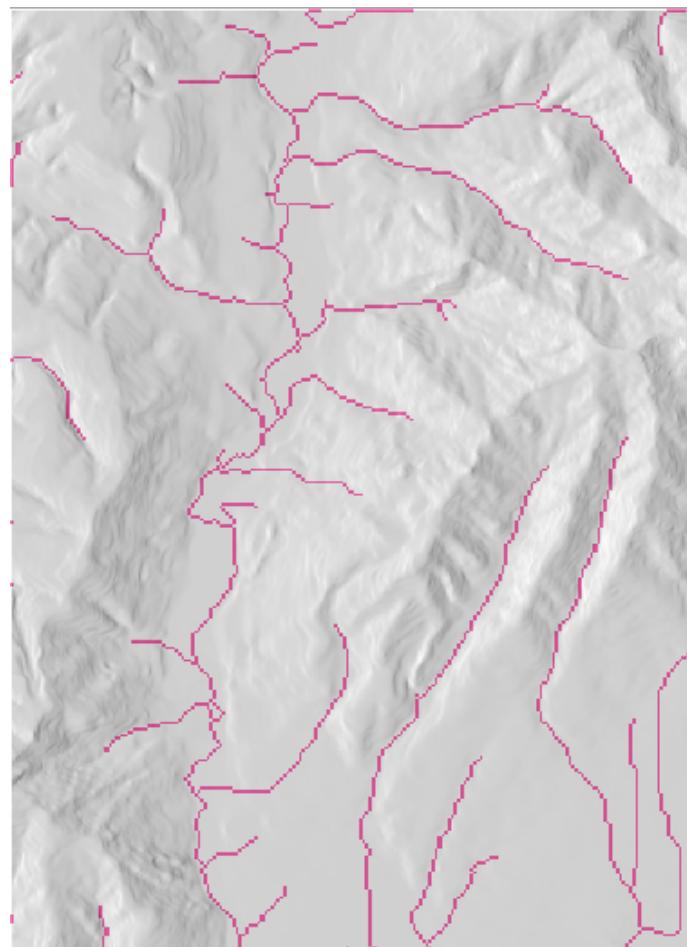
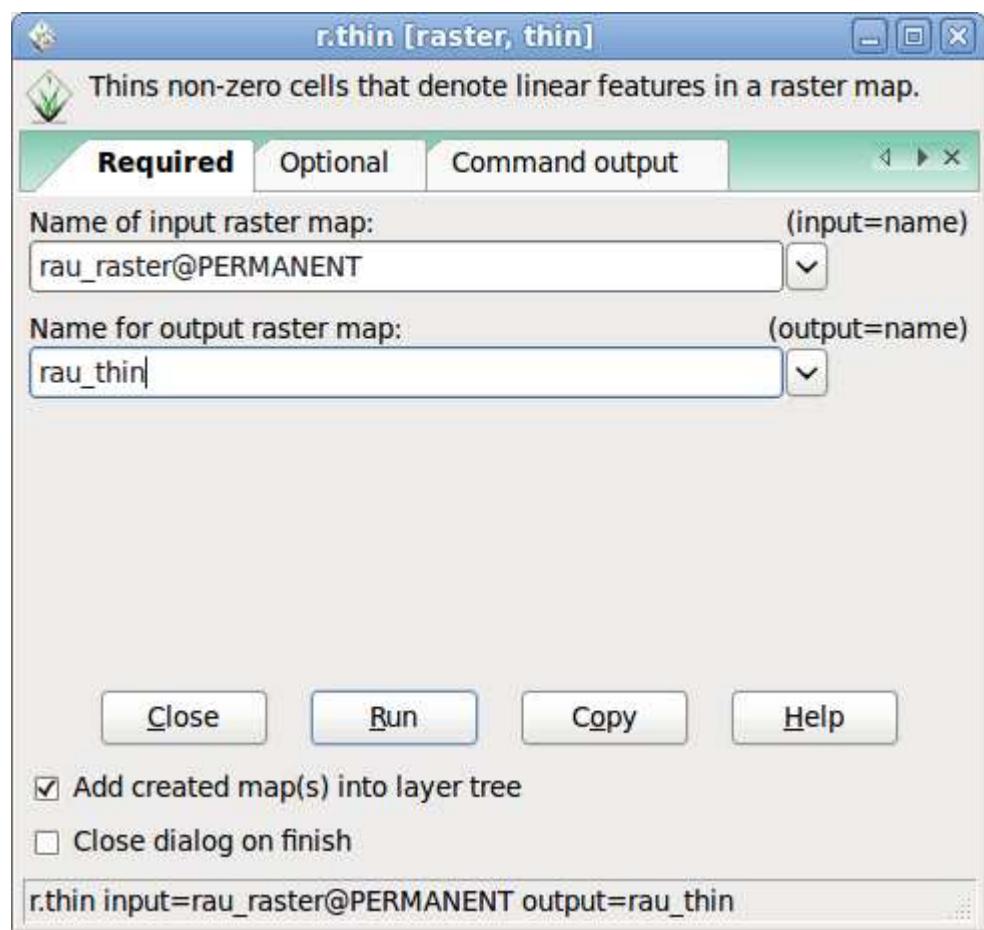




## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

În cele din urmă, pentru a crea o hartă vectorială a rețelei râului, utilizați `r.thin` din meniu, selectând **Raster > Transform Features > Thin** pentru a "subția" pixelii strabatuti de rauri

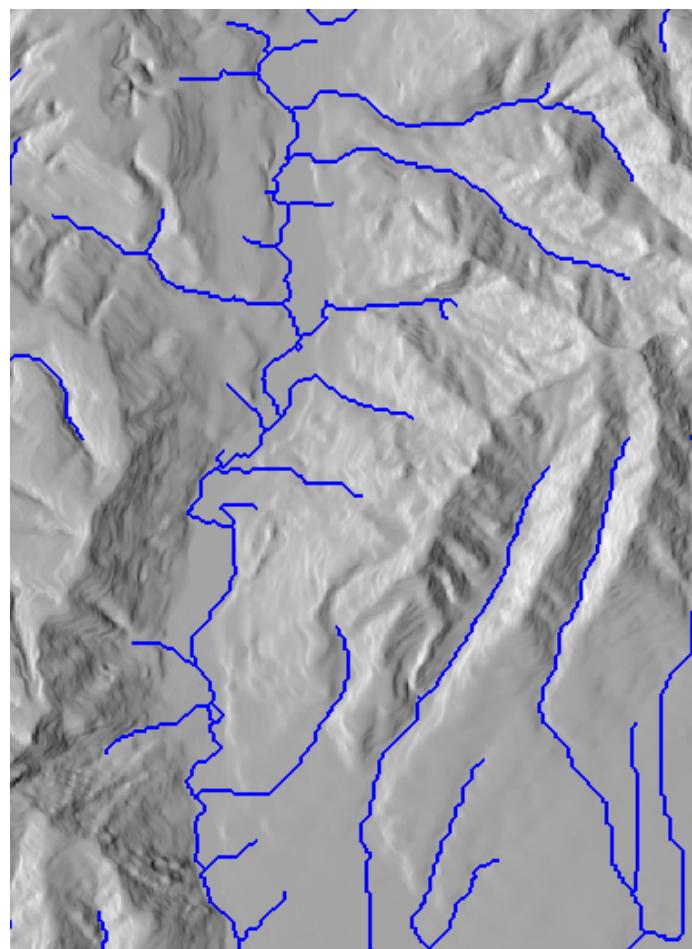
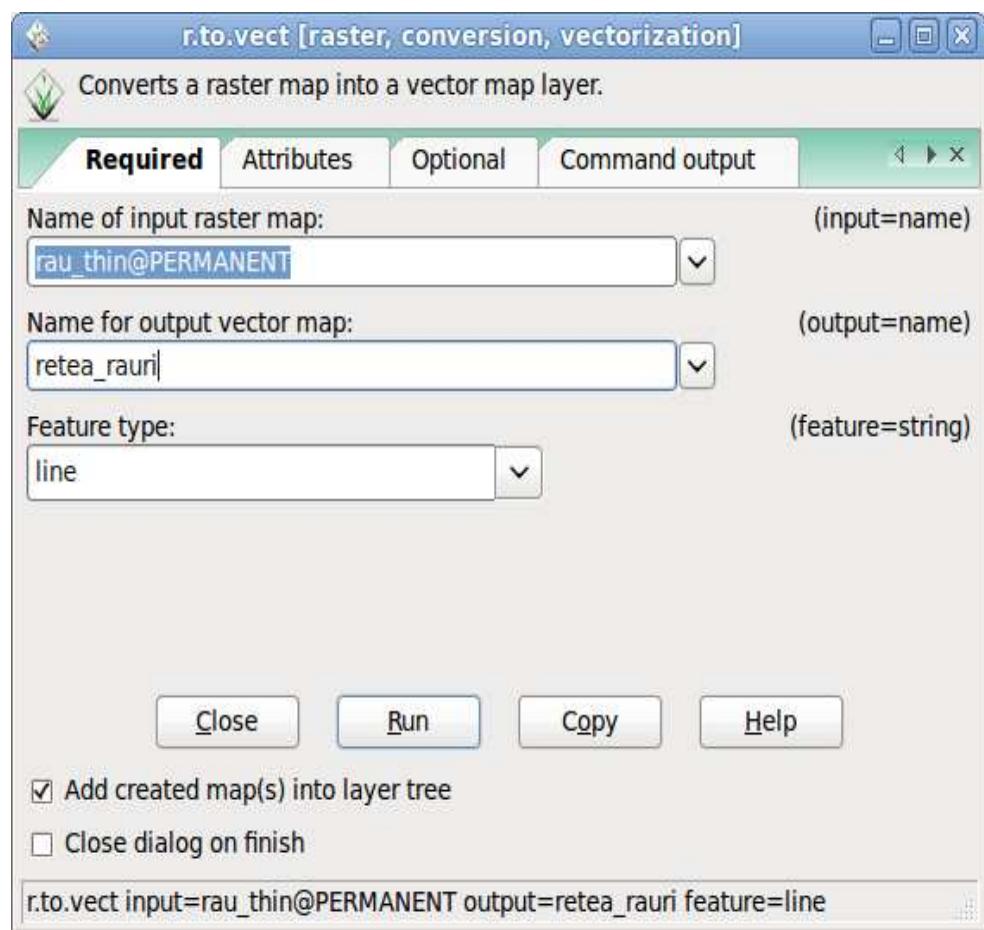




## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

Convertim reteaua de rauri din format raster in format vectorial `r.to.vect` din meniu, selectând **File > Map type > Conversions**



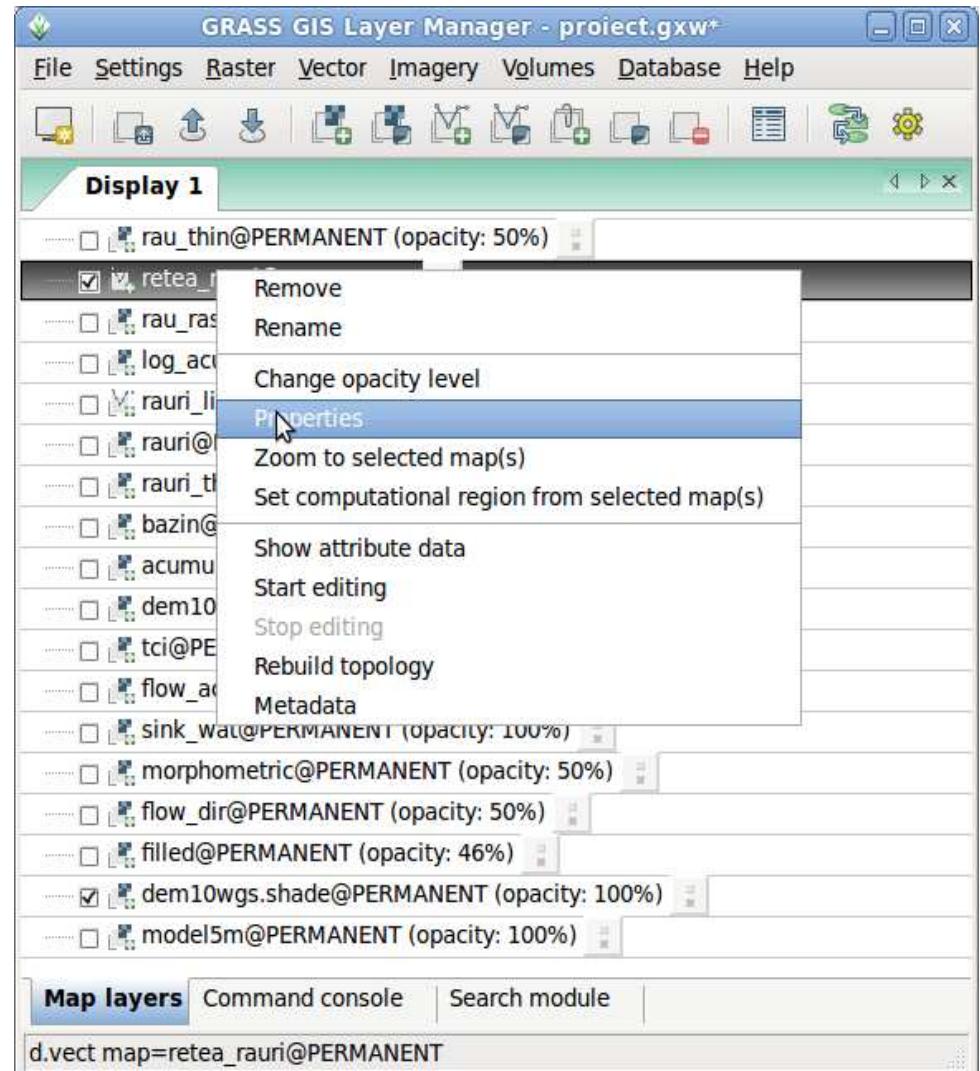


# Elemente de hidrologie

## 4.2. Extragerea retelei hidrografice

Schimbarea proprietatilor vectorilor d.vect

Click dreapta pe tema **reteaua\_rauri@Permanent** si alegem obtiunea **Properties**





## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

d.vect

The image displays two GRASS GIS command dialogs for the `d.vect` command. Both dialogs have a title bar "d.vect [display, vector]" and a status message "Displays user-specified vector map in the active graphics frame".

**Left Dialog (Colors Tab):**

- Required:**  Get colors from map table column (of form RRR:GGG:BBB)
- Selection:**  Random colors according to category number (or layer)
- Colors:**  Colorize polygons according to z height
- Line color:** blue (selected),  Transparent
- Area fill color:** 200:200:200,  Transparent
- Name of color definition column (for use with -a flag):** GRASSRGB

**Right Dialog (Lines Tab):**

- Required:**  Line width: 2 (width=integer)
- Selection:**  Name of column for line widths (these values will be scaled by wscale): (wcolumn=name)
- Colors:**  Scale factor for wcolumn: 1 (wscale=float)

Both dialogs include "Close", "Apply", and "OK" buttons at the bottom. The command line at the bottom of each dialog is:

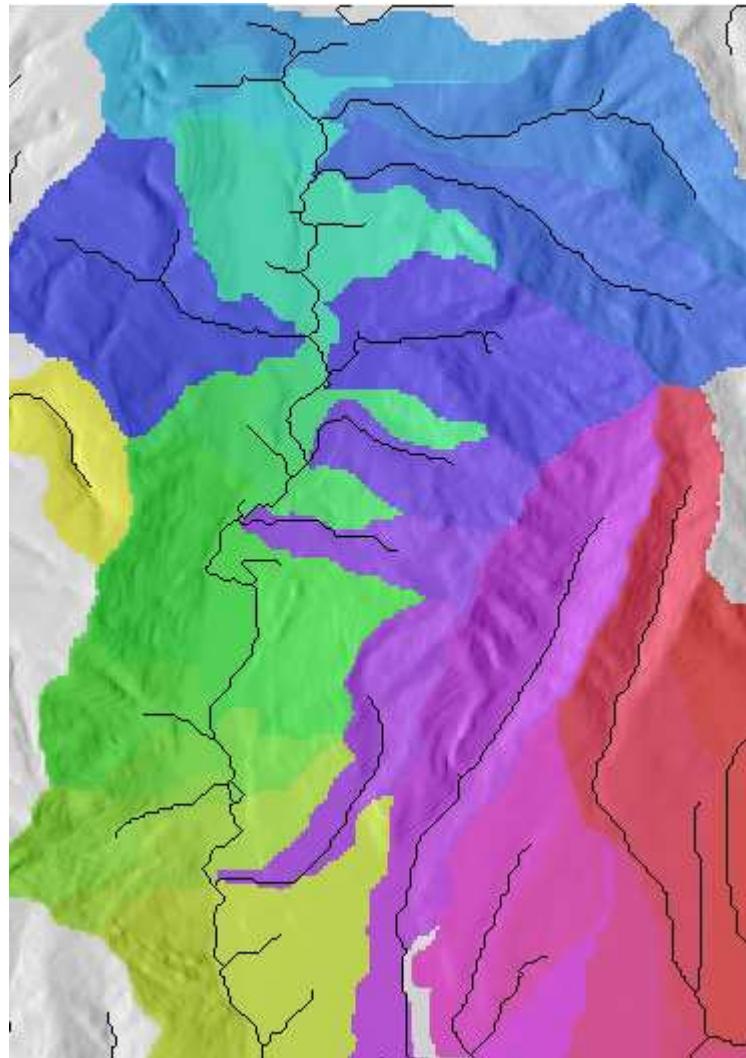
```
d.vect map=retea_rauri@PERMANENT color=blue width=2
```



## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

Reteaua hidrografica  
+  
Bazinele hidrografice



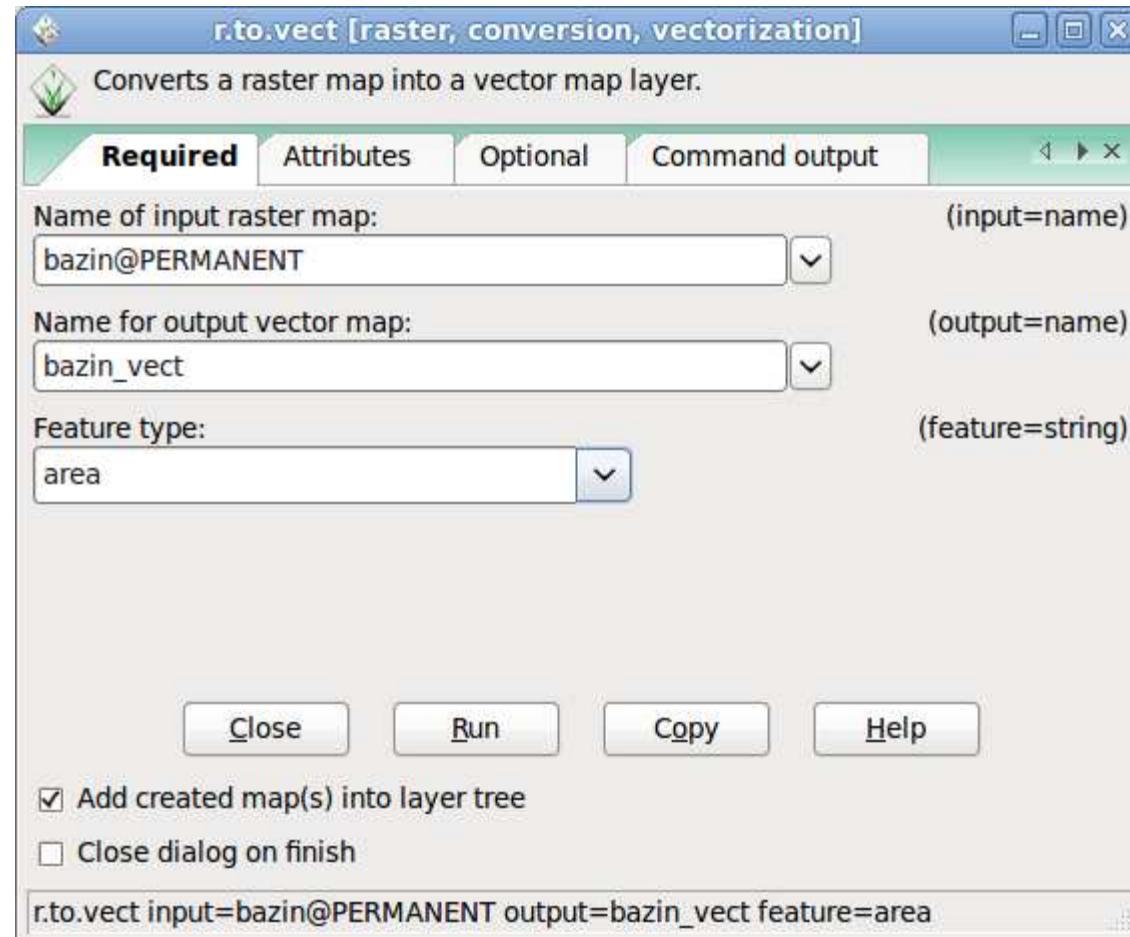


## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

Conversia bazinelor hidrografice din format raster in format vector

**File > Map type conversions > Raster to vector map**





## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice

Conversia bazinelor hidrografice din format raster in format vector

File > Map type conversions > Raster to vector map

The image shows two side-by-side screenshots of the QGIS processing dialog for the 'r.to.vect' algorithm.

**Left Screenshot (Required Parameters):**

- Name of input raster map: `bazin@PERMANENT`
- Name for output vector map: `bazin_vect`
- Feature type: `area`
- Checkboxes at the bottom:
  - Add created map(s) into layer tree
  - Close dialog on finish
- Command output:  
`r.to.vect input=bazin@PERMANENT output=bazin_vect feature=area`

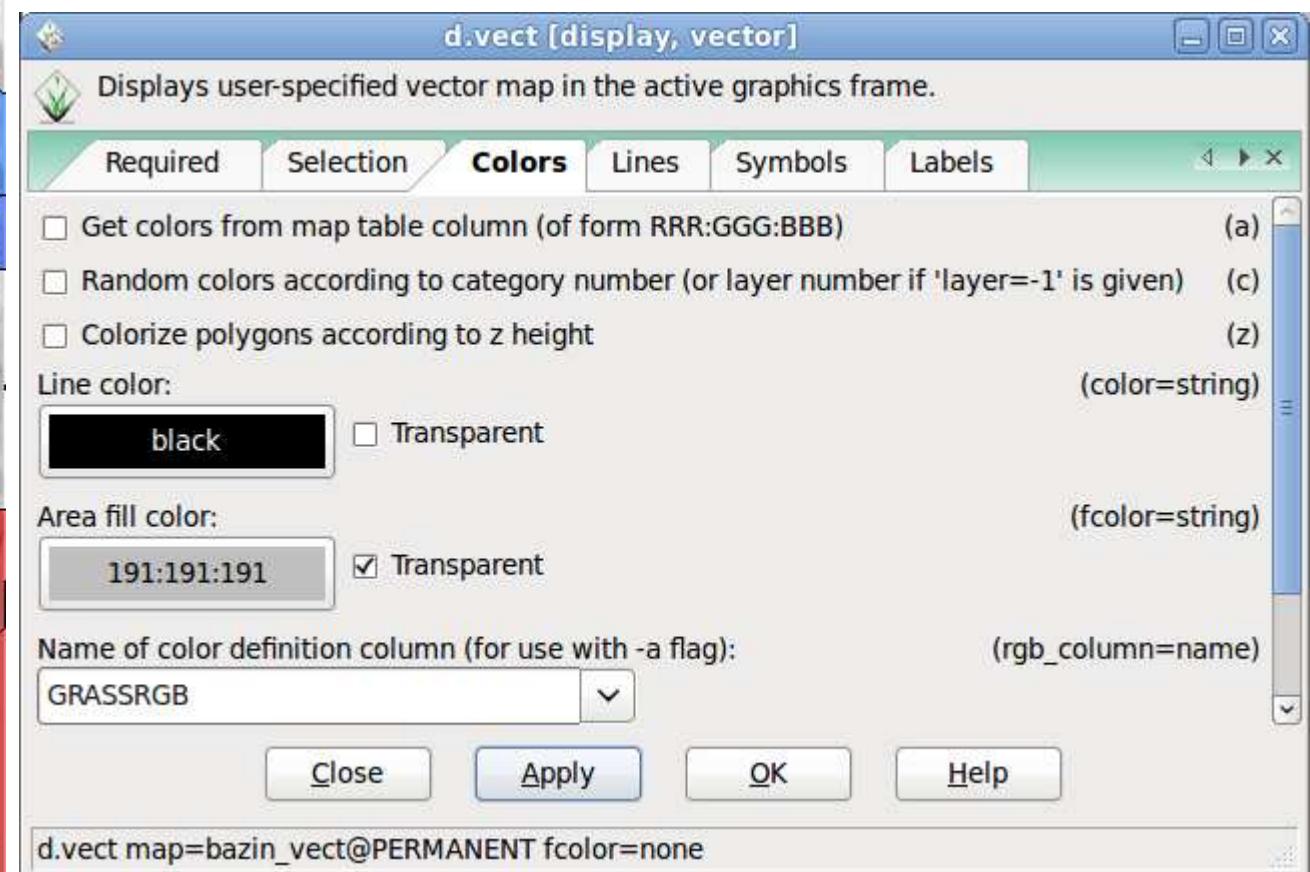
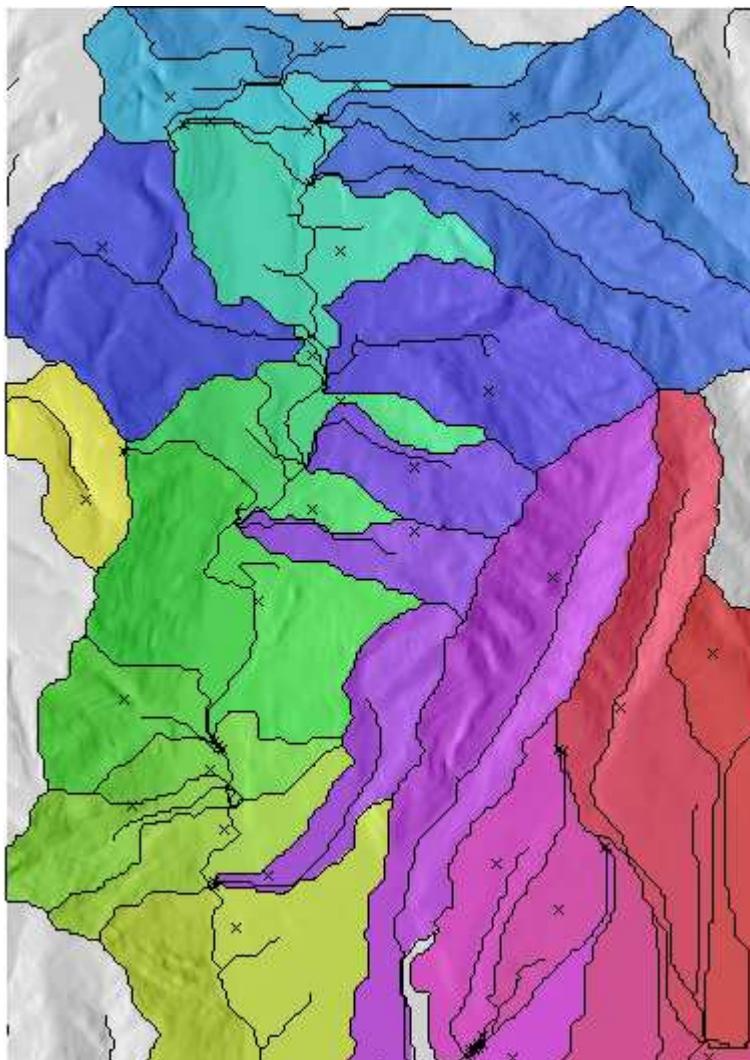
**Right Screenshot (Optional Parameters):**

- Checkboxes in the 'Optional' tab:
  - Smooth corners of area features
  - Do not build vector topology (use with care for massive point export)
  - Quiet - Do not show progress
  - Allow output files to overwrite existing files
  - Verbose module output
  - Quiet module output
- Checkboxes at the bottom:
  - Add created map(s) into layer tree
  - Close dialog on finish
- Command output:  
`r.to.vect -s feature=line`



## Elemente de hidrologie

### 4.2. Extragerea retelei hidrografice





# 6. Intersectarea MNAT cu un plan orizontal

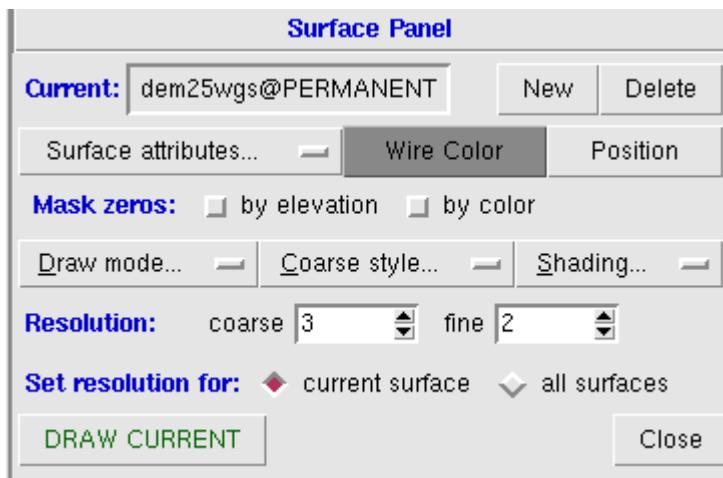


# Manipularea datelor in GRASS

## Interogarea datelor raster - Vizualizare 3D

Intersectarea suprafetei cu un plan orizontal

Se utilizeaza optiunea Surface panel: Vizualize > Raster Surface



Current : stratul aspura caruia se fac modificari

Surface attributes : modificarea atributelor suprafetei

Resolution : cresterea/scaderea rezolutiei

DRAW CURRENT : se aplica dupa fiecare modificare

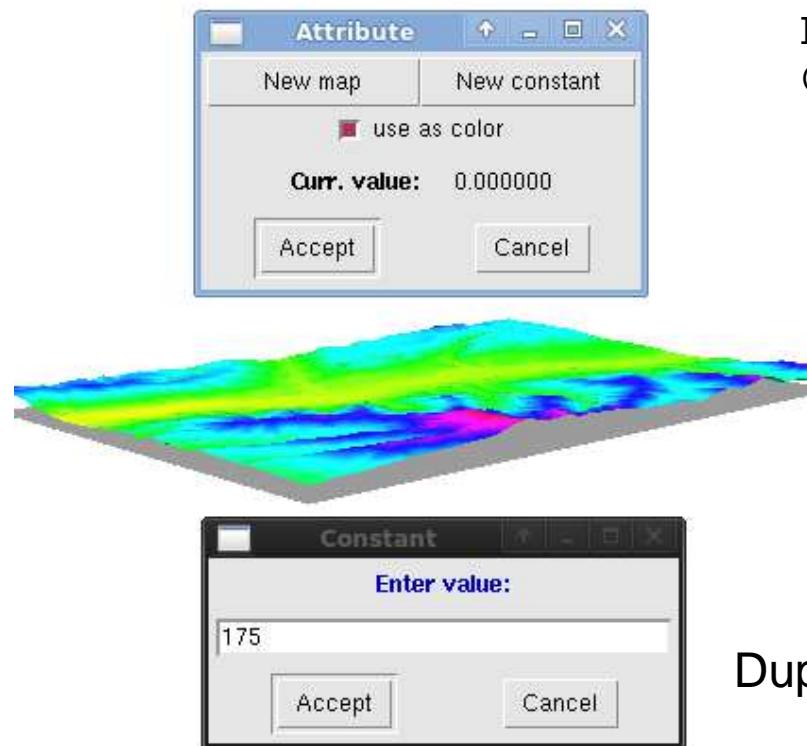


# Manipularea datelor in GRASS

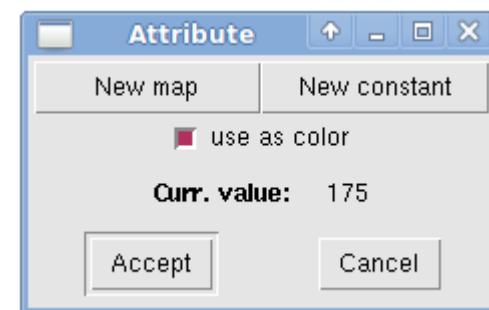
## Interrogarea datelor raster - Vizualizare 3D

Intersectarea suprafetei cu un plan orizontal

Introducem planul de sectionare: New > New Constant



New Constant: Adauga proprietatea Z planului  
Constant: se introduce valoarea Z



Dupa introducerea valorii, aceasta apare la optiunea:  
Curr.value (in cazul nostru 175)

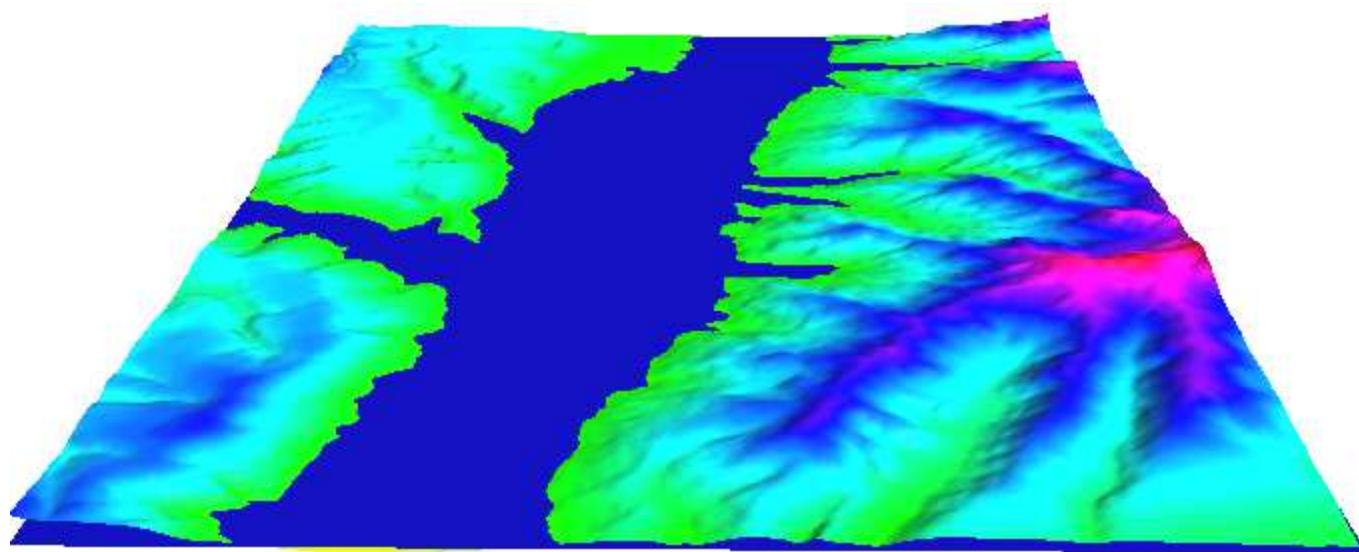


# Manipularea datelor in GRASS

## Interogarea datelor raster - Vizualizare 3D

Intersectarea suprafetei cu un plan orizontal

Rezultatul final:





# Manipularea datelor in GRASS

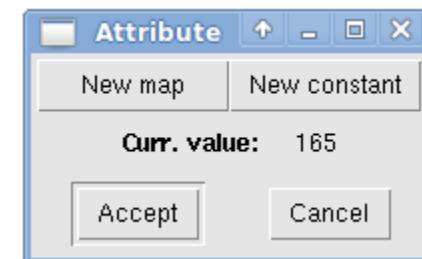
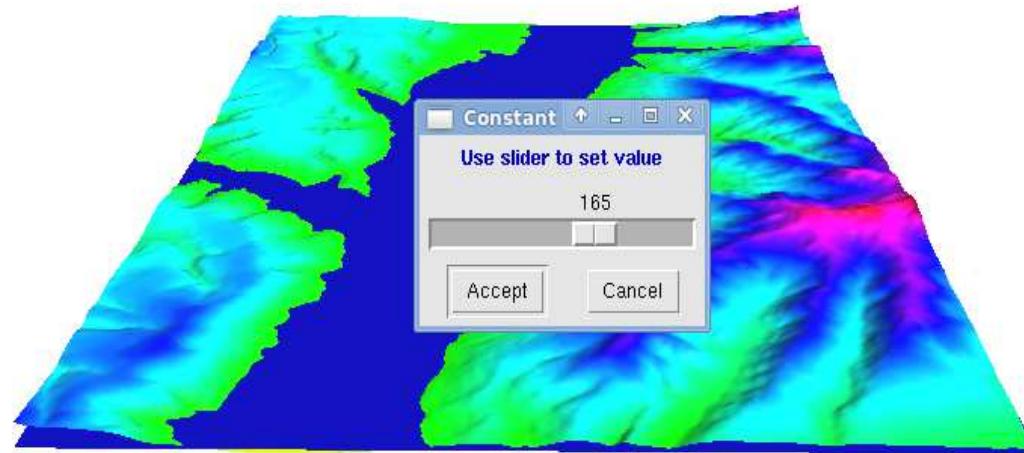
## Interogarea datelor raster - Vizualizare 3D

Intersectarea suprafetei cu un plan orizontal

Schimbarea transparentei stratului creat: Surface attributes... > transparency



New Constant: Adauga transparenta planului  
Constant: se introduce valoarea transparentei



Dupa introducerea valorii, aceasta apare la optiunea:  
Curr. value (in cazul nostru 165)

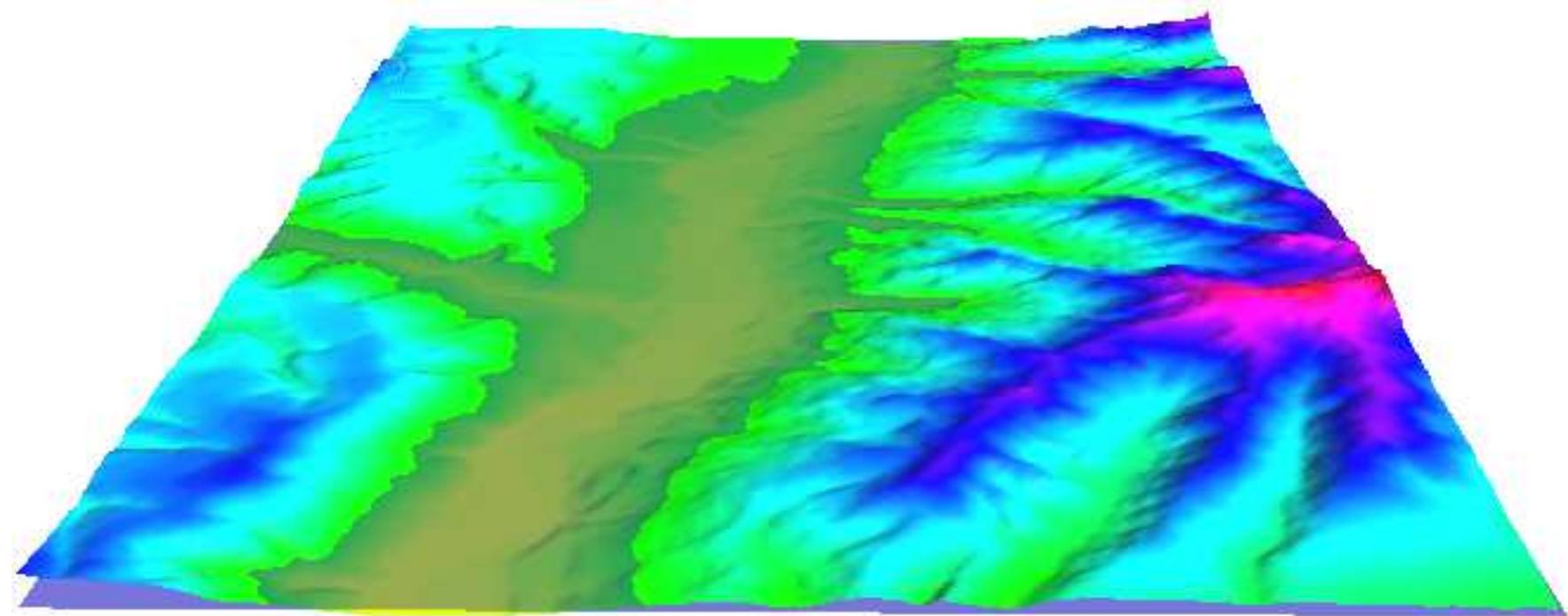


# Manipularea datelor in GRASS

## Interogarea datelor raster - Vizualizare 3D

Intersectarea suprafetei cu un plan orizontal

Rezultatul final:





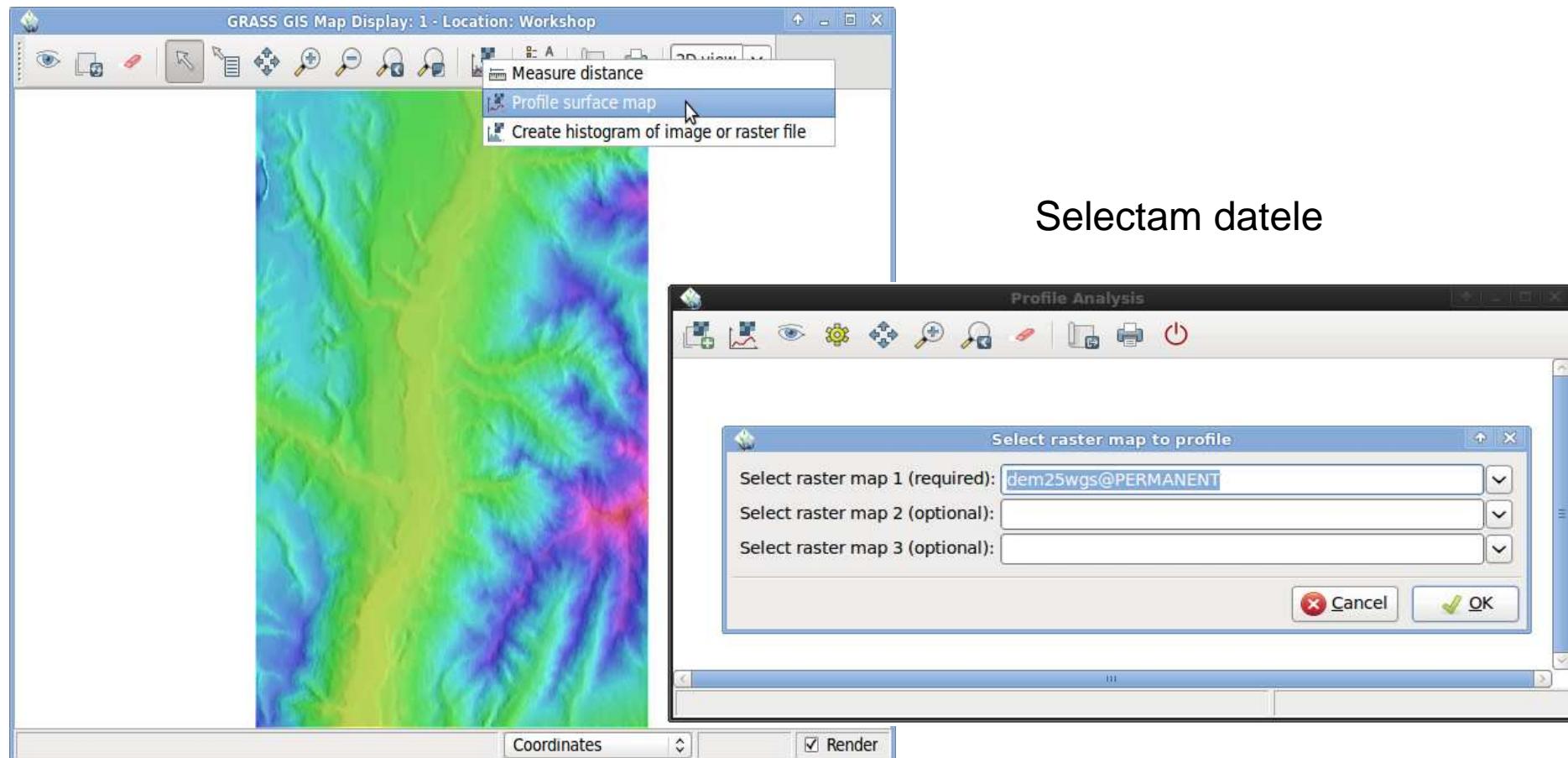
# 7. Interogarea MNAT - profile -



# Manipularea datelor in GRASS

## Interogarea datelor raster - profile

In fereastra de vizualizare alegem: Analyze > Profile surface map



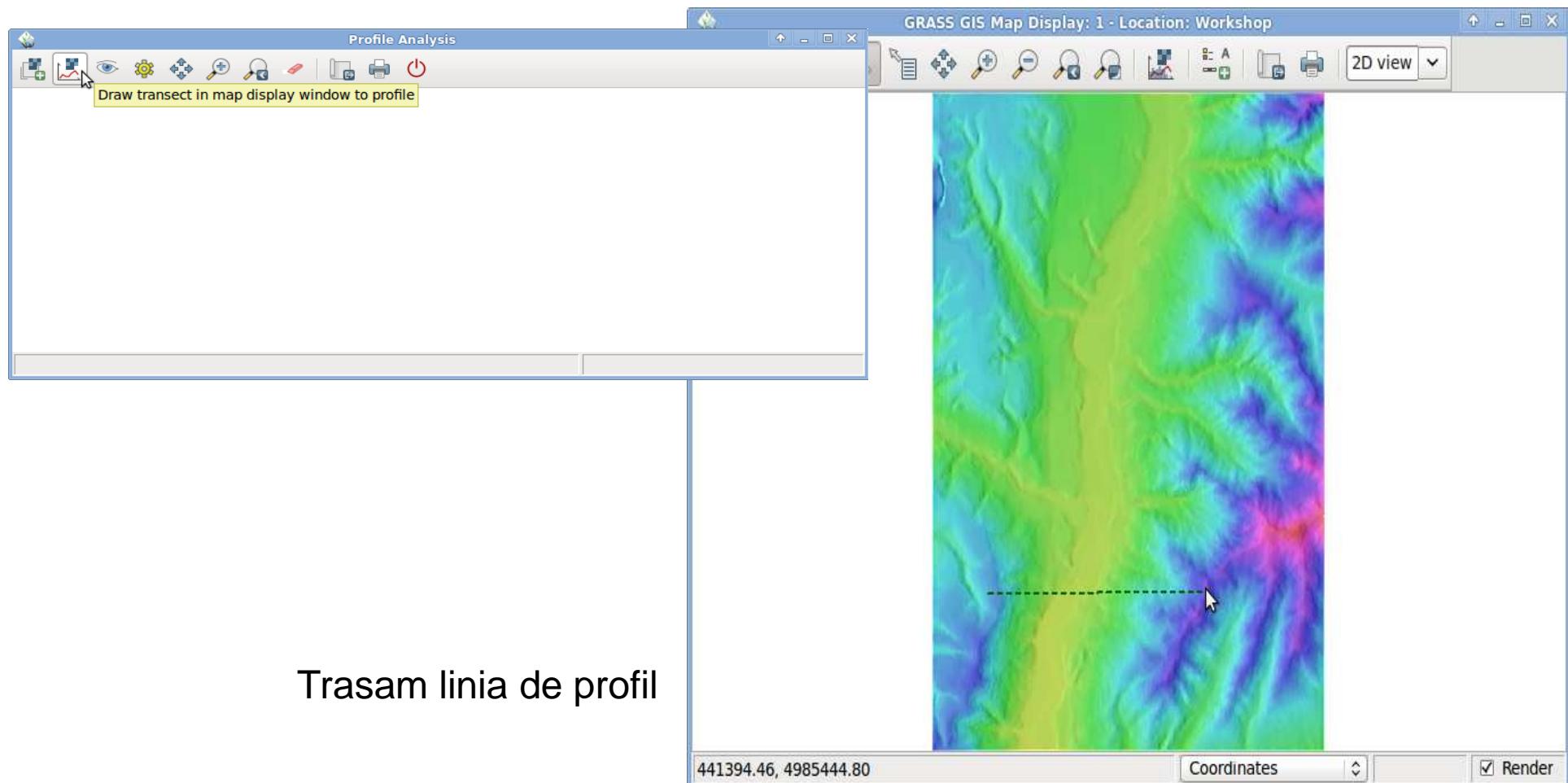
Selectam datele



# Manipularea datelor in GRASS

## Interogarea datelor raster - profile

In Profile Analysis alegem: Draw transect in map display window profile

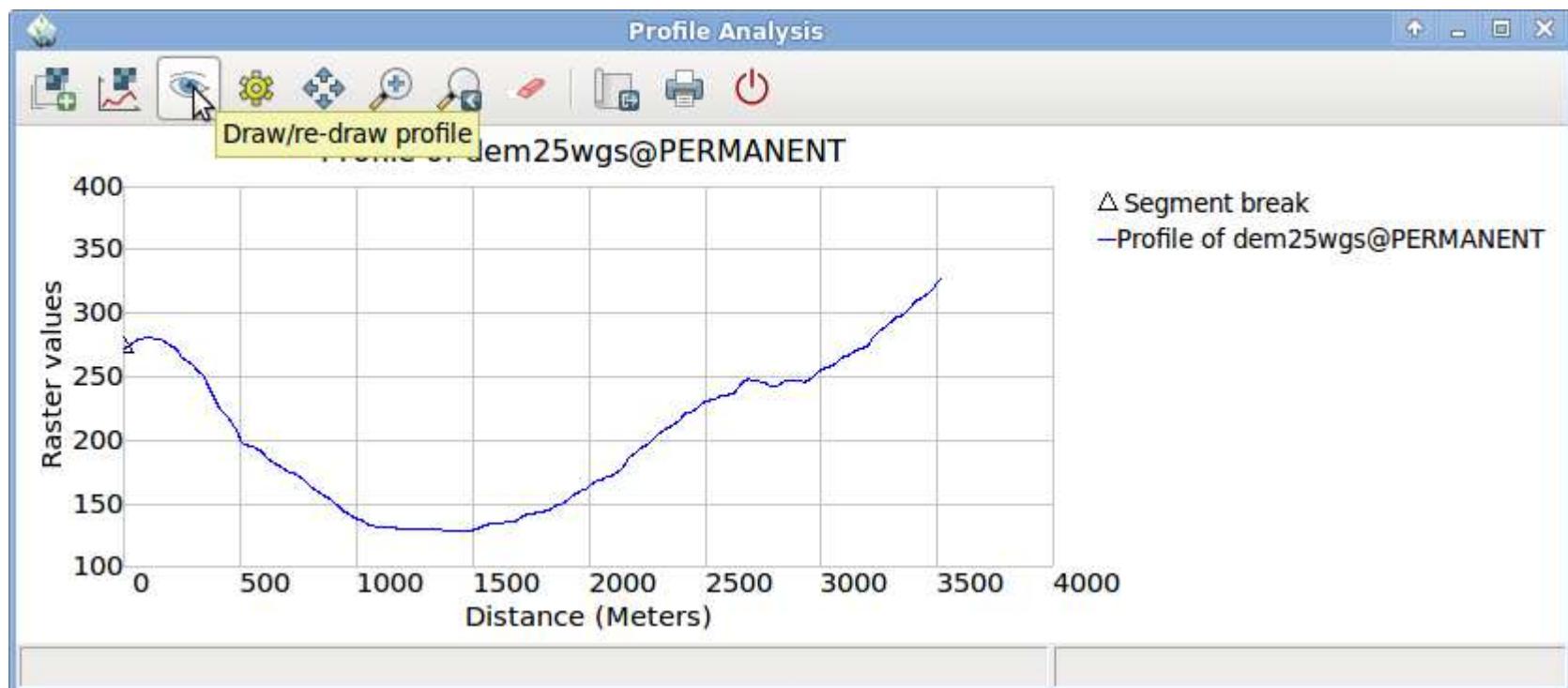




# Manipularea datelor in GRASS

## Interogarea datelor raster - profile

In fereastra Profile Analysis alegem: Draw/re-draw profile



V A M U L T U M I M !

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**<http://www.geo-spatial.org>**

**<http://www.freegis.ro>**

**<http://opengis.unibuc.ro>**