

JGRASS UDIG'S SENSE OF CLIMATE CHANGE

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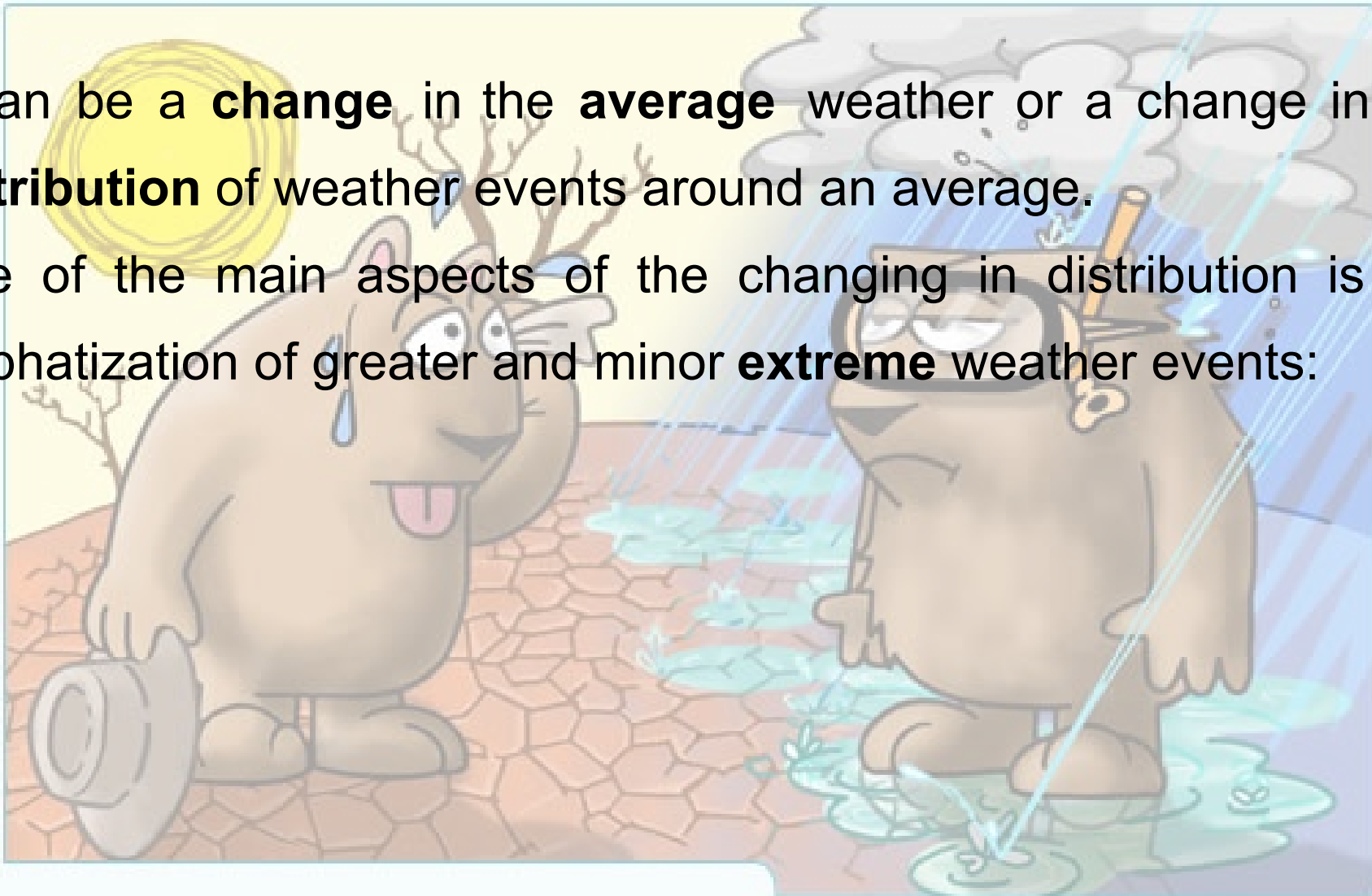
CLIMATE CHANGE

- a change in the statistical distribution of weather over periods of time
- climate forcing (natural causes): variation in solar radiation, Earth's orbit, mountains building
- human activities that change the environment (anthropogenic factors)

CLIMATE CHANGE

It can be a **change** in the **average** weather or a change in the **distribution** of weather events around an average.

One of the main aspects of the changing in distribution is the emphatization of greater and minor **extreme** weather events:

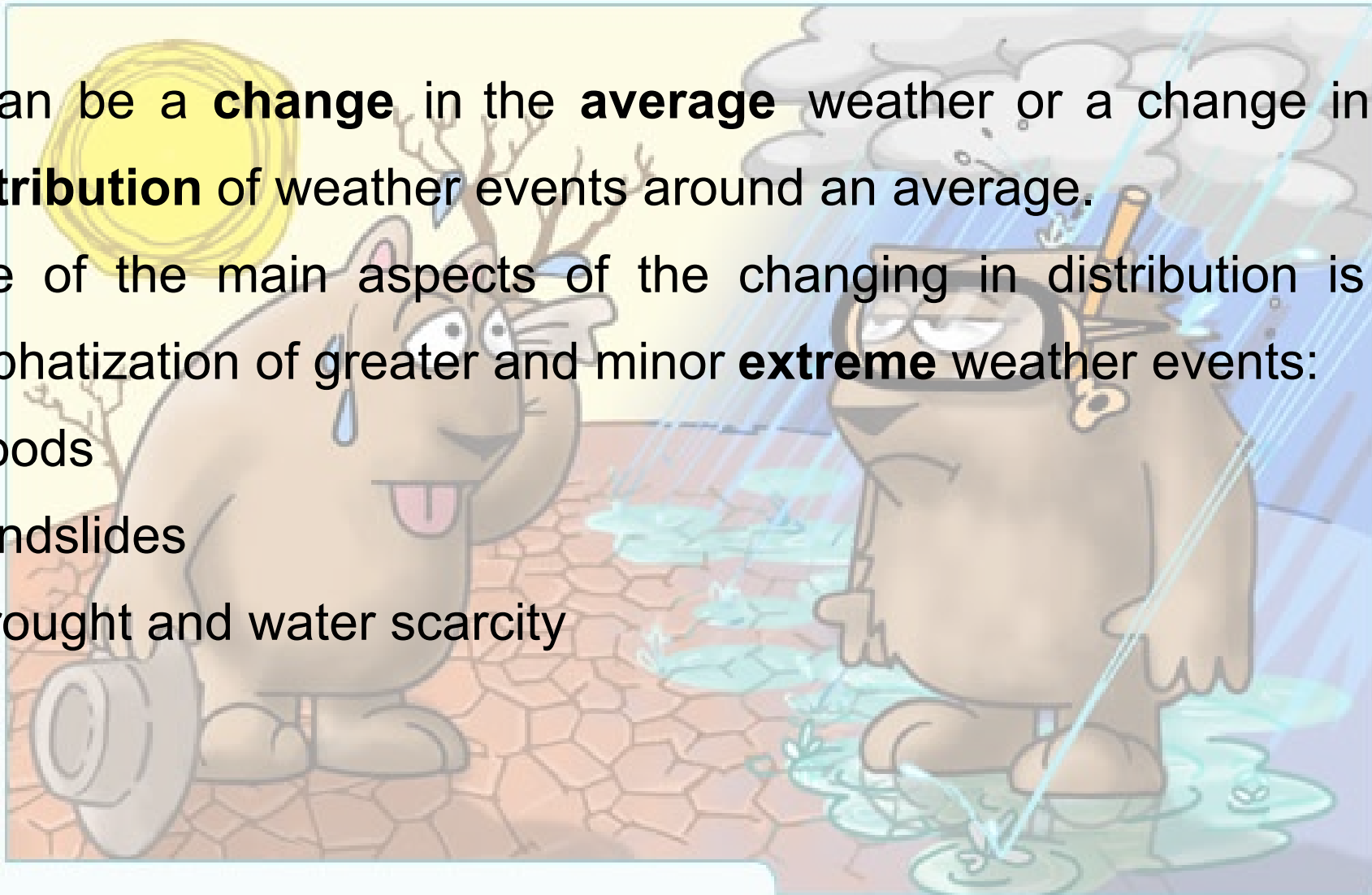


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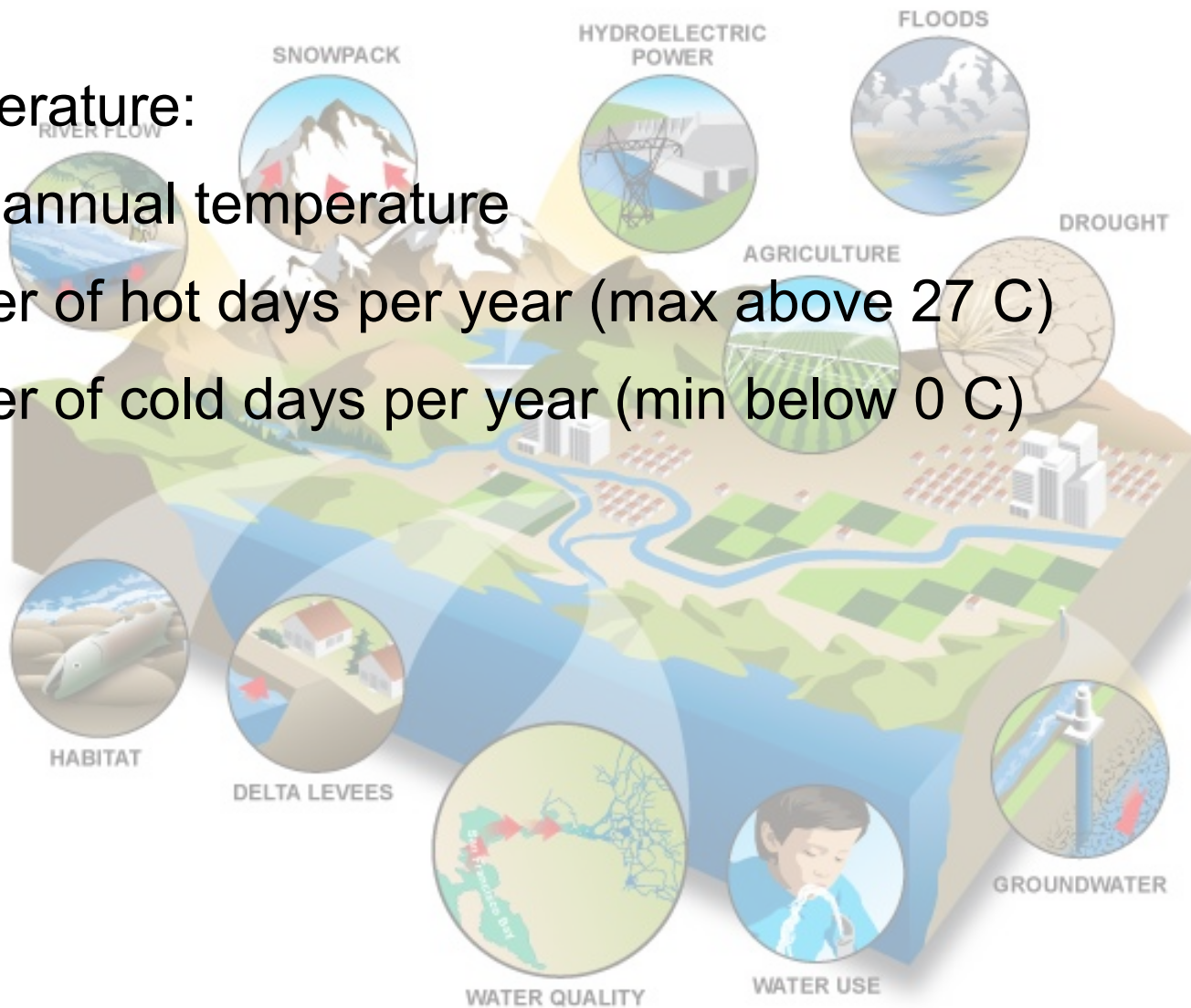
- floods
- landslides
- drought and water scarcity



CLIMATE CHANGE INDICATORS

➤ air temperature:

- mean annual temperature
- number of hot days per year (max above 27 C)
- number of cold days per year (min below 0 C)



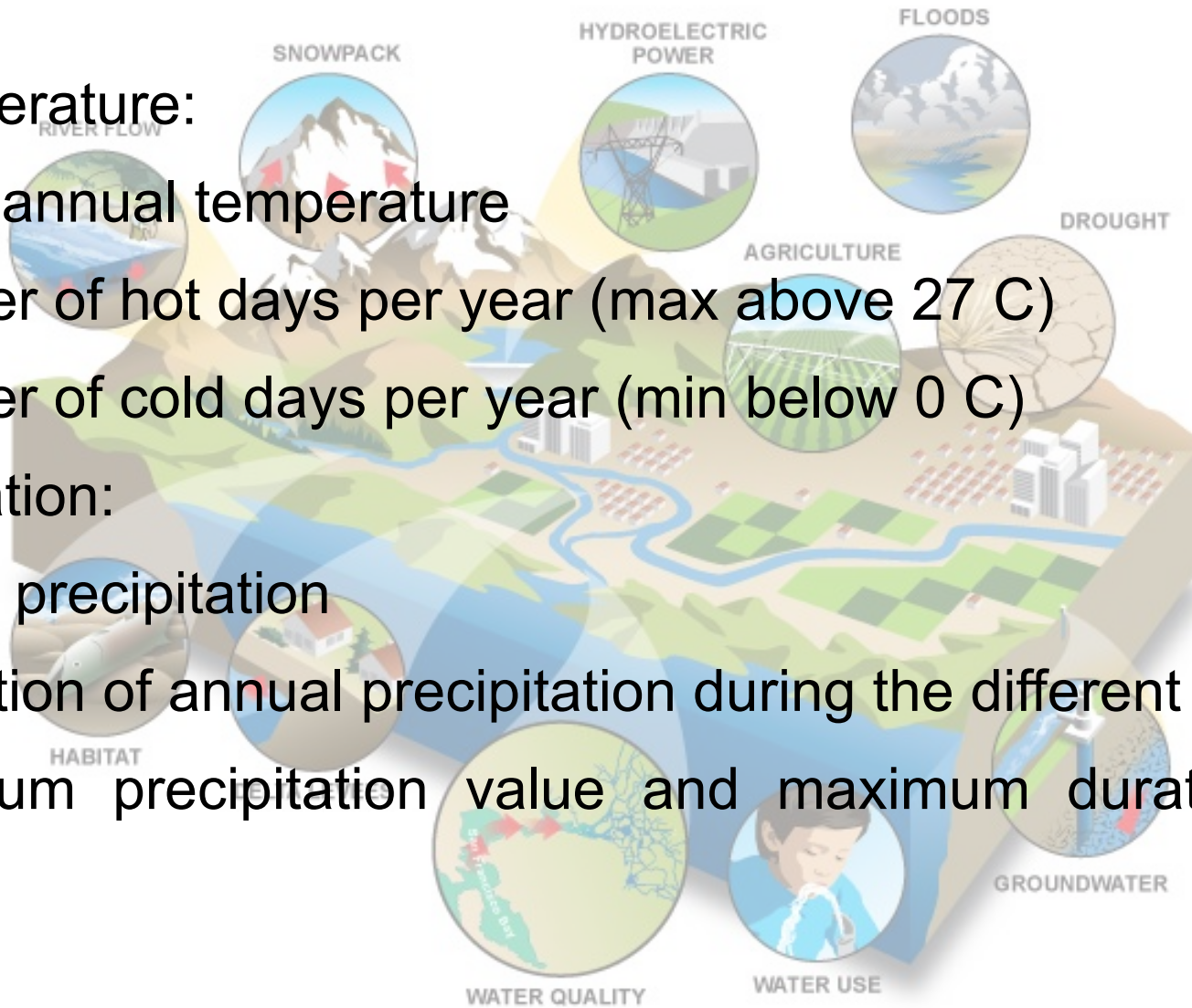
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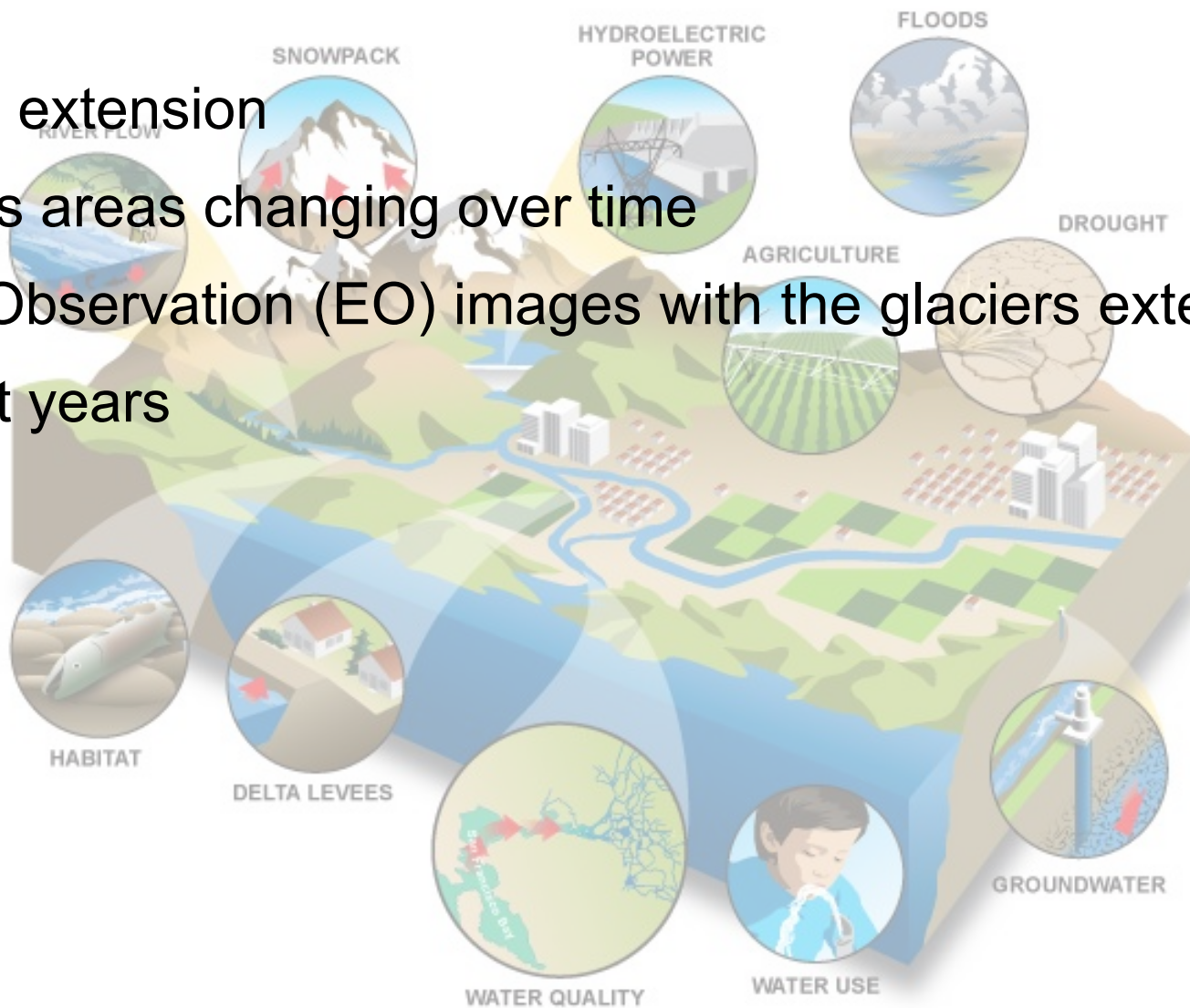
➤ precipitation:

- annual precipitation
- proportion of annual precipitation during the different seasons
- maximum precipitation value and maximum duration of the events

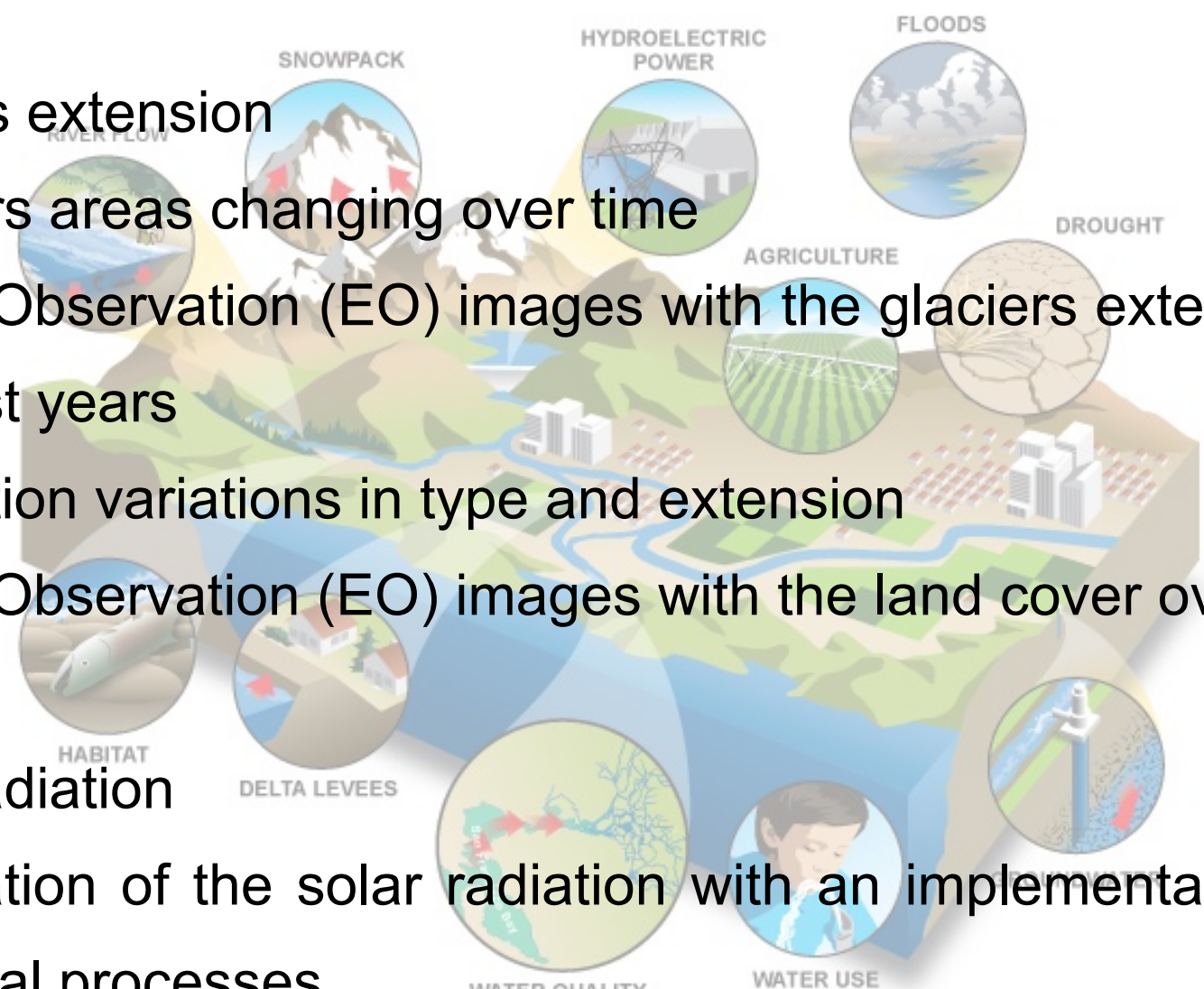


CLIMATE CHANGE INDICATORS

- glaciers extension
 - glaciers areas changing over time
 - Earth Observation (EO) images with the glaciers extension over the last years



CLIMATE CHANGE INDICATORS

- 
- glaciers extension
 - glaciers areas changing over time
 - Earth Observation (EO) images with the glaciers extension over the last years
 - vegetation variations in type and extension
 - Earth Observation (EO) images with the land cover over the last years
 - solar radiation
 - evaluation of the solar radiation with an implementation of the physical processes

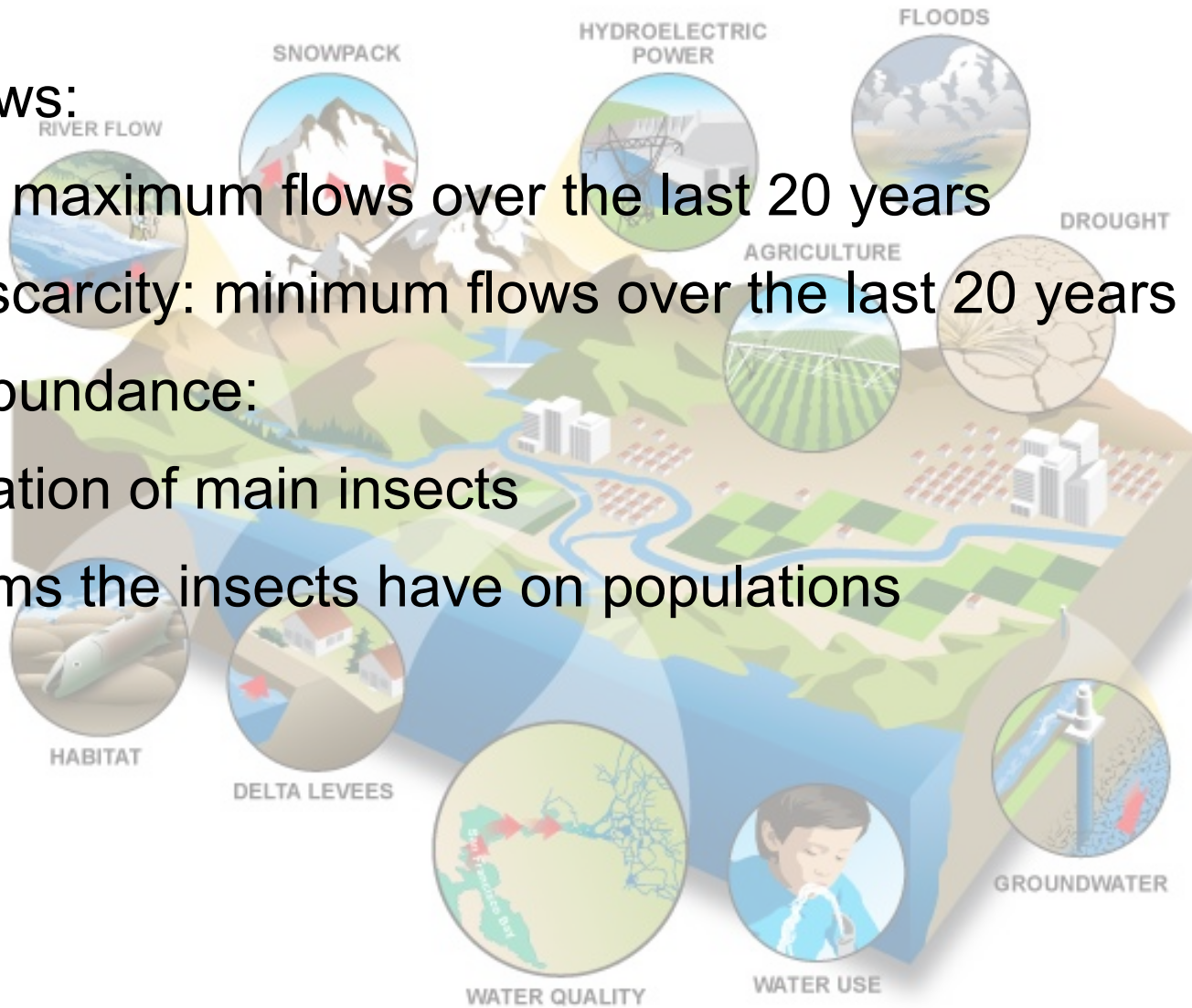
CLIMATE CHANGE INDICATORS

➤ river flows:

- floods: maximum flows over the last 20 years
- water scarcity: minimum flows over the last 20 years

➤ insect abundance:

- localization of main insects
- problems the insects have on populations



JGRASS AND CLIMATE CHANGE

- GIS mainly dedicated to environmental analysis



JGrass

JGRASS AND CLIMATE CHANGE

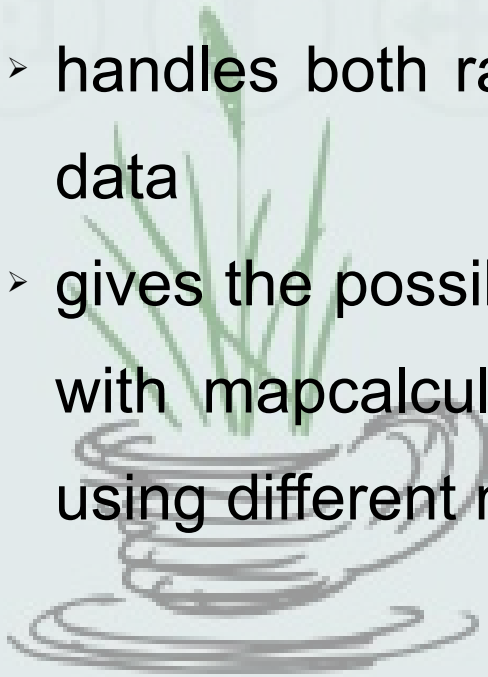
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- handles both raster and vector data: meteo data or DTM based data



JGrass

JGRASS AND CLIMATE CHANGE

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- extract morphological attributes from a DTM

JGrass

JGRASS AND CLIMATE CHANGE

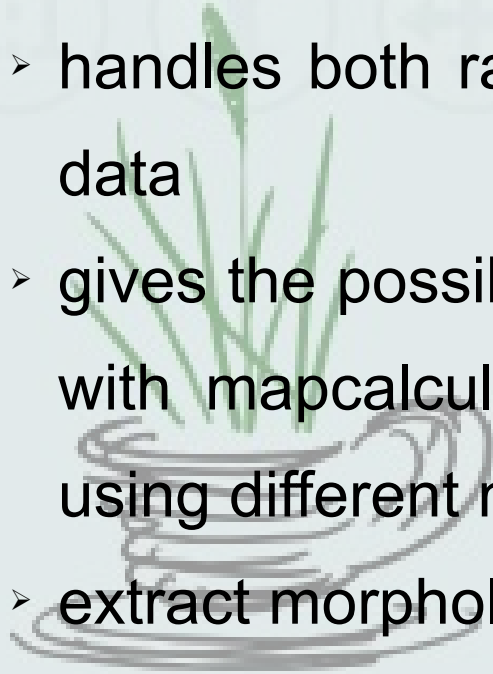
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- modeling past scenarios with hydrologic and stability models

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- gives the possibility to do calculations on maps: direct calculation with mapcalculator or other complex and recursive calculation using different modules and the scripting environment
- extract morphological attributes from a DTM
- modeling past scenarios with hydrologic and stability models
- creating a new scenario and run simulations on this
- analyzing the results starting from maps and charts

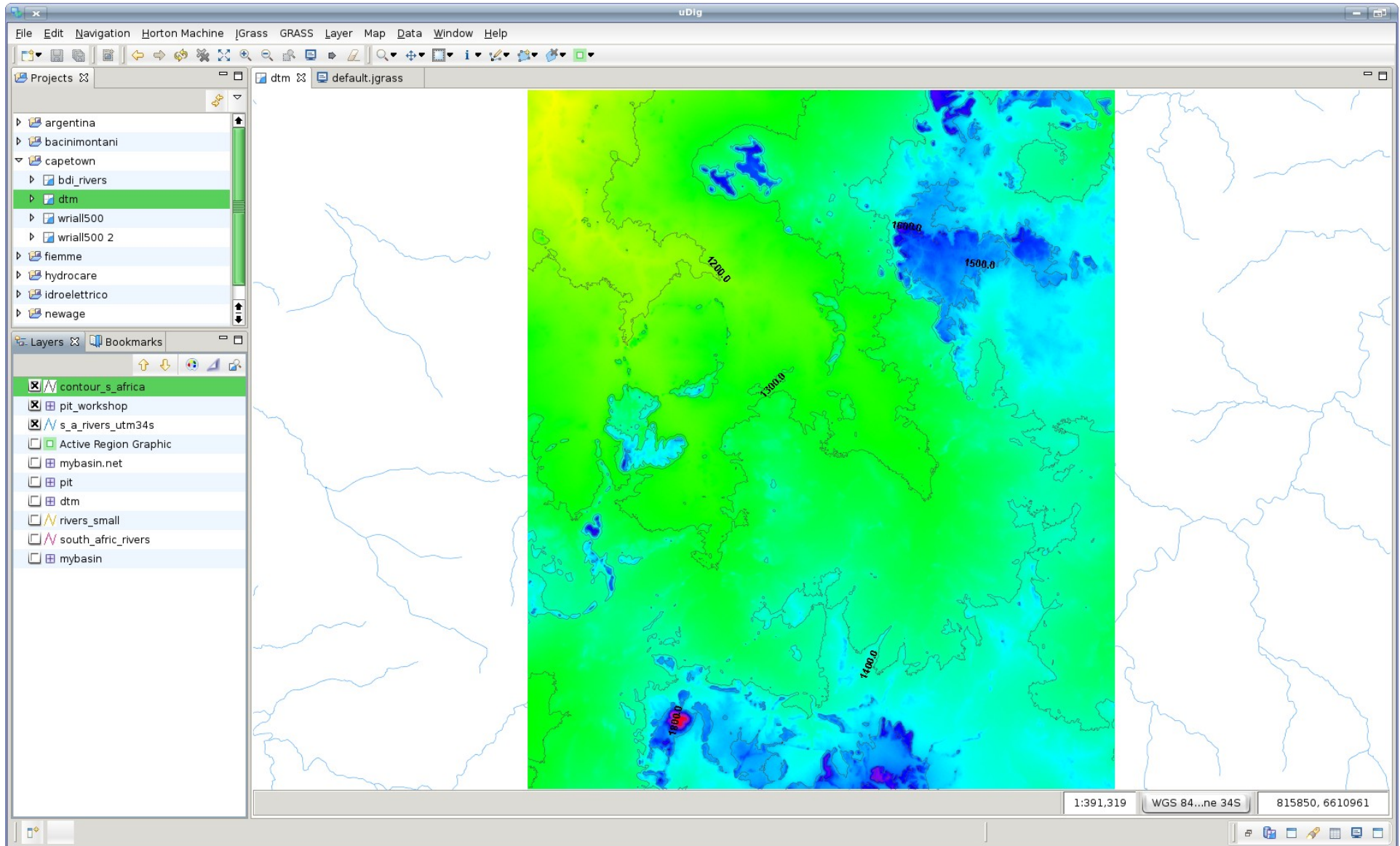
JGrass



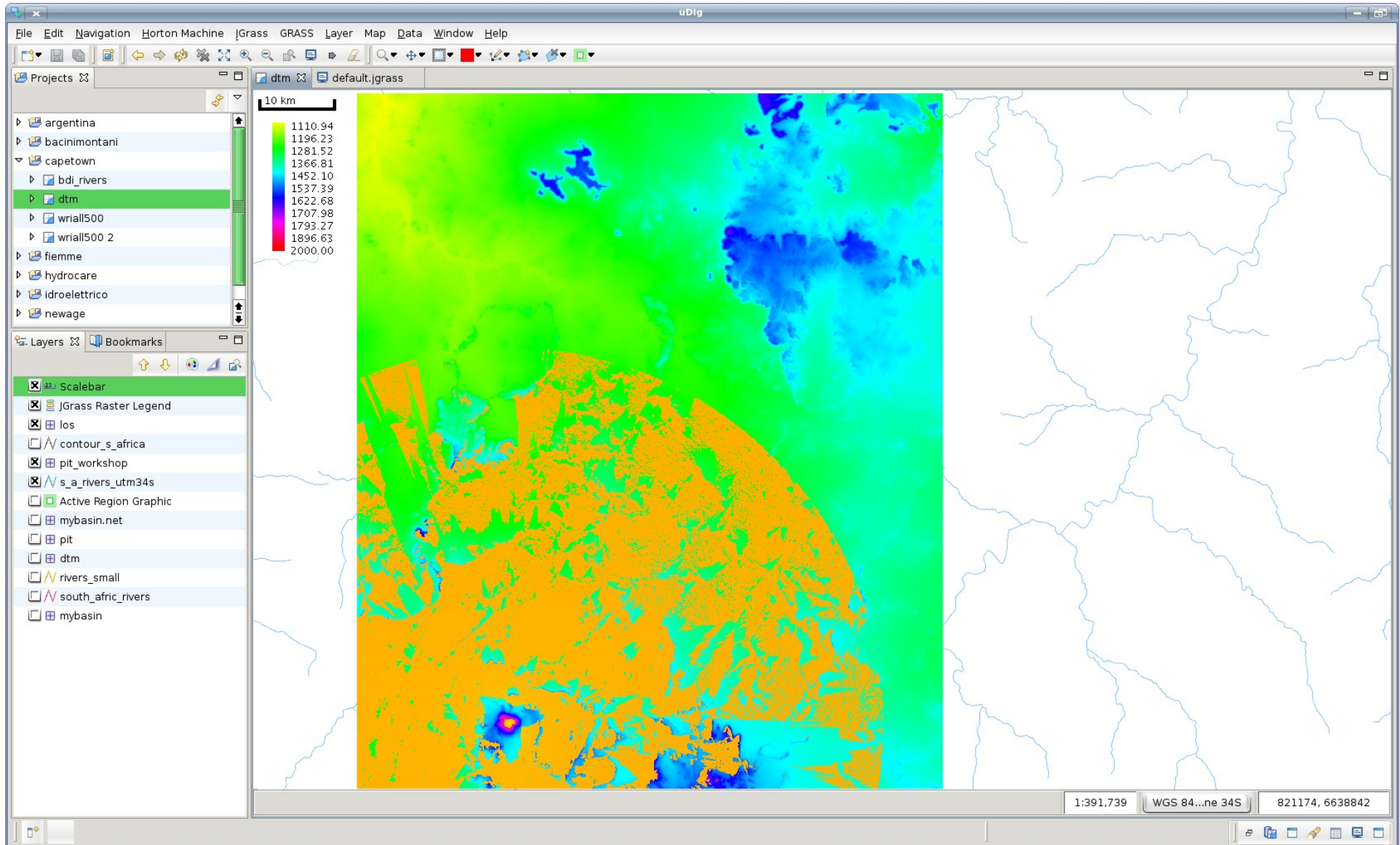
JGRASS RASTERS AND VECTORS

- r.contours: interpolate contours lines to obtain a DTM map or extract the contours line from a DTM
- ◆ h.hypsographic: calculation of the hypsographic curve (cumulative height frequency curve for the Earth's surface or some part thereof)

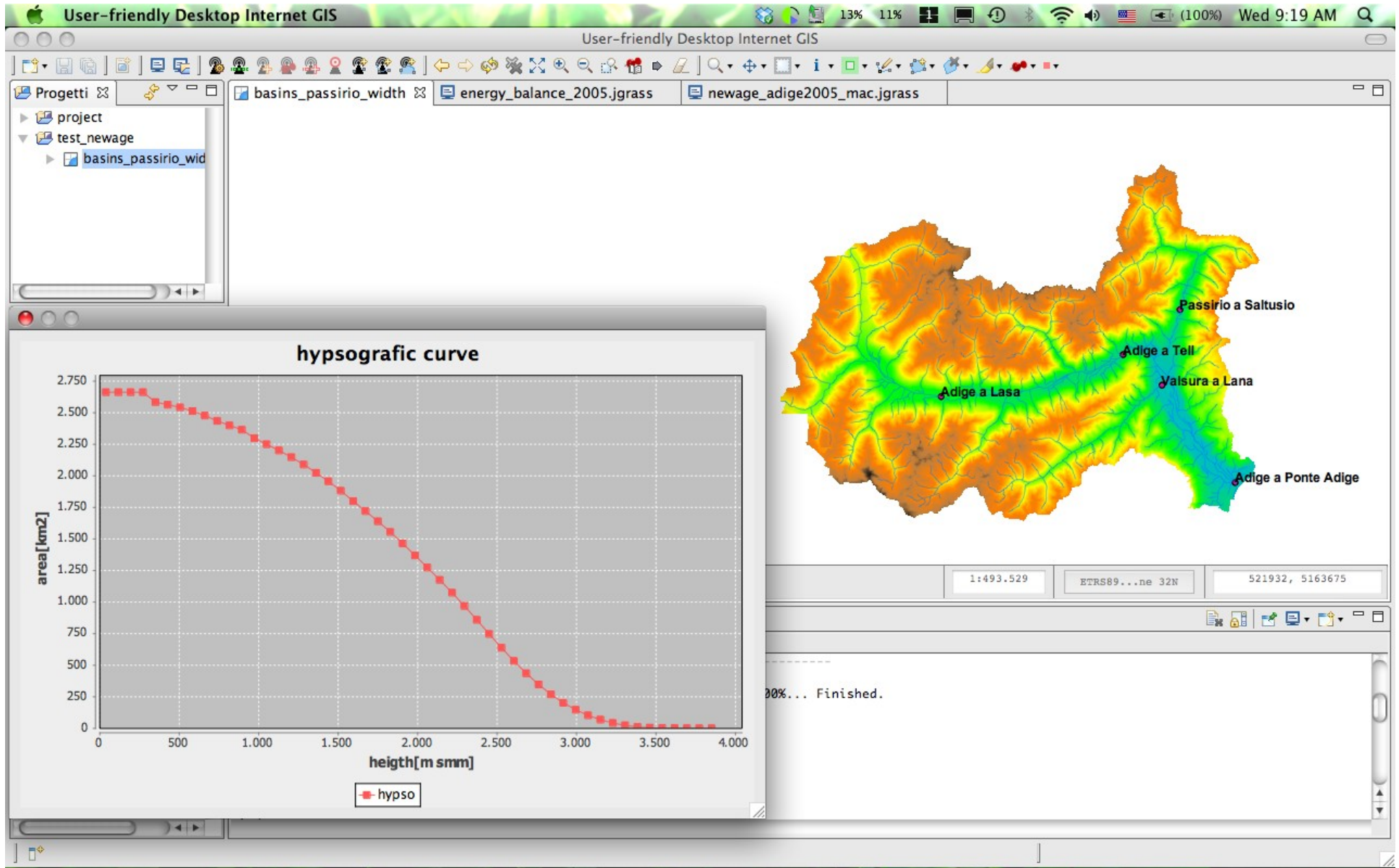
JGRASS RASTERS AND VECTORS



JGRASS RASTERS AND VECTORS



JGRASS RASTERS AND VECTORS



JGRASS RASTERS AND VECTORS

- h.kriging: interpolate measured rainfall data in monitoring points using the kriging model
 - ◆ h.variogram: create your own variogram based on measured data distribution and values
 - ◆ create raster maps starting from discrete measured data
 - ◆ interpolate values in discrete points such as the barycenter of subbasins

JGRASS RASTERS AND VECTORS

The screenshot displays the uDig software interface with the h.meteointerpolator model configuration window open. The interface is divided into several panels:

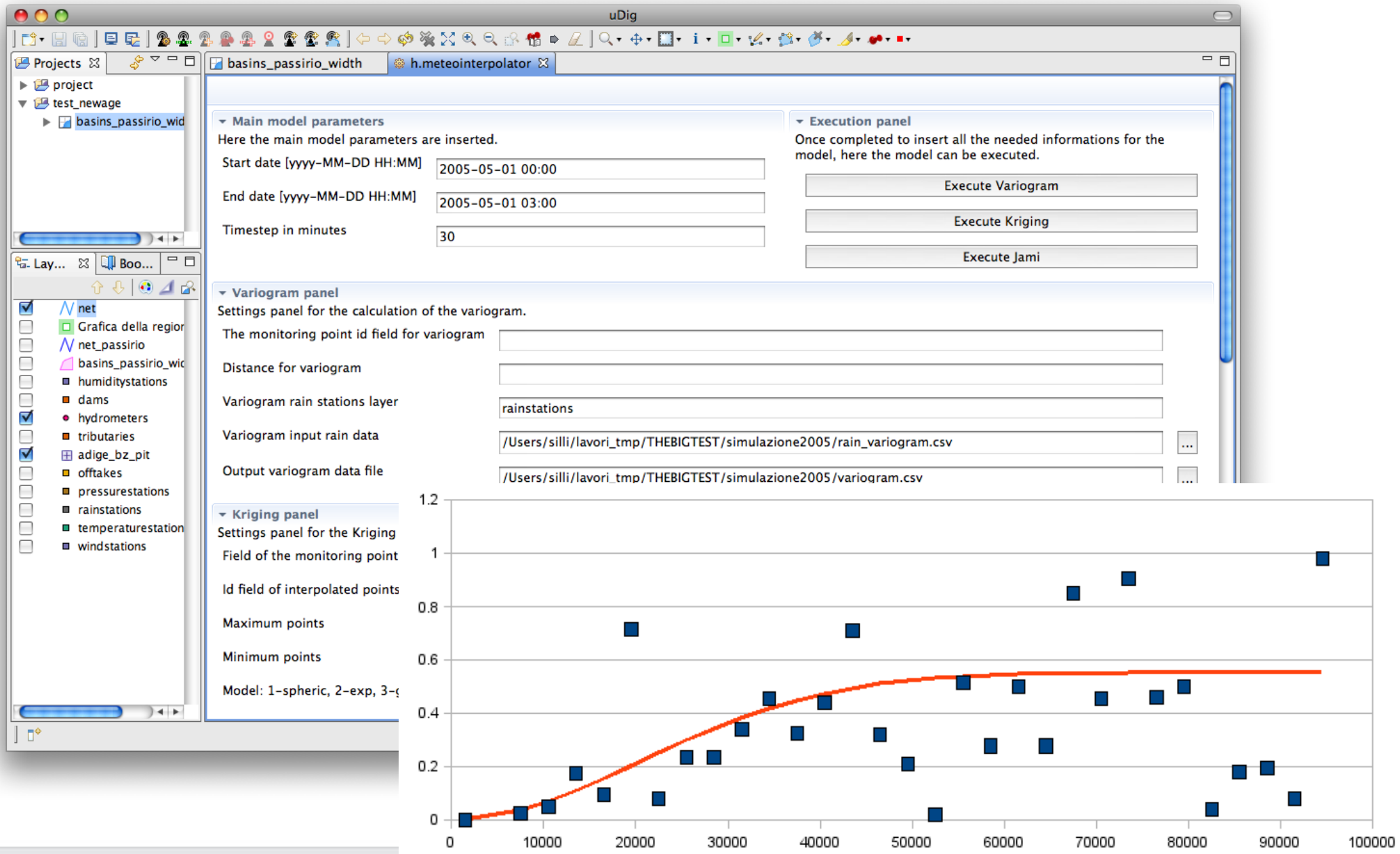
- Projects:** Shows a tree view with 'project' and 'test_newage' folders, and a sub-folder 'basins_passirio_wid'.
- Layer List:** A list of layers with checkboxes, including 'net', 'Grafica della region', 'net_passirio', 'basins_passirio_wid', 'humiditystations', 'dams', 'hydrometers', 'tributaries', 'adige_bz_pit', 'offtakes', 'pressurestations', 'rainstations', 'temperaturestation', and 'windstations'.
- Main model parameters:** Contains input fields for 'Start date [yyyy-MM-DD HH:MM]' (2005-05-01 00:00), 'End date [yyyy-MM-DD HH:MM]' (2005-05-01 03:00), and 'Timestep in minutes' (30).
- Execution panel:** Contains three buttons: 'Execute Variogram', 'Execute Kriging', and 'Execute Jami'.
- Variogram panel:** Settings for variogram calculation, including 'The monitoring point id field for variogram', 'Distance for variogram', 'Variogram rain stations layer' (rainstations), 'Variogram input rain data' (/Users/silli/lavori_tmp/THEBIGTEST/simulazione2005/rain_variogram.csv), and 'Output variogram data file' (/Users/silli/lavori_tmp/THEBIGTEST/simulazione2005/variogram.csv).
- Kriging panel:** Settings for Kriging, including 'Field of the monitoring point id for kriging' (id_punti_m), 'Id field of interpolated points' (netnum), 'Maximum points' (4), 'Minimum points' (2), and 'Model: 1-spheric, 2-exp, 3-gauss'.

JGRASS RASTERS AND VECTORS

The screenshot displays the JGRASS web interface, titled "User-friendly Desktop Internet GIS". The interface is divided into several panels:

- Progetti:** A sidebar on the left showing a project tree with folders like "newage" and "project", and a list of layers including "net_passirio_3basins", "basins_passirio_3basins", "net_passirio_block", "basins_passirio_block", "basins_passirio_2", "net_passirio", "windstations", "tributaries", "temperaturestations", "rainstations", "oftakes", "pressurestations", "dams", "hydrometers", "humiditystations", "basins_passirio_width1", "basins_passirio_width0", and "basins01".
- Menu:** A top menu bar with options: File, Modifica, Horton Machine, JGrass, GRASS, Piano, Mappa, Dati, Finestra, Aiuto.
- Toolbar:** A toolbar with various icons for navigation and editing.
- Model Configuration:** The main area contains several panels:
 - Pannello principale del modello:** Contains input fields for "Data inizio [yyyy-MM-DD HH:MM]", "Data fine [yyyy-MM-DD HH:MM]", and "Passo temporale in minuti". A red error message "16 errors detected" is displayed above this panel.
 - Pannello di esecuzione:** Contains buttons for "Esegui Variogram", "Esegui Kriging", and "Esegui Jami".
 - Pannello del Variogramma:** Contains input fields for "Campo ID punti monitoraggio per variogram", "Distanza per variogramma", "Piano delle stazioni pioggia per variogramma", "Piogge in input al variogramma", and "File di output del variogramma".
 - Pannello Kriging:** Contains input fields for "Campo ID punti monitoraggio per Kriging", "Campo ID dove l'interpolazione", "Numero massimo punti", "Numero minimo punti", "Modello", "Nugget", "Sill", "Range", "Raggio di ricerca", "Piano stazioni pioggia Kriging", "Piano delle geometrie dove interpolare", and "Pioggia input del Kriging". A tooltip message "il campo ID punti monitoraggio è un parametro richiesto." is visible over the "Campo ID punti monitoraggio per Kriging" field.
 - Pannello Jami:** Contains input fields for "Tipo di dato da interpolare".

JGRASS RASTERS AND VECTORS



JGRASS RASTERS AND VECTORS

▼ Kriging panel

Settings panel for the Kriging

Field of the monitoring point id for kriging	<input type="text" value="id_punti_m"/>
Id field of interpolated points	<input type="text" value="netnum"/>
Maximum points	<input type="text" value="4"/>
Minimum points	<input type="text" value="2"/>
Model: 1-spheric, 2-exp, 3-gauss	<input type="text"/>
Nugget	<input type="text" value="0"/>
Sill	<input type="text" value="0.85"/>
Range	<input type="text" value="75000"/>
Search radius	<input type="text" value="100000"/>
Kriging rain stations layer	<input type="text" value="rainstations"/>
Interpolated positions layer	<input type="text" value="basins_passirio_width"/>
Kriging input rain data	<input type="text" value="/Users/silli/lavori_tmp/THEBIGTEST/simulazione2005/rain2005_all.csv"/> ...
Interpolated output data	<input type="text" value="/Users/silli/lavori_tmp/THEBIGTEST/simulazione2005/test_kriging.csv"/> ...

JGRASS RASTERS AND VECTORS

The screenshot displays the JGRASS GIS software interface. The main window shows a map of a watershed with a network of streams and several colored points (green, yellow, pink) representing stations. The interface includes a menu bar, a toolbar, a project list on the left, a layer list, and a data table at the bottom.

Project List (Progetti):

- alto adige
- adige

Layer List (Piani):

- test_2006-09-07_01-00
- test_2006-09-07_00-30
- test_2006-09-07_00-00
- rete8
- stazioni_vento
- stazioni_umidita
- stazioni_temperatura
- stazioni_pressione
- pit
- bacini_bz_idliikedb0

Data Table (Tabella):

MINZ	IDVALUE	FASCIA1	FASCIA2	FASCIA3	FASCIA4	FASCIA5	new_0
498.57	1238	1498.57	1498.57	1498.57	1498.57	1498.57	0.0
82.66	1447	1016.77	1285.0	1553.22	1821.44	2089.67	0.0
391.01	1524	990.59	1189.74	1388.88	1588.03	1787.18	0.0
351.12	911	2480.65	2739.71	2998.77	3257.82	3516.88	2.64191847321...
157.17	3213	588.52	851.22	1113.92	1376.62	1639.32	0.0
283.54	2634	1414.23	1680.89	1947.54	2214.19	2480.84	0.0

JGRASS RASTERS AND VECTORS

The screenshot displays the JGRASS GIS interface. The main window shows a map of a watershed with a network of streams and several colored points representing different data layers. The interface includes a menu bar (File, Modifica, Navigazione, Horton Machine, JGrass, GRASS, Piano, Mappa, Dati, Finestra, Aiuto), a toolbar, and a project list on the left. The project list shows 'alto adige' and 'adige'. Below the project list, there are 'Piani' and 'Bookmarks' sections. The 'Piani' section lists several layers with checkboxes: test_2006-09-07_01-00, test_2006-09-07_00-30, test_2006-09-07_00-00, rete8, stazioni_vento, stazioni_umidita, stazioni_temperatura, stazioni_pressione, pit, and bacini_bz_idlikedb0. The map shows a network of streams and several colored points (green, yellow, pink, blue) representing different data layers. The map scale is 1:511.085, and the projection is ETRS89...ne 32N. The map coordinates are 590610, 5149308. Below the map, there is a 'Catalogo' section with a search bar and a 'Tabella' section showing a table of selected features. The table has 8 columns: MINZ, IDVALUE, FASCIA1, FASCIA2, FASCIA3, FASCIA4, FASCIA5, and new_0. The table contains 7 rows of data.

MINZ	IDVALUE	FASCIA1	FASCIA2	FASCIA3	FASCIA4	FASCIA5	new_0
498.57	1238	1498.57	1498.57	1498.57	1498.57	1498.57	0.03654079504...
82.66	1447	1016.77	1285.0	1553.22	1821.44	2089.67	0.25682721322...
391.01	1524	990.59	1189.74	1388.88	1588.03	1787.18	0.35082222624...
351.12	911	2480.65	2739.71	2998.77	3257.82	3516.88	0.47177115593...
157.17	3213	588.52	851.22	1113.92	1376.62	1639.32	0.61829490476...
283.54	2634	1414.23	1680.89	1947.54	2214.19	2480.84	0.55797333492...

JGRASS RASTERS AND VECTORS

The screenshot displays the JGRASS GIS interface. The main window shows a map of a watershed with a network of streams and several colored points representing different data layers. The interface includes a menu bar, a toolbar, and several panels:

- Progetti:** Shows the current project 'adige' and its sub-project 'default.jgrass'.
- Piani:** A list of layers with checkboxes:
 - test_2006-09-07_01-00
 - test_2006-09-07_00-30
 - test_2006-09-07_00-00
 - rete8
 - stazioni_vento
 - stazioni_umidita
 - stazioni_temperatura
 - stazioni_pressione
 - pit
 - bacini_bz_idliikedb0
- Mapa:** The main map area showing a watershed network with several colored points (green, yellow, pink, blue) overlaid on it.
- Scale and Coordinates:** Scale: 1:511.085; Projection: ETRS89...ne 32N; Coordinates: 595343, 5144169.
- Tabella:** A data table showing selected features with columns: MINZ, IDVALUE, FASCIA1, FASCIA2, FASCIA3, FASCIA4, FASCIA5, and new_0.

MINZ	IDVALUE	FASCIA1	FASCIA2	FASCIA3	FASCIA4	FASCIA5	new_0
498.57	1238	1498.57	1498.57	1498.57	1498.57	1498.57	0.0
382.66	1447	1016.77	1285.0	1553.22	1821.44	2089.67	0.0
391.01	1524	990.59	1189.74	1388.88	1588.03	1787.18	0.03898024736...
351.12	911	2480.65	2739.71	2998.77	3257.82	3516.88	0.04717711559...
157.17	3213	588.52	851.22	1113.92	1376.62	1639.32	0.04248971701...
283.54	2634	1414.23	1680.89	1947.54	2214.19	2480.84	0.04034194456...

JGRASS RASTERS AND VECTORS

```
12
13 jgrass {
14     h.kriging
15         --idfield "NETNUM"
16         --idfieldinterpolated "NETNUM"
17         --maxpoints 4 --minpoints 2 --model 2 --nugget "0.05"
18         --sill 0.6 --range 50000 --dovariance "true" --searchradius 100000
19         --itscalar-inputvalues "/media/BUNDELE/newage/modelli_nuovi/THEBIGTEST/pioggia_2005/rain2005_all.csv"
20         --iflayer-positions "stazioni_rain_all"
21         --iflayer-interpolatedpositions "bacini_bz_idlikedb0_uso_suolo"
22         --oscalar-outputvalues "/media/BUNDELE/newage/modelli_nuovi/THEBIGTEST/simulazione2005/kriging2005.csv"
23 }
24
25 jgrass {
26     v.addattributes
27     --iflayer-infeatures "bacini_bz_idlikedb0"
28     --itscalar-attributes "/Users/silli/lavori_tmp/THEBIGTEST/pioggia_2005/rain_krigged_small2"
29     --oshapefile-outfeatures "/Users/silli/lavori_tmp/THEBIGTEST/pioggia_2005/shape_rain/rain2"
30     --joinfield "NETNUM"
31 }
```

JGRASS RASTERS AND VECTORS

- h.jami: interpolate other measured quantities in monitoring points using particular physical based models, taking into account
 - ◆ spatial distribution of monitoring points
 - ◆ monitoring points height
 - ◆ number of available valid measures
 - ◆ used for temperature, pressure, wind celerity, relative humidity, daily and monthly temperature range

JGRASS RASTERS AND VECTORS

▼ Jami panel

Settings panel for the Jami interpolator

The data type to be interpolated: 1-T, 2:P, 3:RH, 4:W, 5:DTday, 6:DTmonth

Maximum number of stations to use per elevation band

Number of bins to use

Field of the monitoring point id for Jami

Field of the station elevation

Field of the basin netnum

Layer of stations

Layer of basins (polygon or point)

Altimetry input data



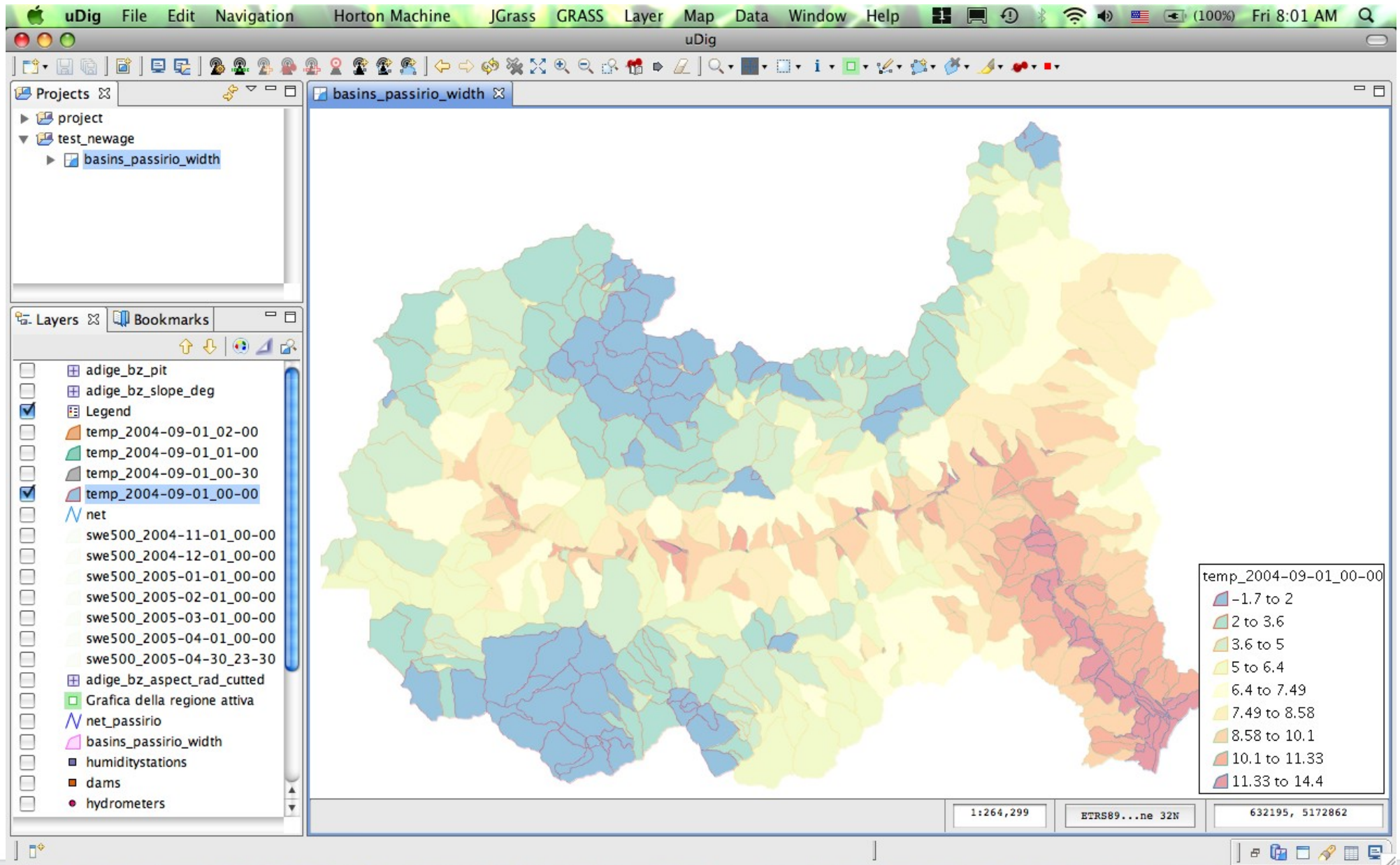
Meteo input data



Interpolated meteo output data



JGRASS RASTERS AND VECTORS



JGRASS CALCULATION ON MAPS

- r.mapcalc and r.summary provide general calculation on maps
 - ◆ average, max e min values
 - ◆ mathematical operations over values in a map

JGRASS CALCULATION ON MAPS

The screenshot shows the uDig GIS interface. A map of the Adige basin is displayed with a color-coded terrain (green to brown) and stream networks. Several locations are labeled: Passirio a Saltusio, Adige a Tell, Adige a Lasa, Yalsura a Lana, and Adige a Ponte Adige. A dialog box titled 'r.summary' is open, showing 'raster map: adige_bz_pit' and 'OK' button. The map's metadata at the bottom right indicates a scale of 1:423,379, a coordinate system of ETRS89...ne 32N, and coordinates 597929, 5204365. The console at the bottom shows the output of the 'energy_balance_2005.jgrass' process:

```

energy_balance_2005.jgrass
*****
summary for the map:

range: 237.31492614746094 - 3889.779541015625
mean: 1885.2780120409461
active cells: 1663897.0
active area (assuming metric resolution): 2.6622352E9
window:
west=601576.82243
east=686136.82243
    
```


JGRASS CALCULATION ON MAPS

The screenshot shows the uDig software interface. On the left, the 'Layers' panel lists various data layers, including 'adige_bz_pit', 'adige_bz_slope_deg', and 'basins_passirio_width'. The main map area displays a topographic map of a region. A dialog box titled 'function area' is open, containing the following text:

```
if(adige_bz_pit > 2000,sqrt(adige_bz_nabla) /  
2,adige_bz_nabla /2)
```

Below the text area, the 'resulting map:' field is set to 'test'. The dialog also features a grid of mathematical operators and functions, including 'map:', 'adige_bz_nabla', 'if()', 'null', 'isnull', 'CE', '==', '!=', 'AND', 'OR', '>', '<', '>=', '<=', 'sin', 'cos', 'tan', 'atan', 'log', 'sqrt', 'exp', 'abs', and a numeric keypad with digits 0-9, a decimal point, and a plus sign. 'Ok' and 'Cancel' buttons are at the bottom.

JGRASS CALCULATION ON MAPS

- r.mapcalc and r.summary provide general calculation on maps
 - ♦ average, max e min values
 - ♦ mathematical operations over values in a map
- h.cb for statistical properties on the maps
 - ♦ average and standard deviation values
 - ♦ possibility to combine values of two different maps (slope against height, temperature against rain, ...)

JGRASS CALCULATION ON MAPS

The screenshot shows the uDig GIS application interface. The main window displays a topographic map of a watershed area, color-coded by elevation (green for lower elevations, yellow/orange for mid, and brown for higher). Several sub-watersheds are labeled: "Adige a Lasa", "Adige a Tell", "Passirio a Saltusio", "Valsura a Lana", and "Adige a Ponte Adige".

The "Horton Machine" menu is open, showing a list of processing tools. The "Statistics" option is selected, and its sub-menu is also open, listing tools: "h.sumdownstream", "h.kriging", "h.variogram", "h.jami", "h.cb", and "h.hypsographic".

The left sidebar shows a project tree with "basins_passirio_wid" selected. Below it, a layer list includes "net", "Grafica della region", "net_passirio", "basins_passirio_wid", "humidystations", "dams", "hydrometers", "tributaries", "adige_bz_pit", "offtakes", "pressurestations", "rainstations", "temperaturestation", and "windstations".

The bottom console window displays the following text for the "energy_balance_2005.jgrass" map:

```

energy_balance_2005.jgrass
*****
summary for the map:

range: 237.31492614746094 - 3889.779541015625
mean: 1885.2780120409461
active cells: 1663897.0
active area (assuming metric resolution): 2.6622352E9
window:
west=601576.82243
east=686136.82243
    
```

At the bottom left, a status bar indicates "Layer rendered".

JGRASS CALCULATION ON MAPS

input map with independent variable: mybasin_topindex_corr

input map with dependent variable: mybasin_topindex_corr

first moment: 1

last moment: 2

number of bins: 100

Create the peakflow input file

peakflow output file:

Create the complete output file

full output file: /media/BUNDELE/lavori/bacinimontani/lezioni_jgras

output table widget

output histogram chart

output line chart

OK Cancel

JGRASS CALCULATION ON MAPS

CB

input map with independent variable: mybasin_topindex_corr

input map with dependent variable: mybasin_topindex_corr

first moment: 1

last moment: 2

number of bins: 1

Create the peakflow input file

peakflow output file:

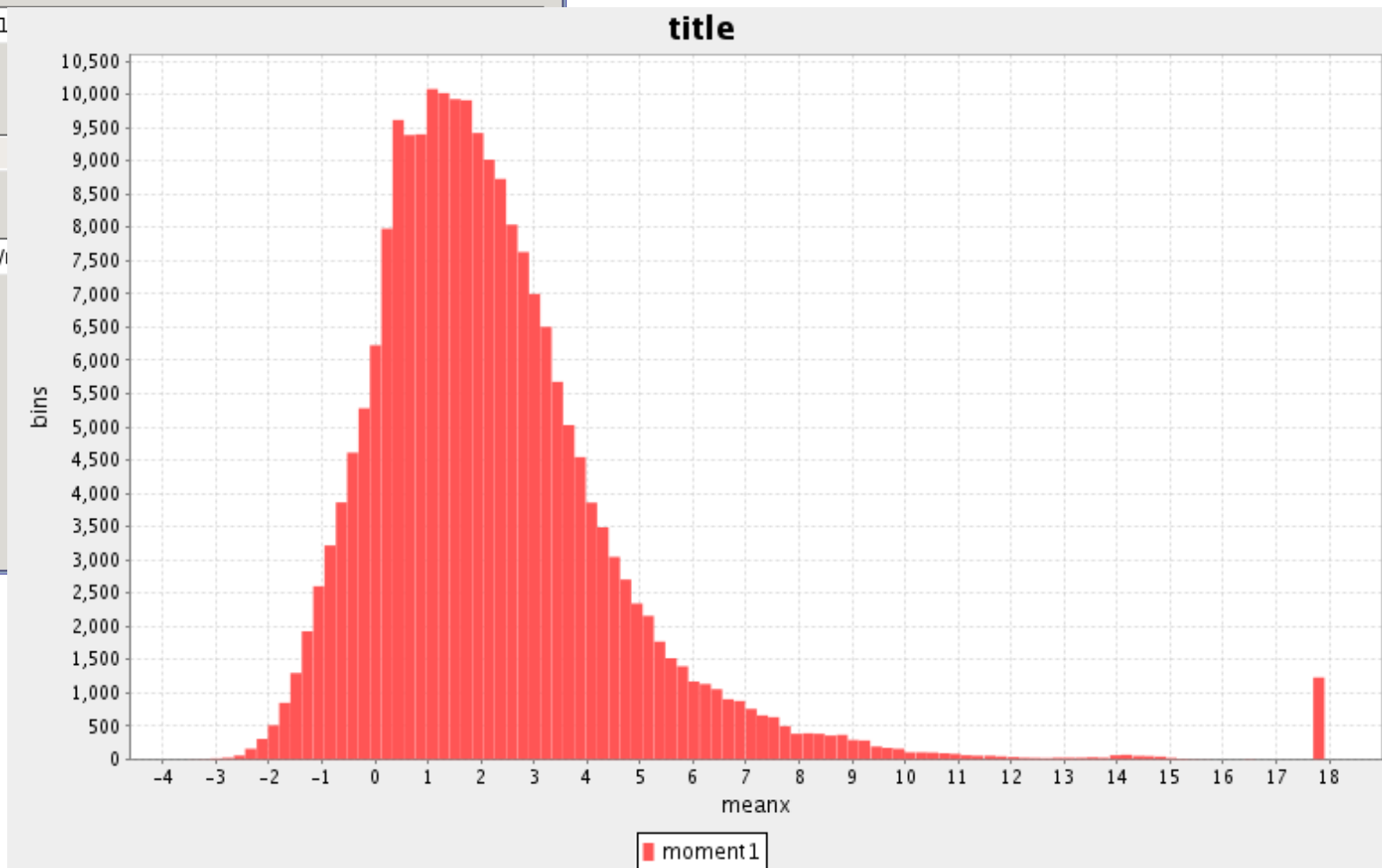
Create the complete output file

full output file: /

output table widget

output histogram chart

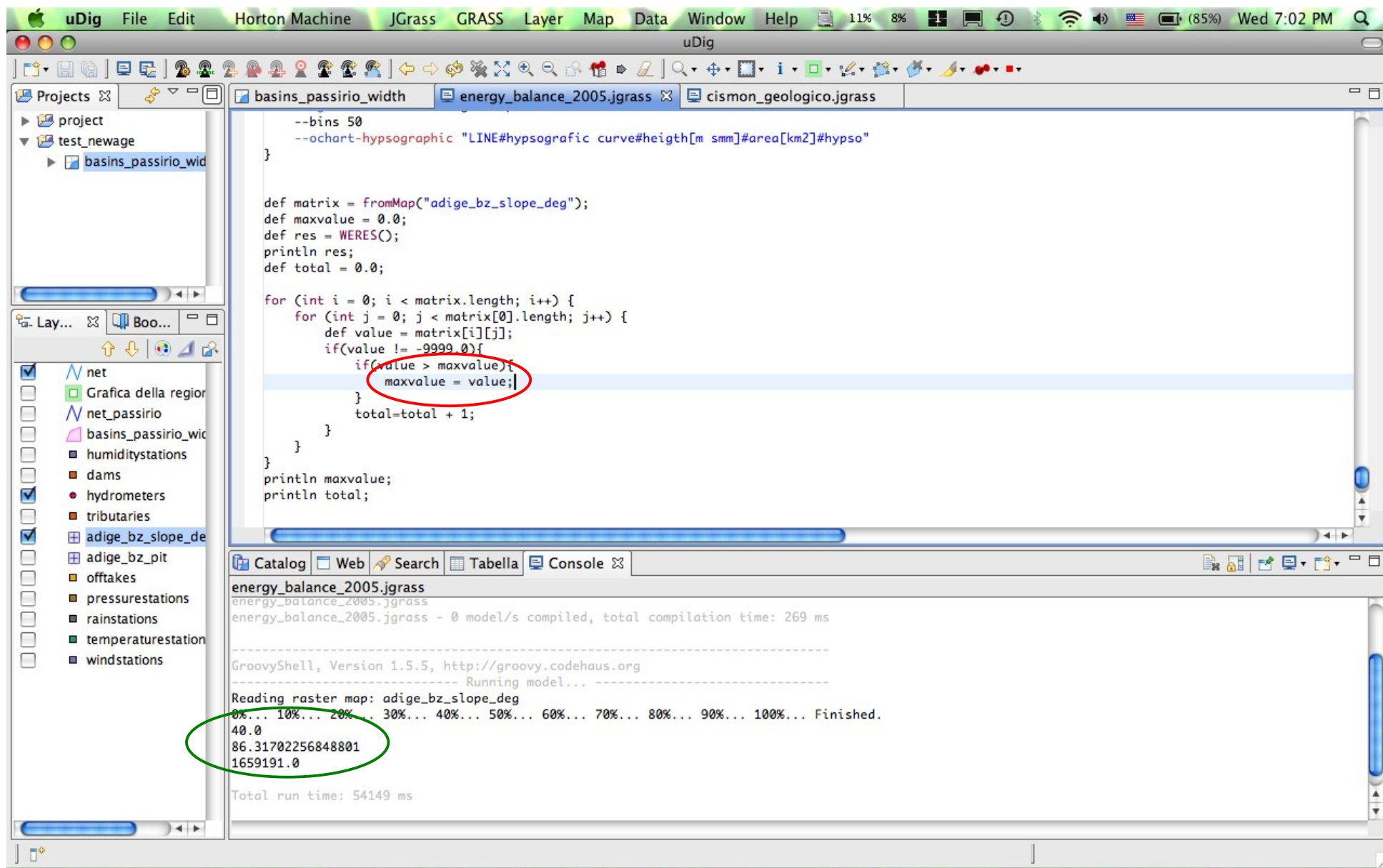
output line chart



JGRASS CALCULATION ON MAPS

- r.mapcalc and r.summary for general calculation on maps
 - ◆ mean, max e min values
 - ◆ mathematical operations over values in a map
- h.cb for statistical contents on maps
 - ◆ mean and standard deviation values
 - ◆ possibility to combine values of two different maps
- scripting environment for recursive calculation and other statistical elaborations
 - ◆ calculation of the number and frequency of sites with hot or cold days in a year (temperature over or less than a fixed value)

JGRASS CALCULATION ON MAPS



The screenshot displays the uDig application window with the following components:

- Projects Panel:** Shows a project named 'test_newage' with a sub-project 'basins_passirio_wid'.
- Layer Panel:** Lists various layers, including 'net', 'Grafica della region', 'net_passirio', 'basins_passirio_wid', 'humiditystations', 'dams', 'hydrometers', 'tributaries', 'adige_bz_slope_deg', 'adige_bz_pit', 'oftakes', 'pressurestations', 'rainstations', 'temperaturestation', and 'windstations'.
- Code Editor:** Contains a Groovy script for calculating the maximum value of a raster map. The script is highlighted in blue, and the line `maxvalue = value;` is circled in red.
- Console Window:** Shows the output of the script execution, including the total run time and the maximum value calculated.

```
--bins 50
--ochart-hypsographic "LINE#hypsographic curve#heigth[m smm]#area[km2]#hypso"
}

def matrix = fromMap("adige_bz_slope_deg");
def maxvalue = 0.0;
def res = WERES();
println res;
def total = 0.0;

for (int i = 0; i < matrix.length; i++) {
    for (int j = 0; j < matrix[0].length; j++) {
        def value = matrix[i][j];
        if(value != -9999.0){
            if(value > maxvalue){
                maxvalue = value;
            }
            total=total + 1;
        }
    }
}
println maxvalue;
println total;
```

energy_balance_2005.jgrass
energy_balance_2005.jgrass - 0 model/s compiled, total compilation time: 269 ms

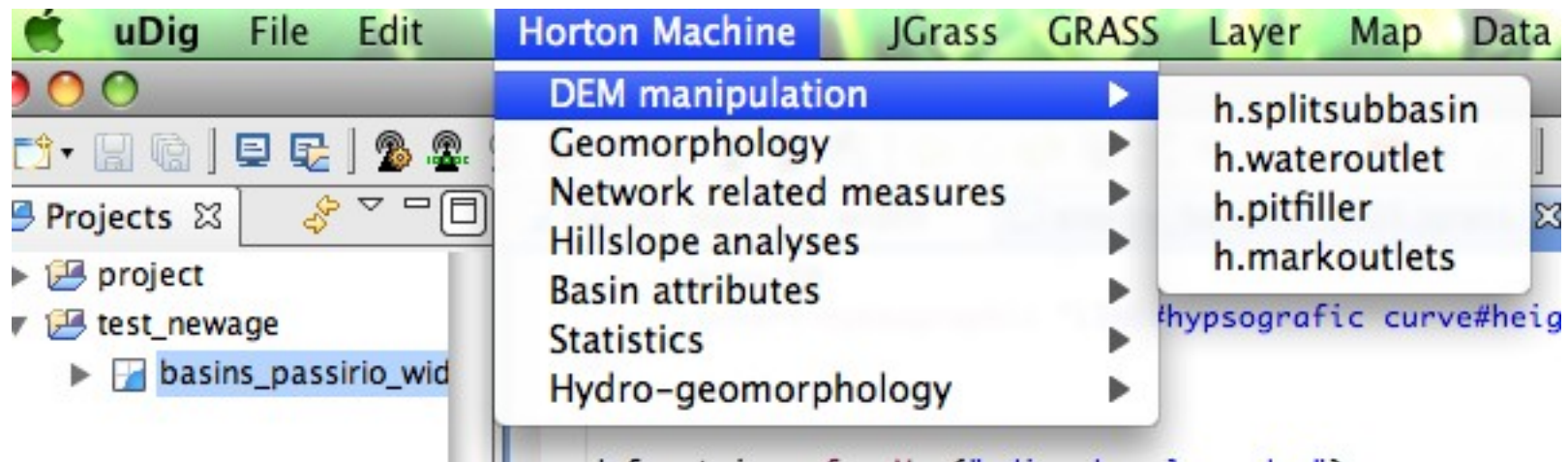
GroovyShell, Version 1.5.5, http://groovy.codehaus.org
Running model...

Reading raster map: adige_bz_slope_deg
0%... 10%... 20%... 30%... 40%... 50%... 60%... 70%... 80%... 90%... 100%... Finished.
40.0
86.31702256848801
1659191.0

Total run time: 54149 ms

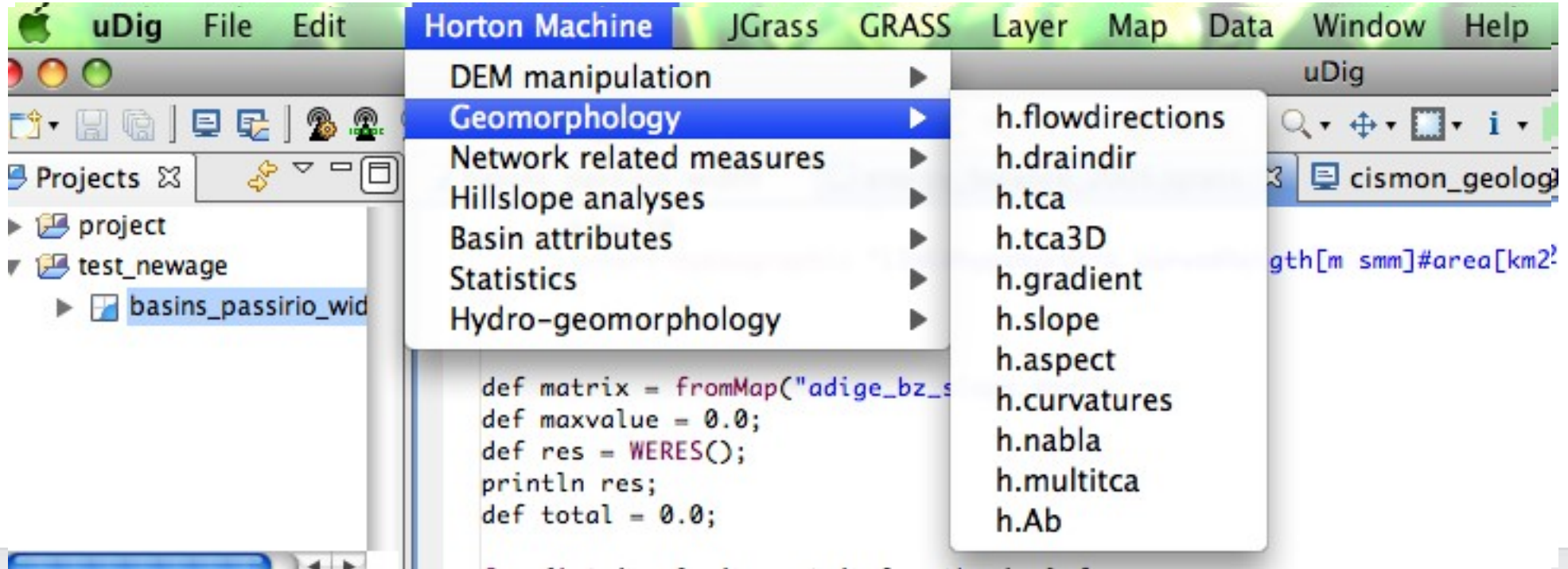
JGRASS MORPHOLOGICAL ATTRIBUTES

- DEM manipulation
- subbasins extraction
- watershed definition

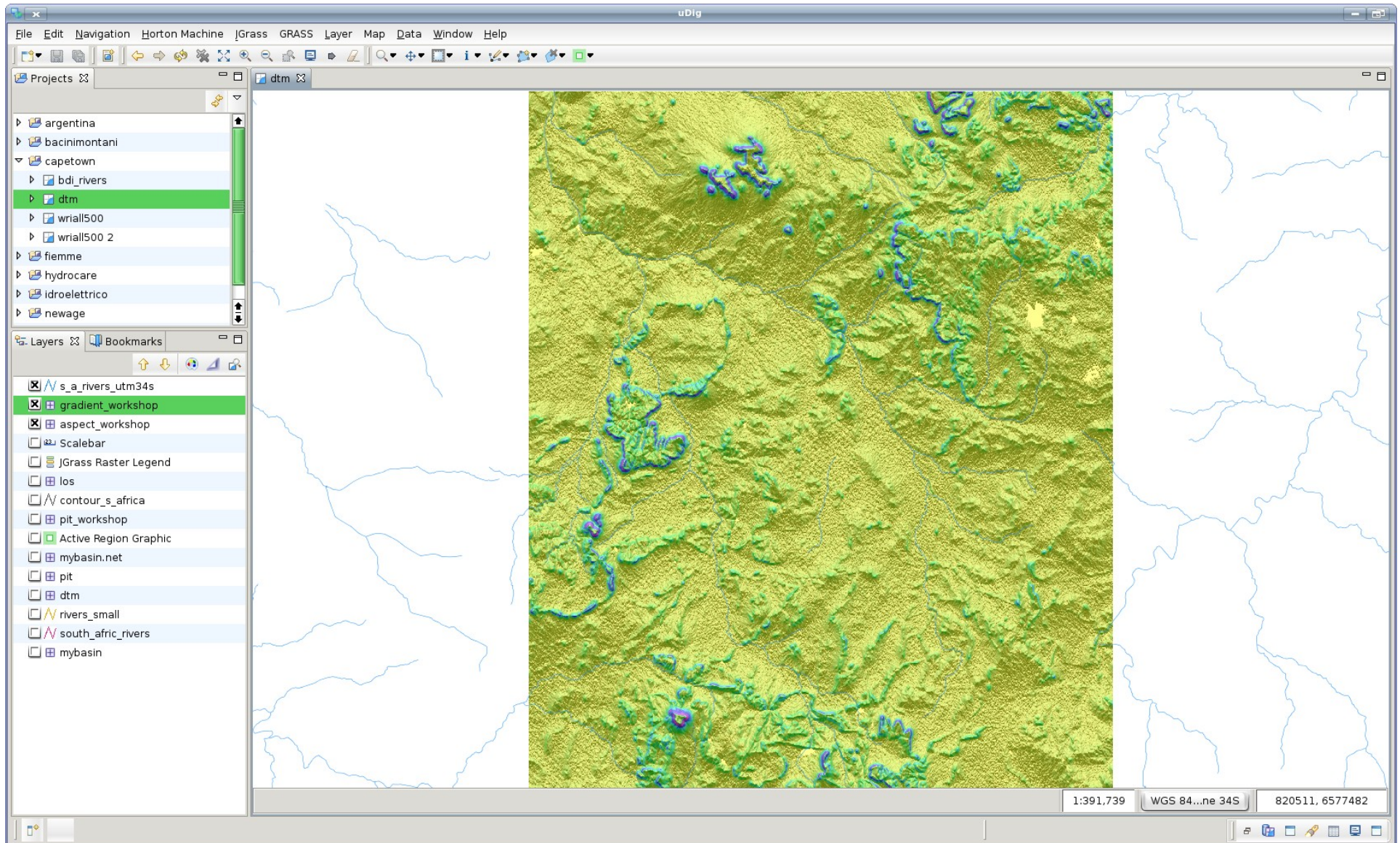


JGRASS MORPHOLOGICAL ATTRIBUTES

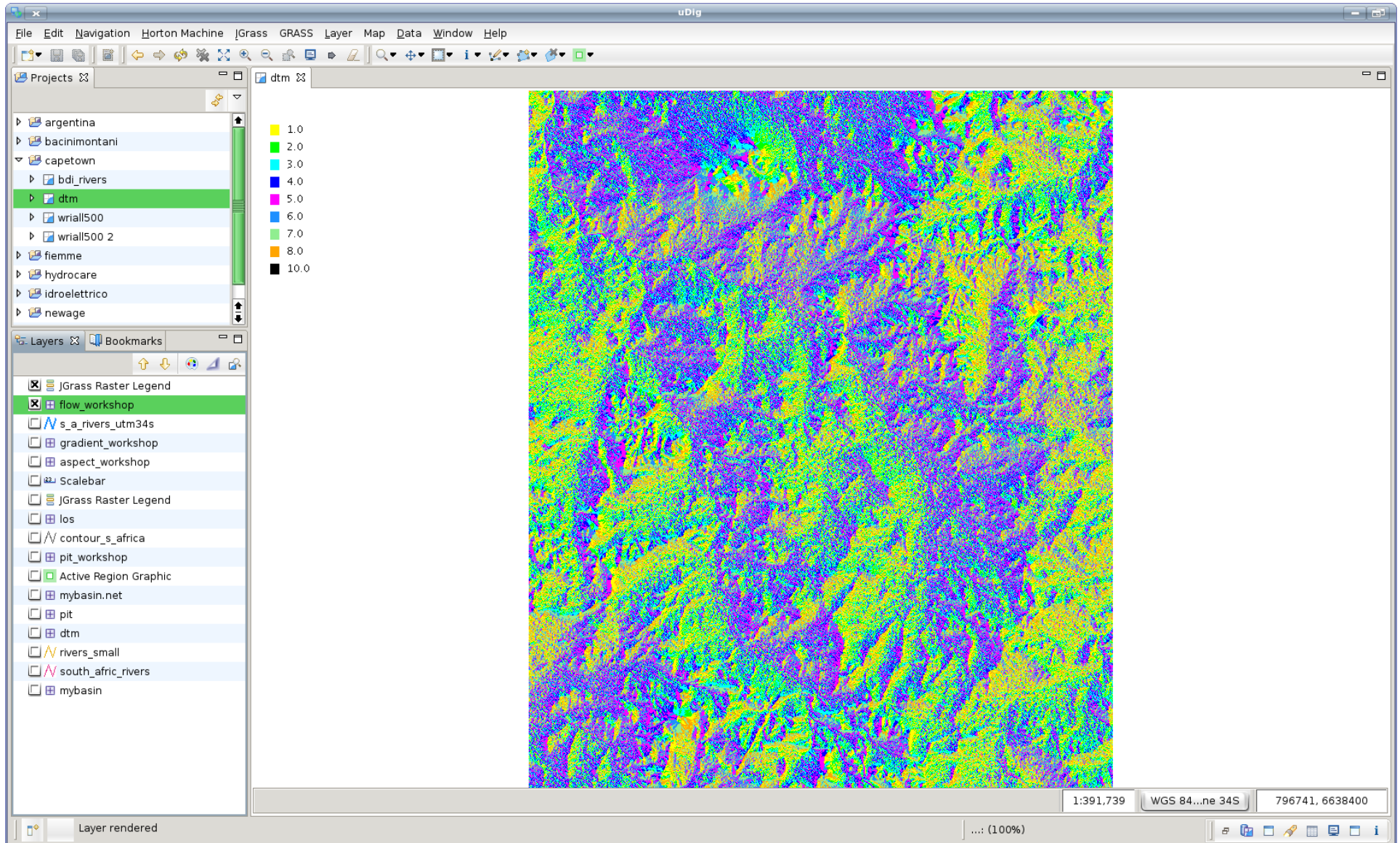
- › DEM manipulation
- › DTM derived information
 - slope
 - curvatures



JGRASS MORPHOLOGICAL ATTRIBUTES

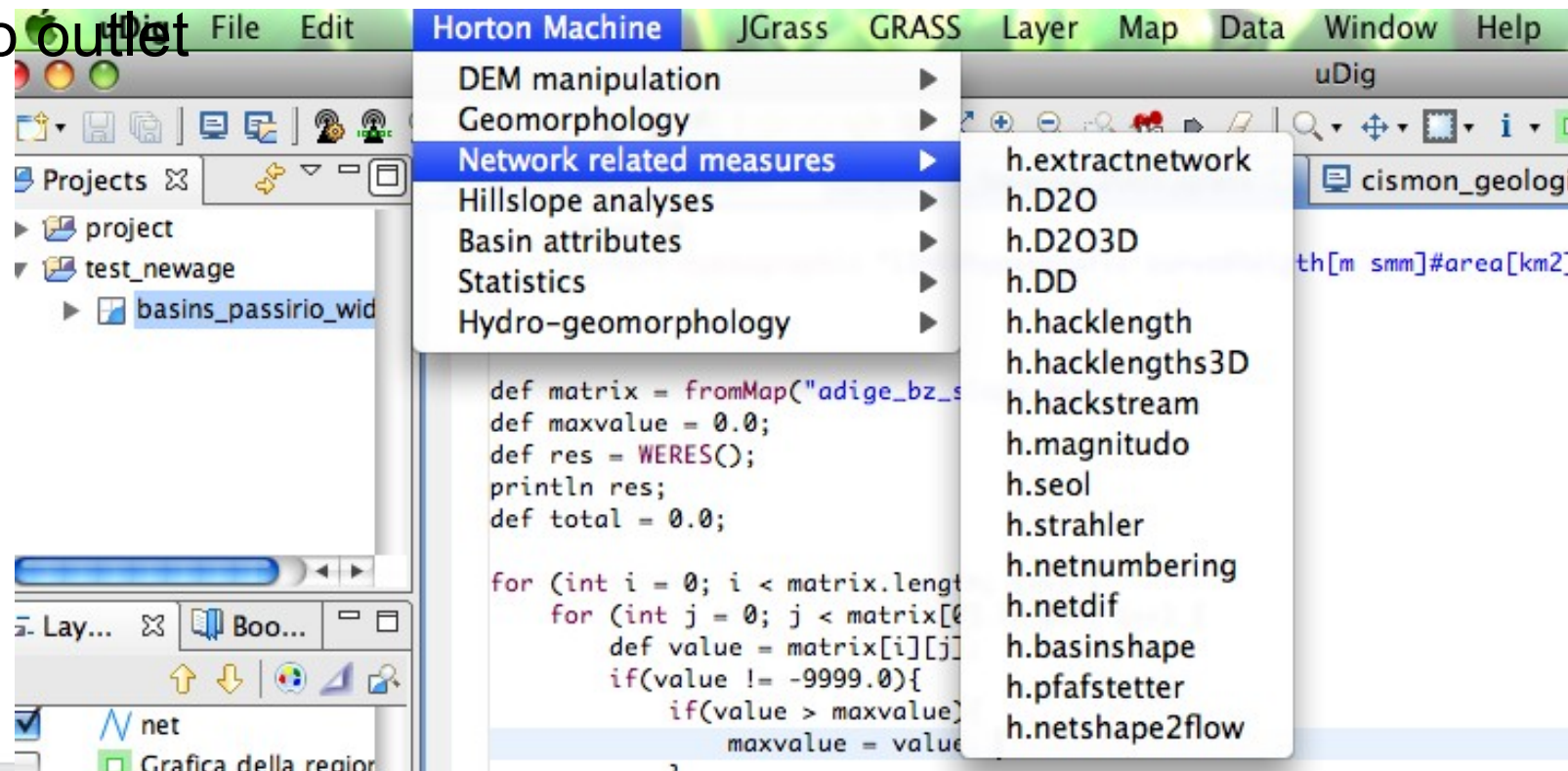


JGRASS MORPHOLOGICAL ATTRIBUTES

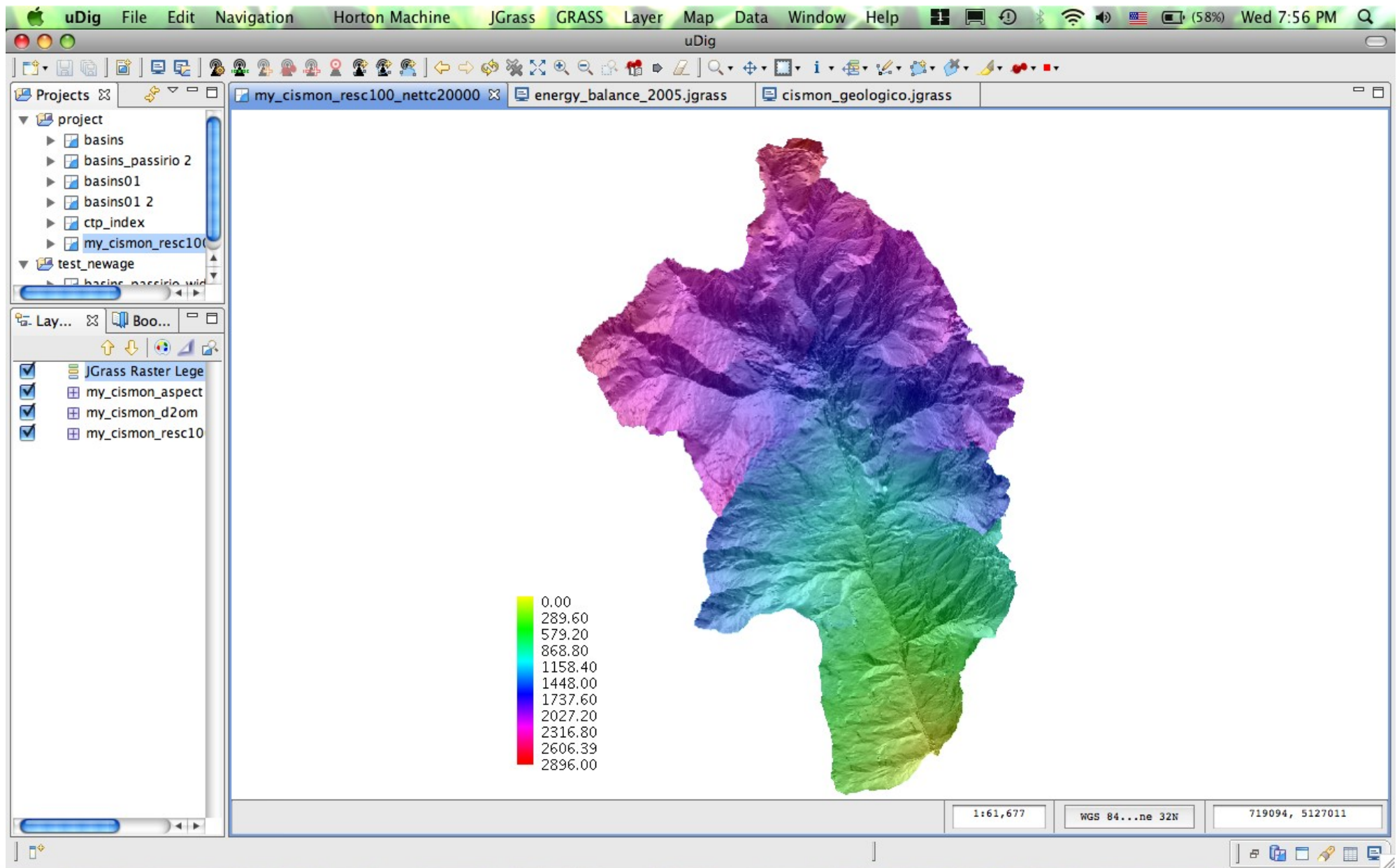


JGRASS MORPHOLOGICAL ATTRIBUTES

- DEM manipulation
- ◆ DTM derived information
- Network related measures
 - ◆ distance to outlet
 - ◆ Strahler

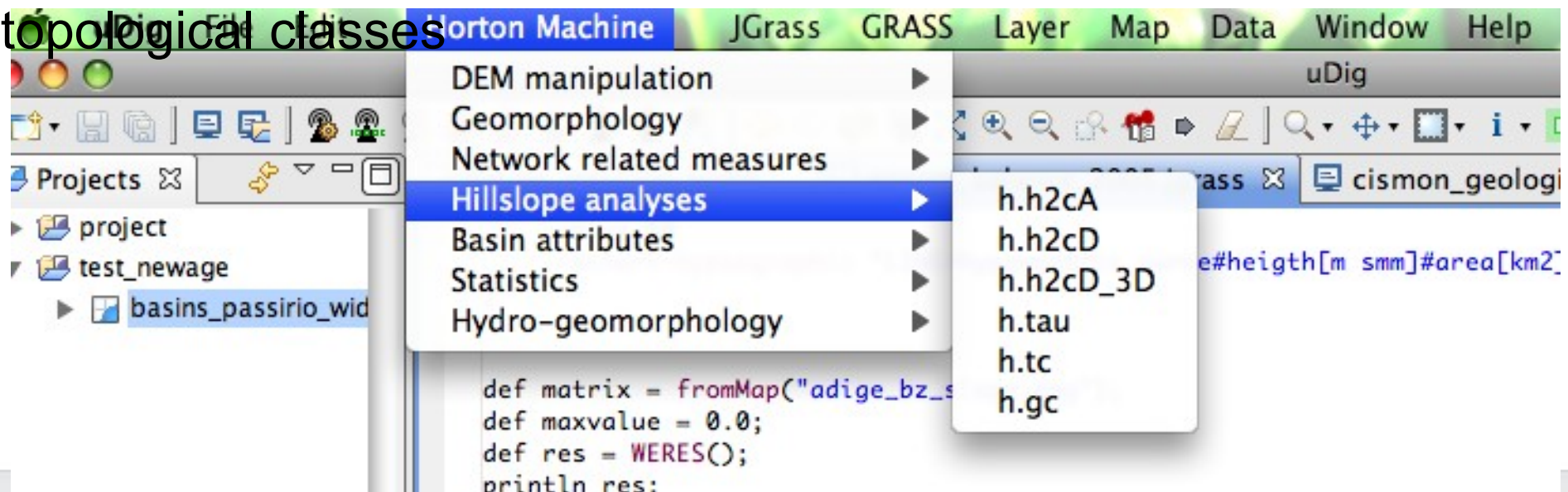


JGRASS MORPHOLOGICAL ATTRIBUTES

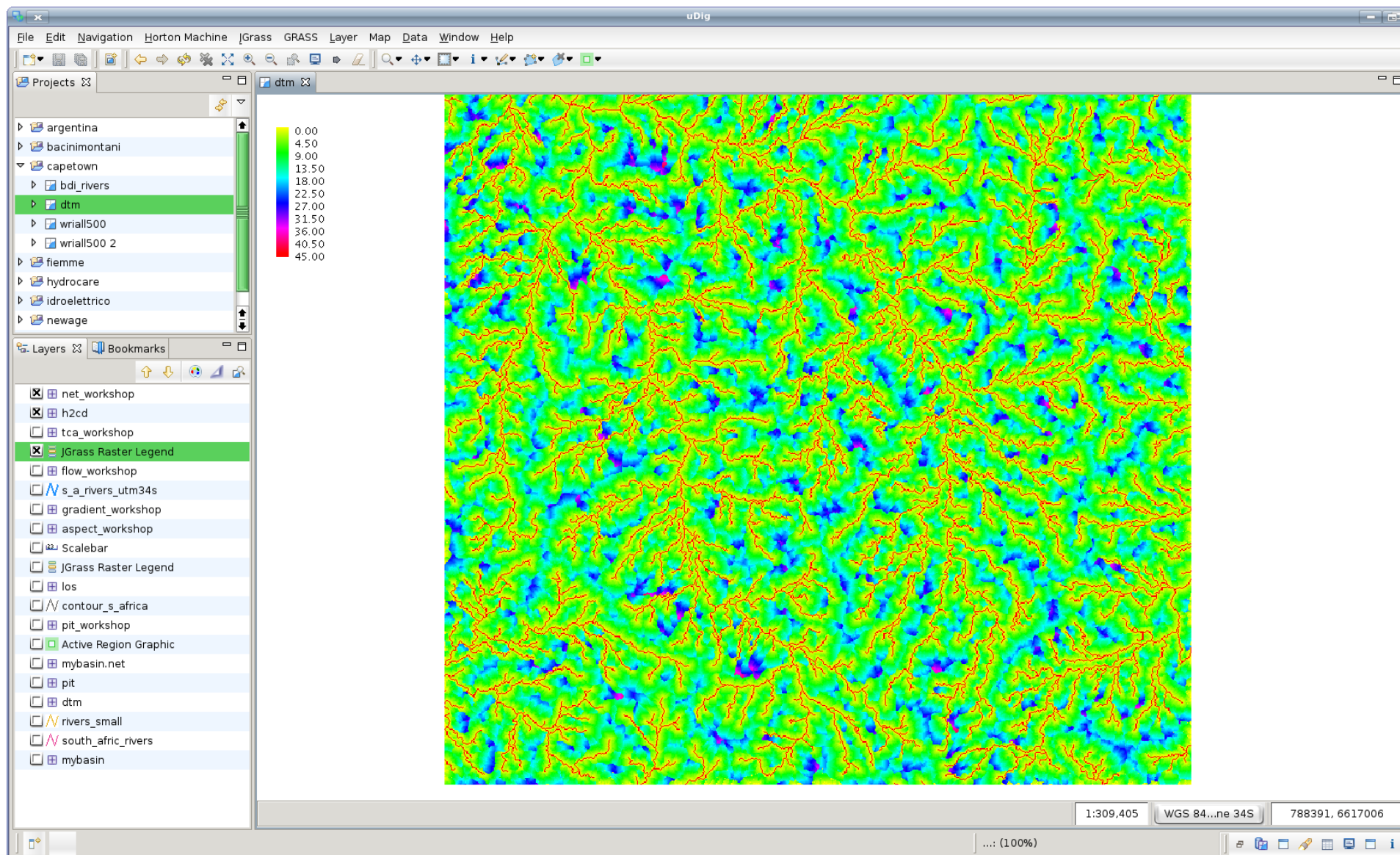


JGRASS MORPHOLOGICAL ATTRIBUTES

- › DEM manipulation
- › DTM derived information
- › Network related measures
- › Hillslope analysis
 - ◆ hillslope to channel distance/attribute
 - ◆ topological classes

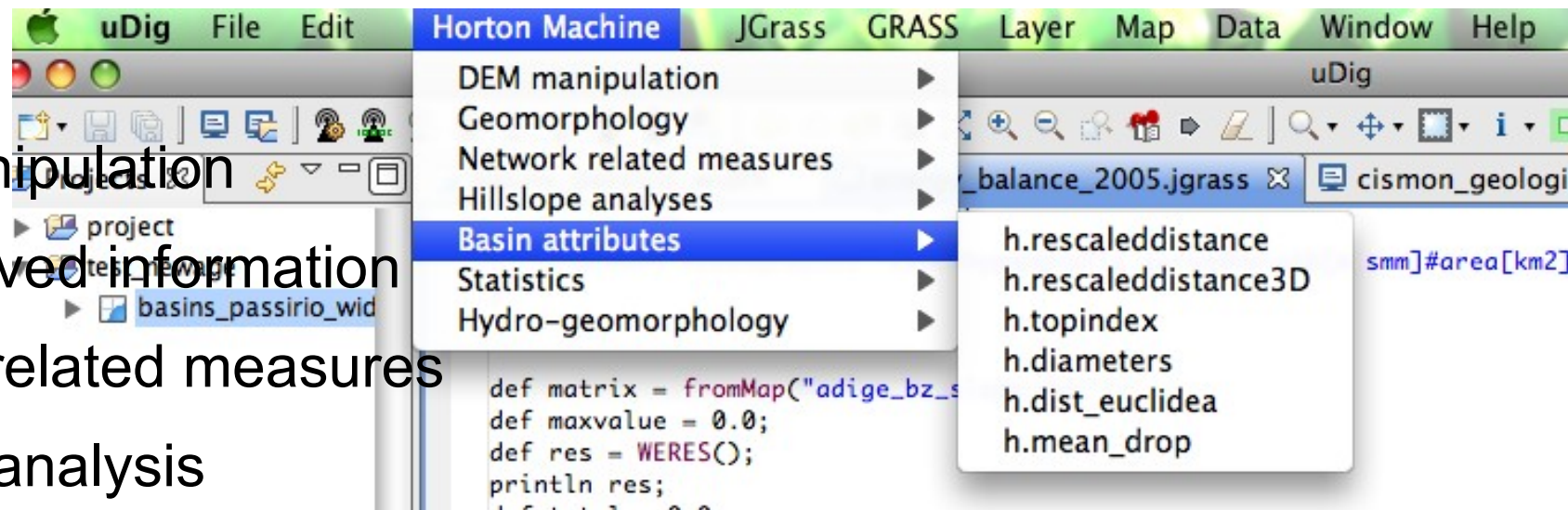


JGRASS MORPHOLOGICAL ATTRIBUTES

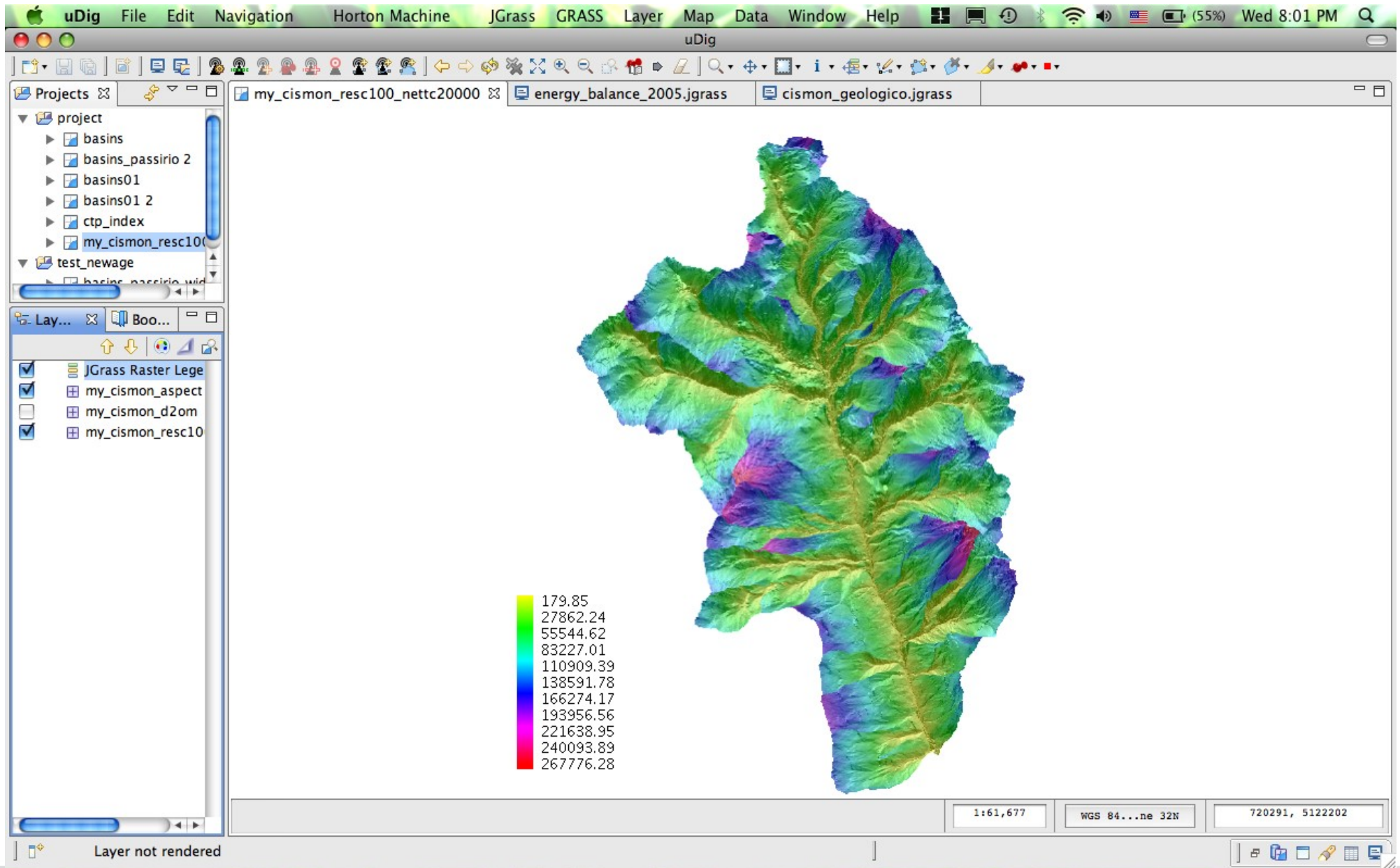


JGRASS MORPHOLOGICAL ATTRIBUTES

- DEM manipulation
- ◆ DTM derived information
- Network related measures
- Hillslope analysis
- Basin attributes
 - ◆ rescaled distances
 - ◆ topindex



JGRASS MORPHOLOGICAL ATTRIBUTES



JGRASS h.peakflow

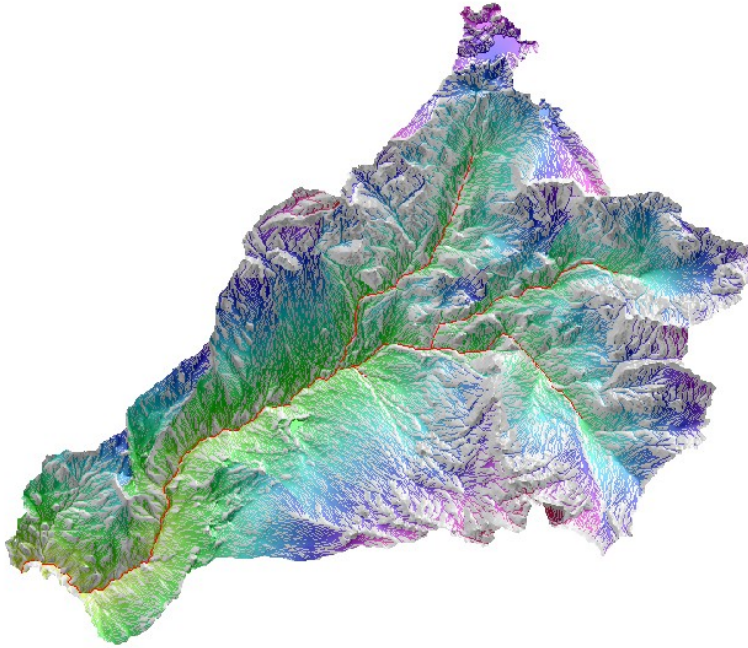
It calculate the maximum discharge in a basin for a given rainfall event

- ♦ based model is the GIUH and the width function
- ♦ rainfall event can be given in term of return period event or measured rainfall for each timestep
- ♦ required parameters are:
 - saturated percentage of the basin
 - flow channel celerity

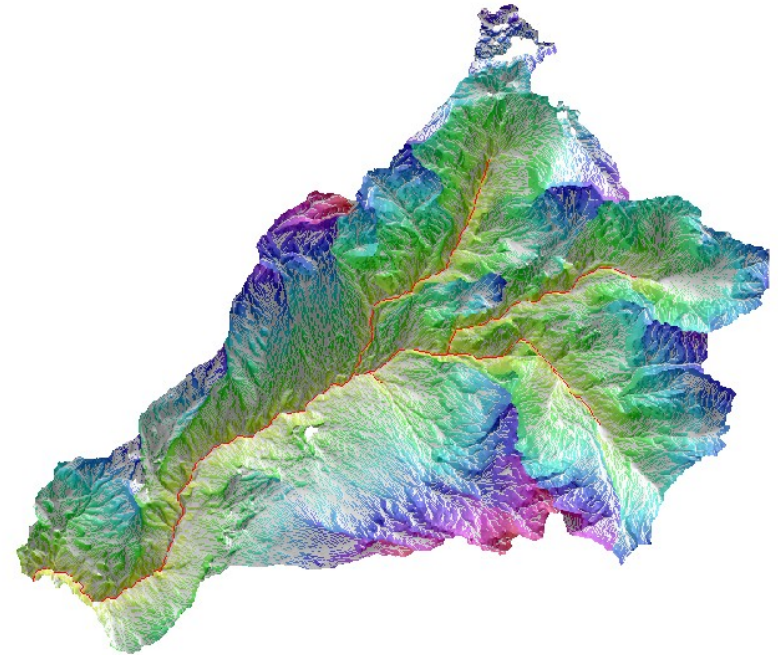
Case study: many applications in Italy and in Switzerland for the evaluation of the maximum discharges and flood risks.

JGRASS h.peakflow

SATURATED ZONE

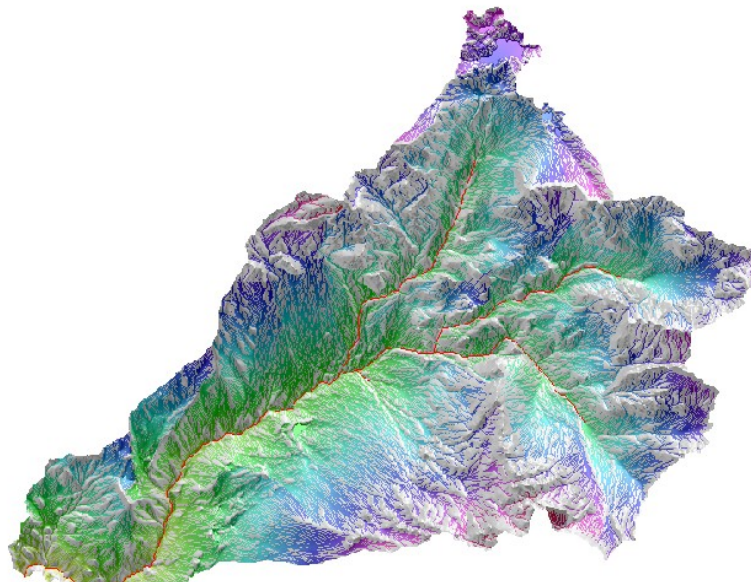


UNSATURATED ZONE

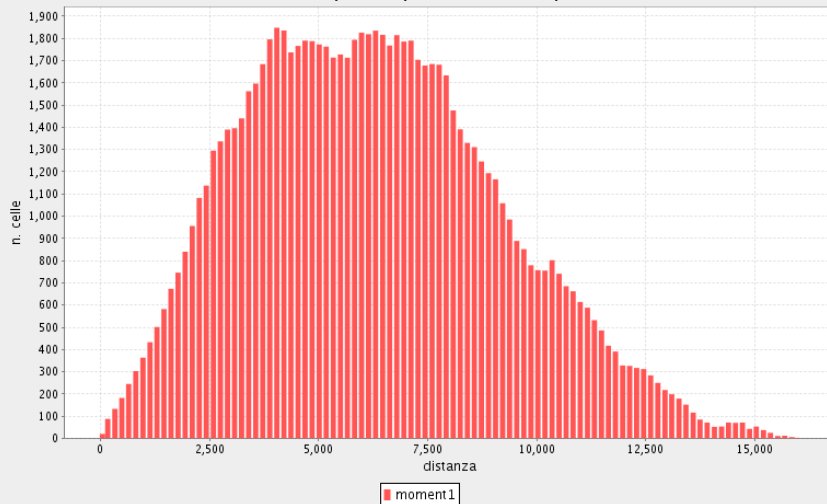


JGRASS h.peakflow

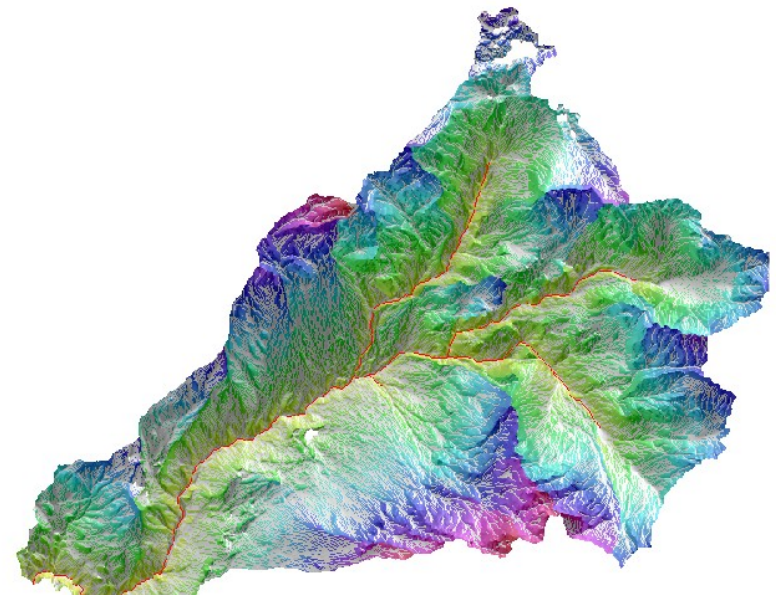
SATURATED ZONE



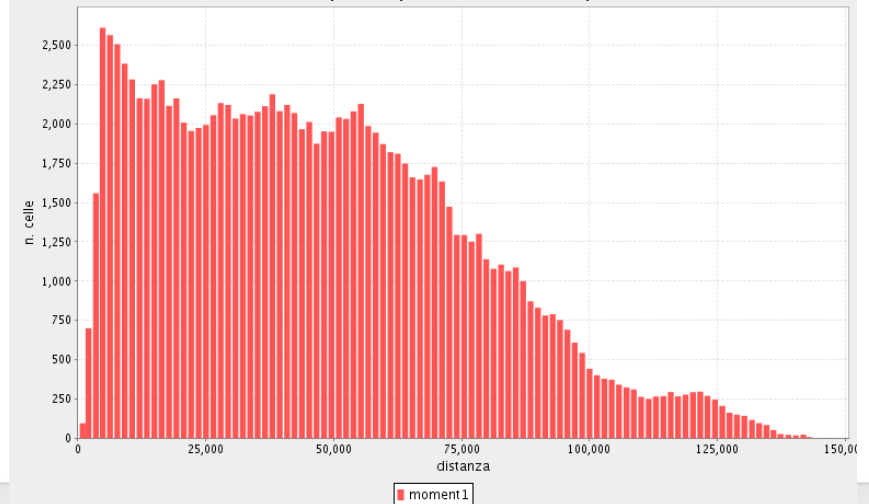
Funzione d'ampiezza per deflusso superficiale



UNSATURATED ZONE



Funzione d'ampiezza per deflusso subsuperficiale



JGRASS h.peakflow

Peakflow

input file with the superficial width function: /i/lezioni_jgrass/dati/mybasin_rescsup10 ...

input file with the subsuperficial width function: /lezioni_jgrass/dati/mybasin_rescsub100 ...

a parameter of IDF curves [m/hⁿ): 43.91

n parameter of IDF curves: 0.48

channel celerity [m/s]: 2

diffusion [m²/s]: 1000

output file timestep [s]: 300

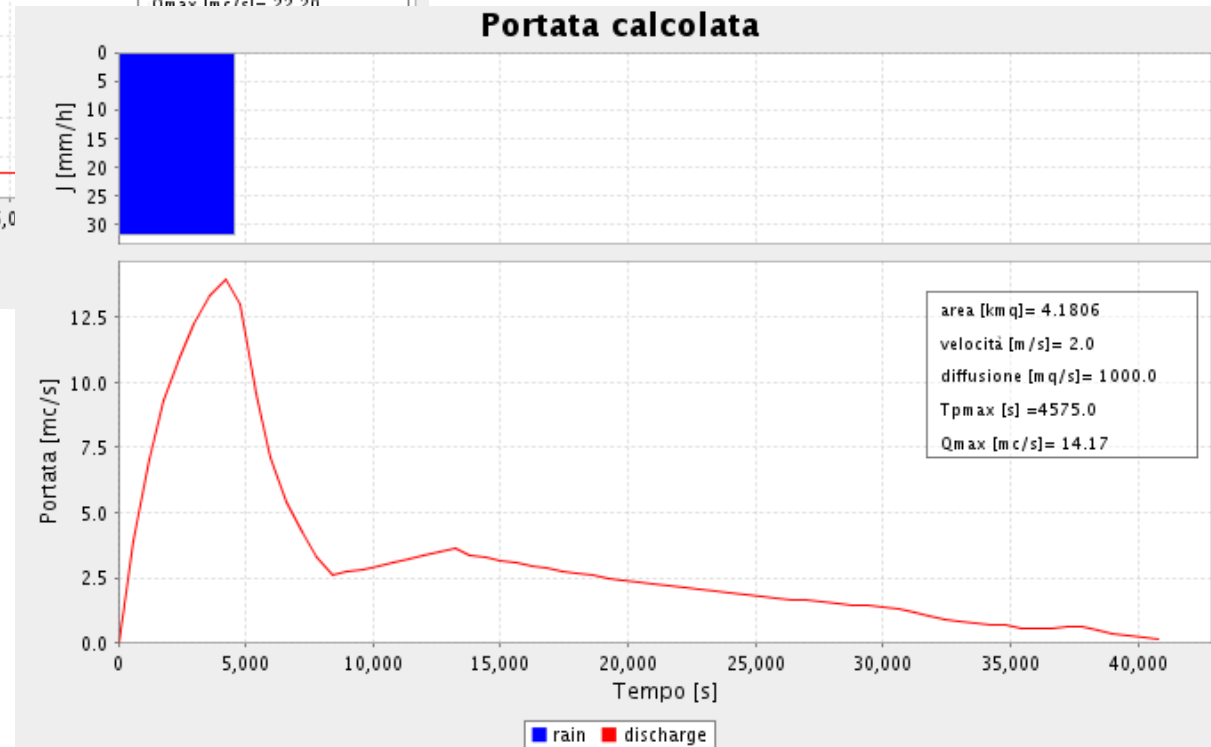
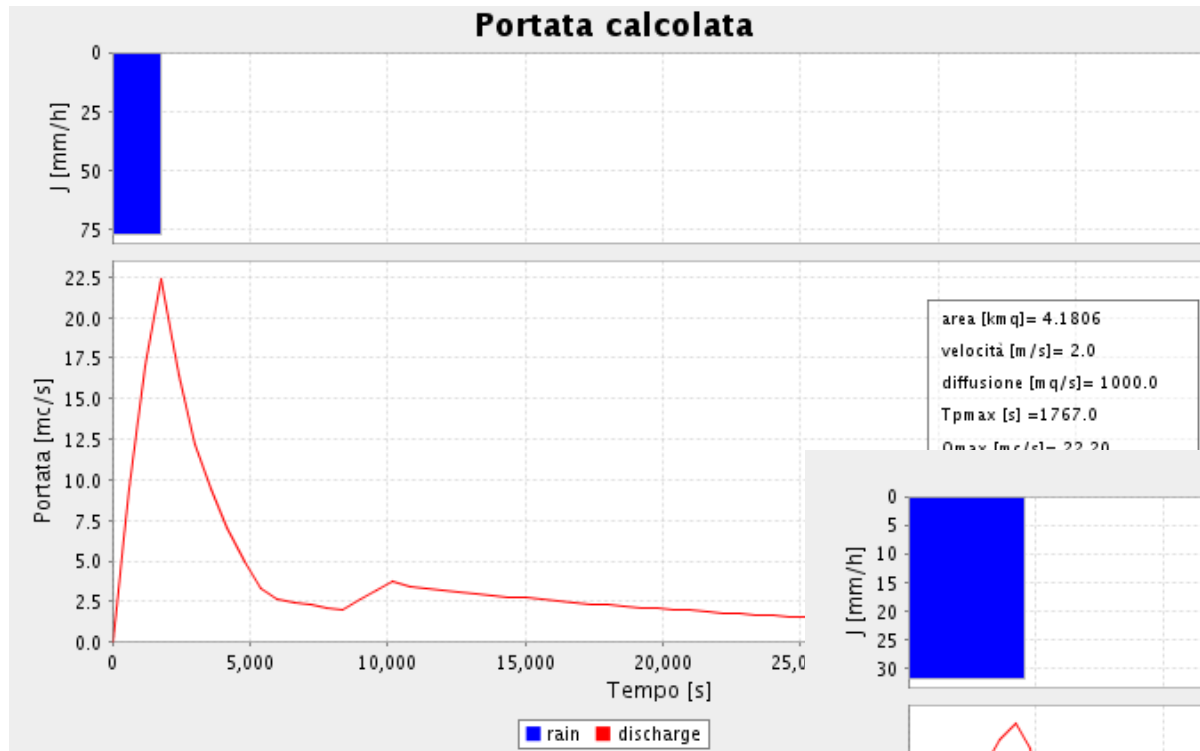
write an output discharge file

output discharge file: /media/BUNDELE/lavori/bacinimontani/le ...

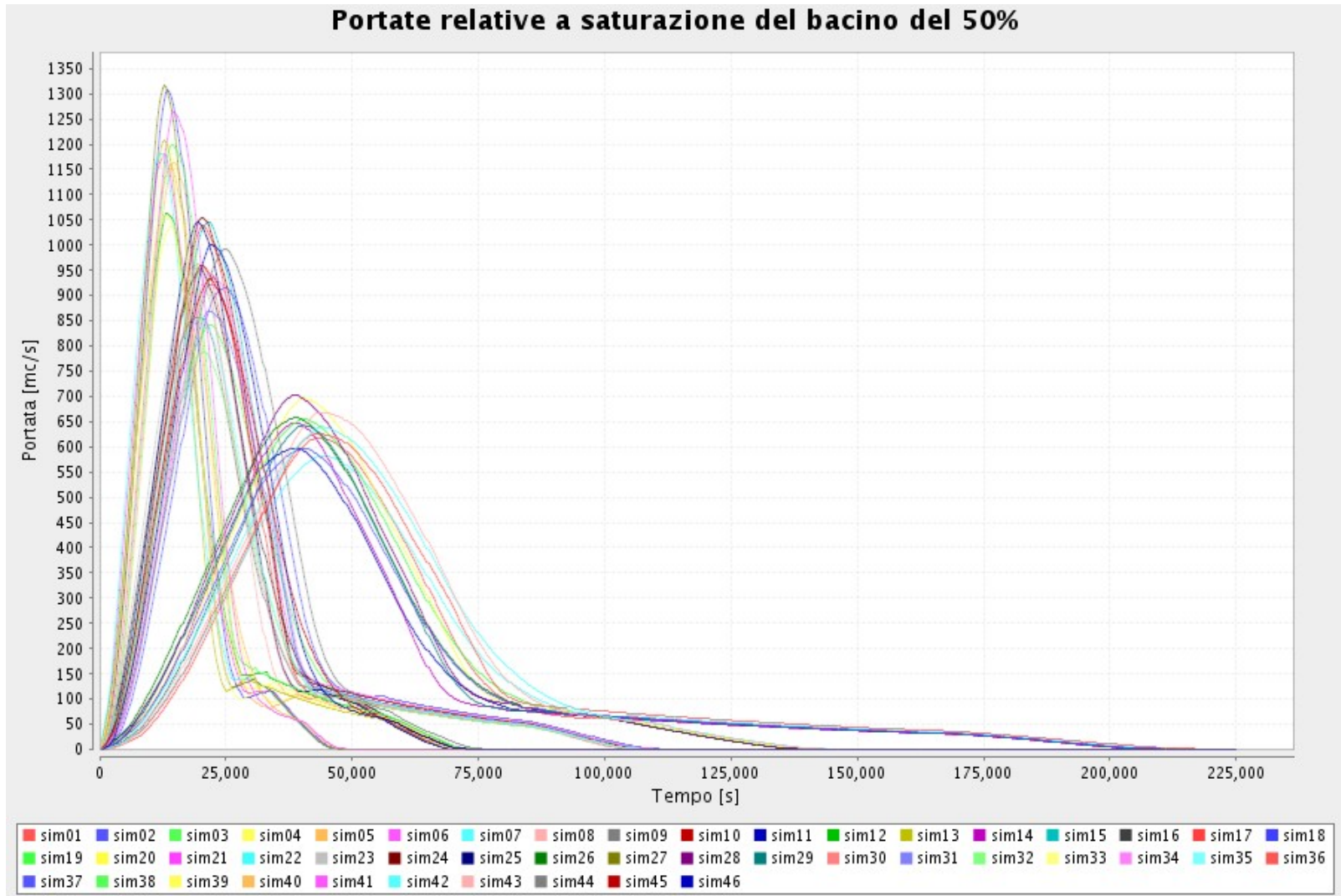
create the discharge chart

OK Cancel

JGRASS h.peakflow



JGRASS h.peakflow



JGRASS h.shalstab

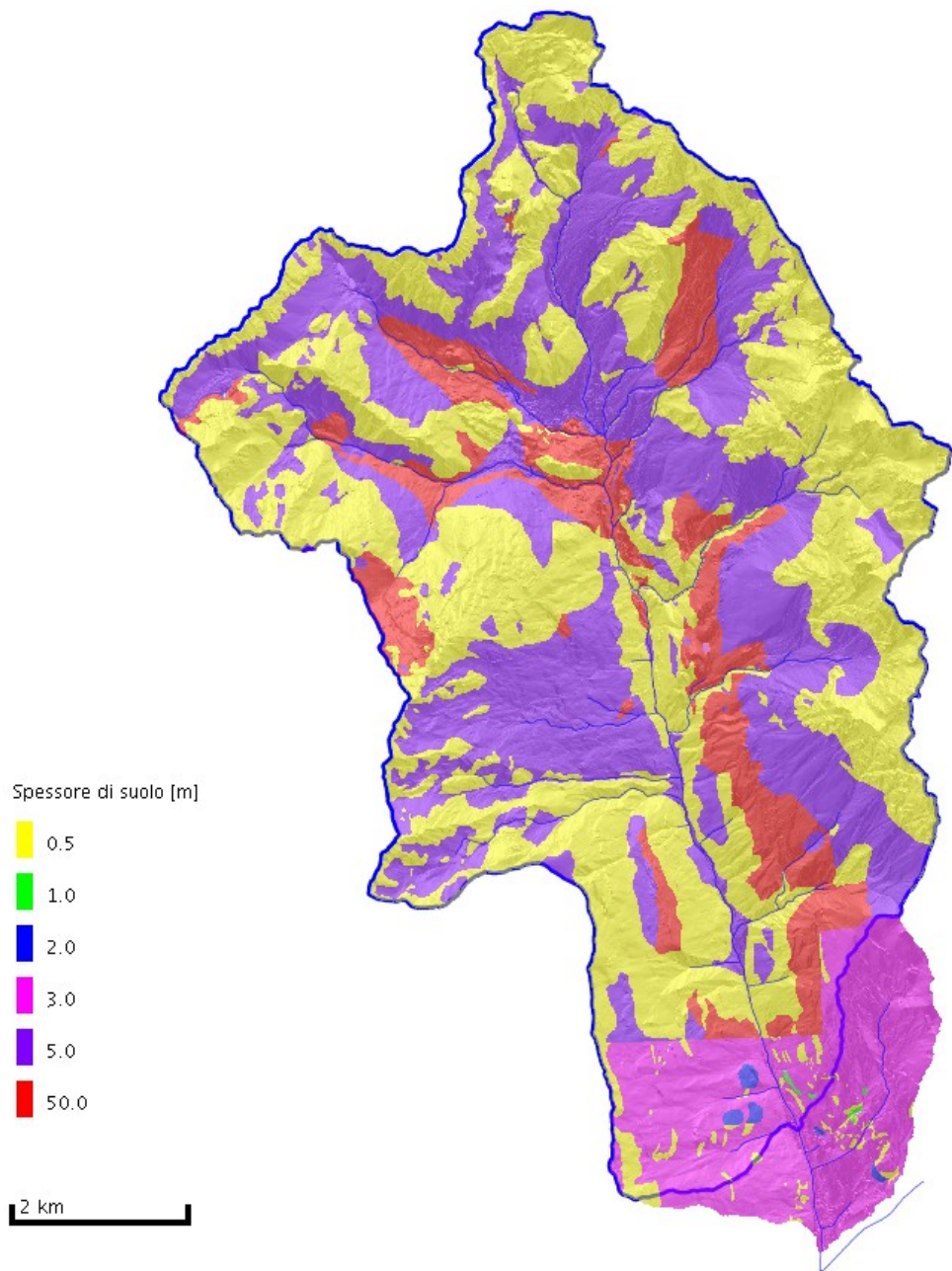
- implementation of the model done by Montgomery and Dietrich (1994)
- combines slope steepness with flow accumulation and a simplified hydrological model to classify the stability conditions
- standard soil parameters are employed to redefine the model as the mechanical properties of soils can profoundly affect slope stability (soil density, angular slope, friction angle, soil transmittivity)
- requires the precipitation as input

JGRASS h.shalstab

Case study: application of the model for the evaluation of the potential availability of sediment in case of debris flow in four basins with different size and morphology in the Trentino region in Italy.

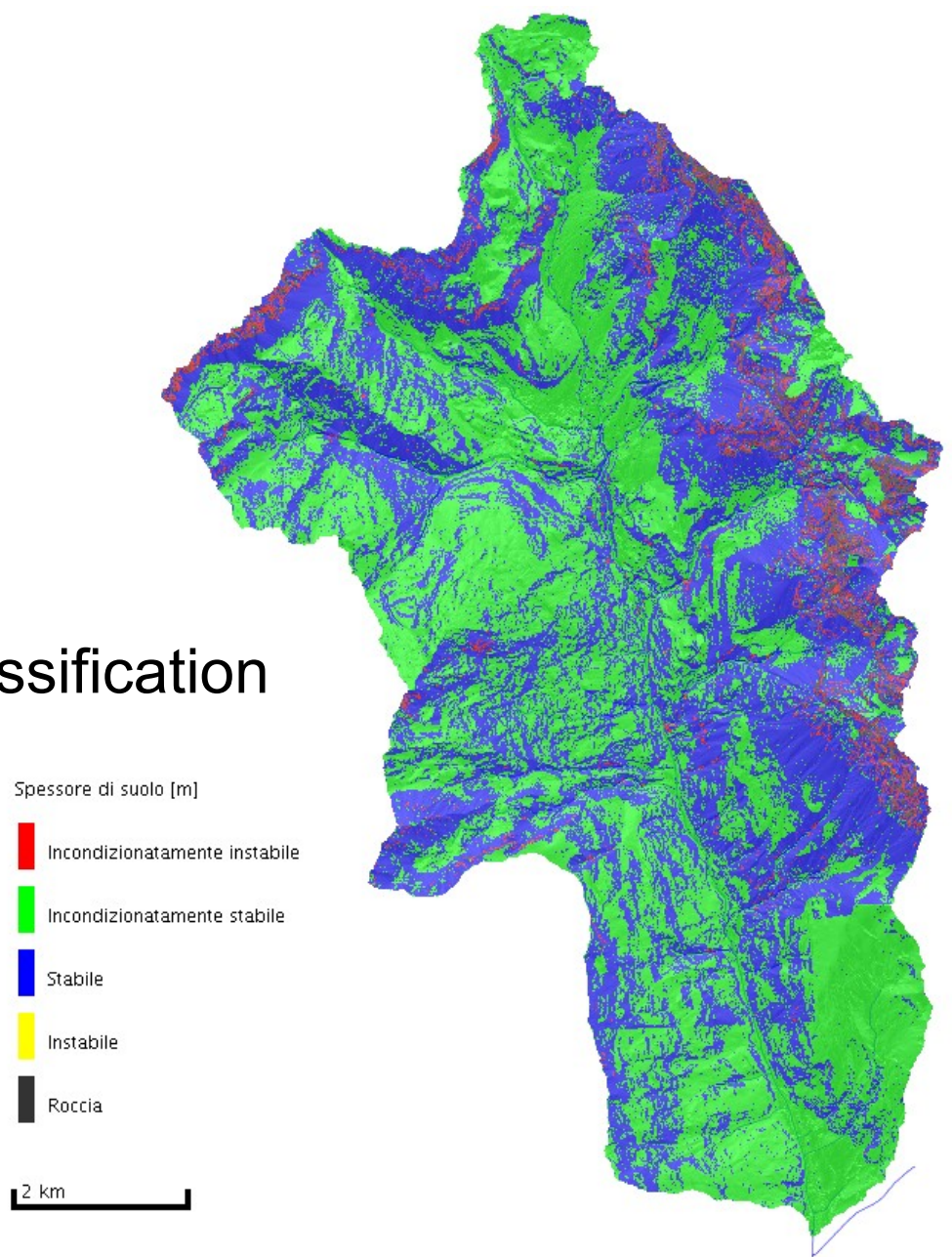
JGRASS h.shalstab

Soil thickness

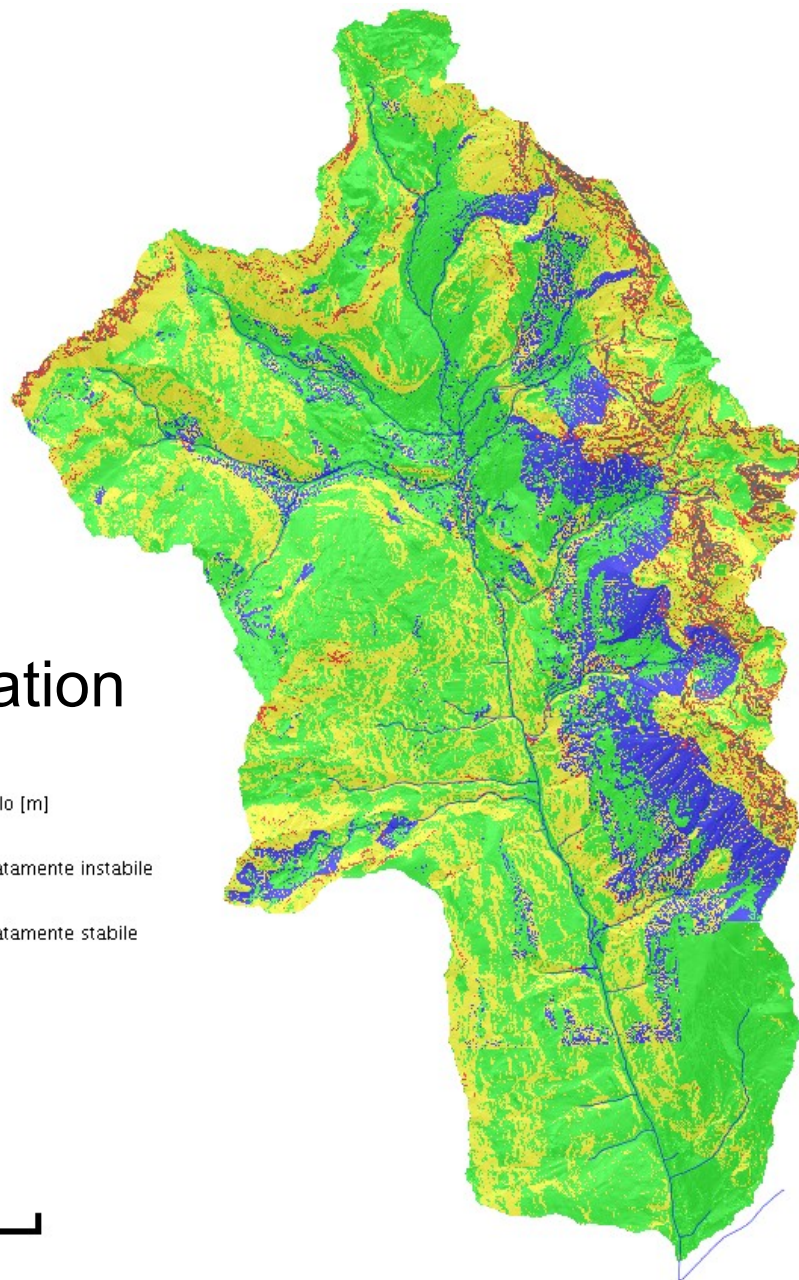


JGRASS h.shalstab

Basin stability classification



JGRASS h.shalstab



Basin stability classification

- Spessore di suolo [m]
- Incondizionatamente instabile
 - Incondizionatamente stabile
 - Stabile
 - Instabile
 - Roccia

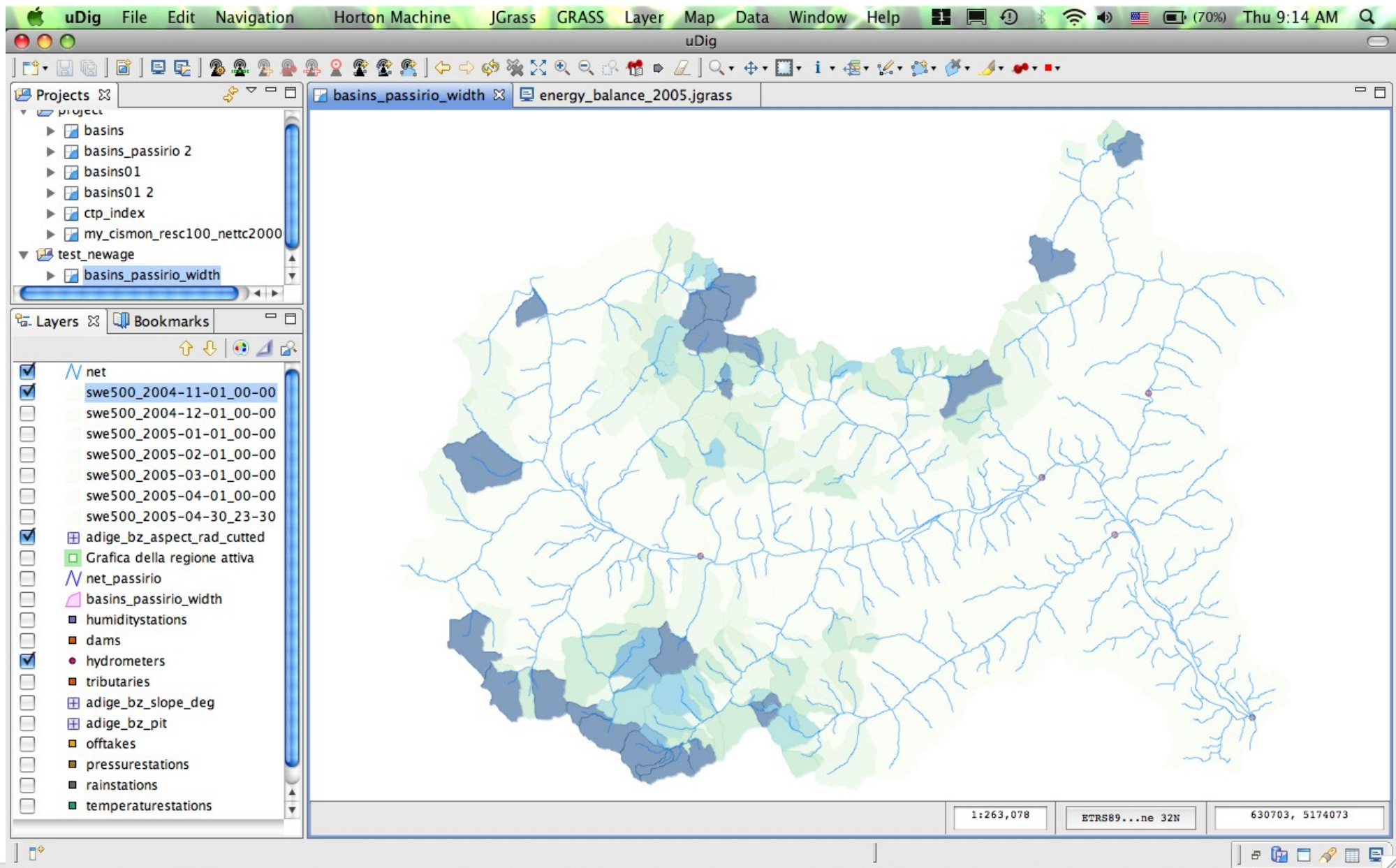
2 km

JGRASS h.energybalance

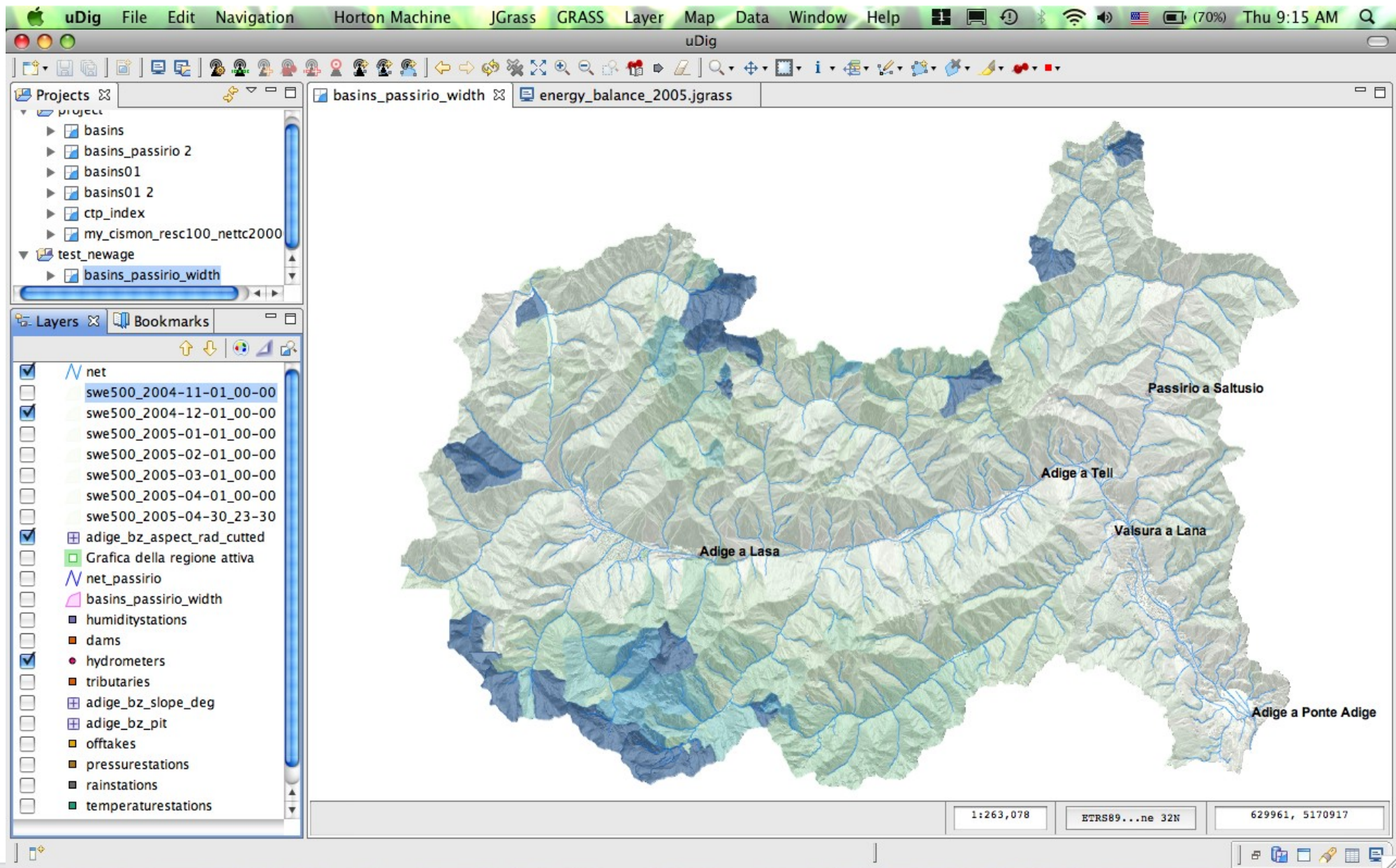
- solves the energy balance for each hillslope dividing it in altimetric and energetic bands
- contains a sophisticated snow module with which it is possible to calculate the SWE for all the basins
- evaluation of the contribution to the discharge from the glaciers during summer time in term of net precipitation ($P + SM - SA$)
- results are presented in term of average in watershed

Case study: comparison of the results in term of SWE during winter 2008 with MODIS satellite images.

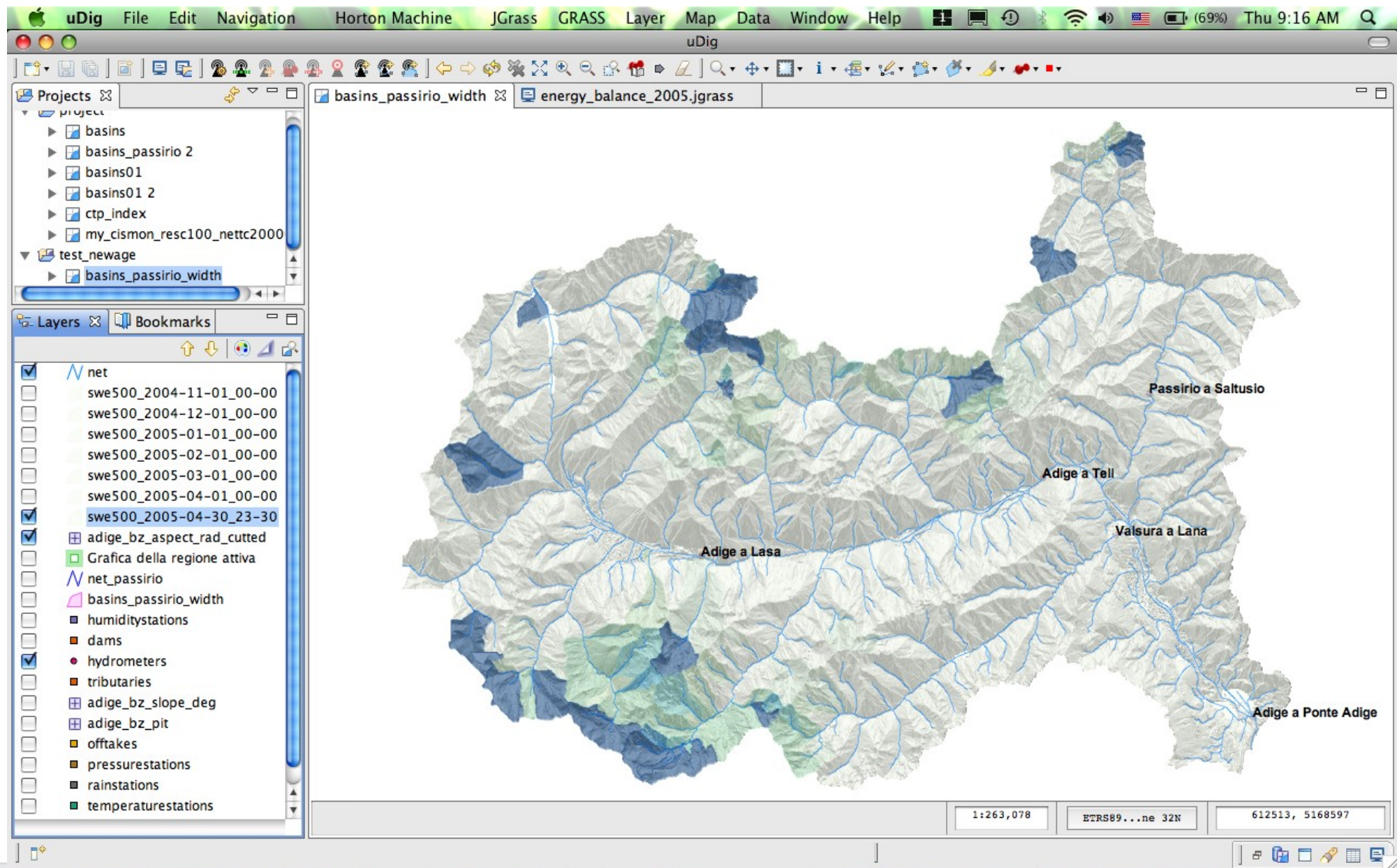
JGRASS h.energybalance



JGRASS h.energybalance

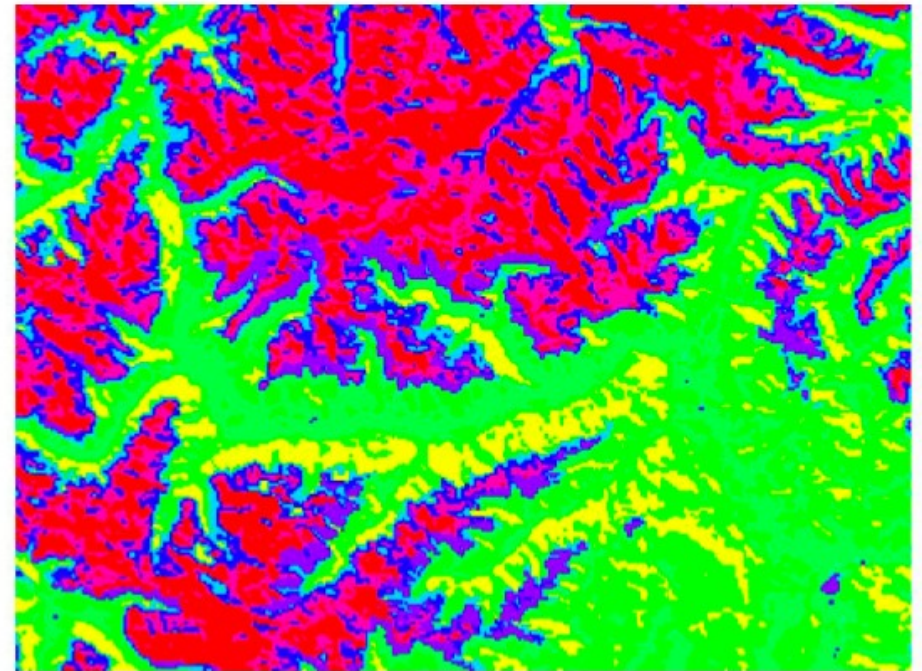
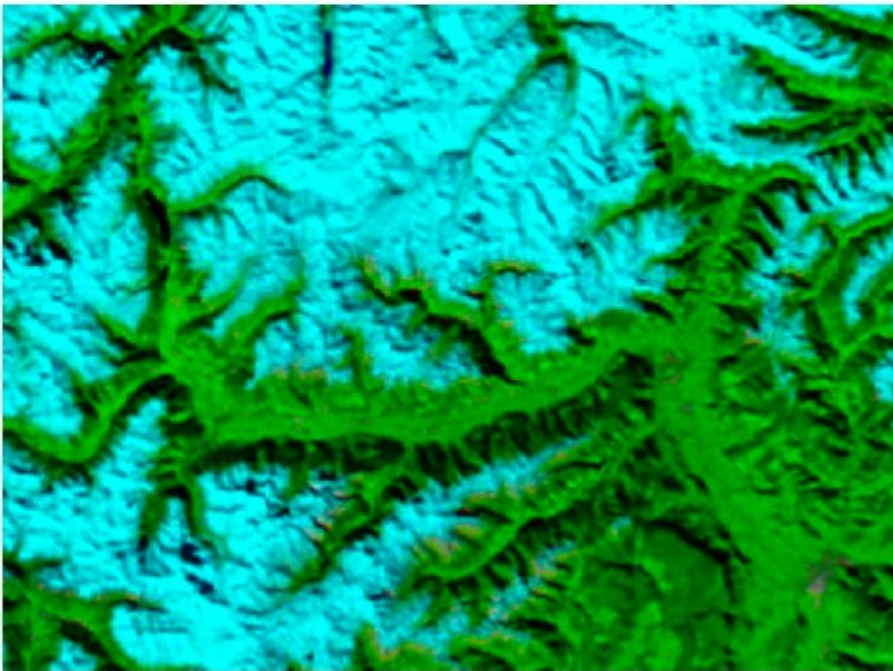


JGRASS h.energybalance






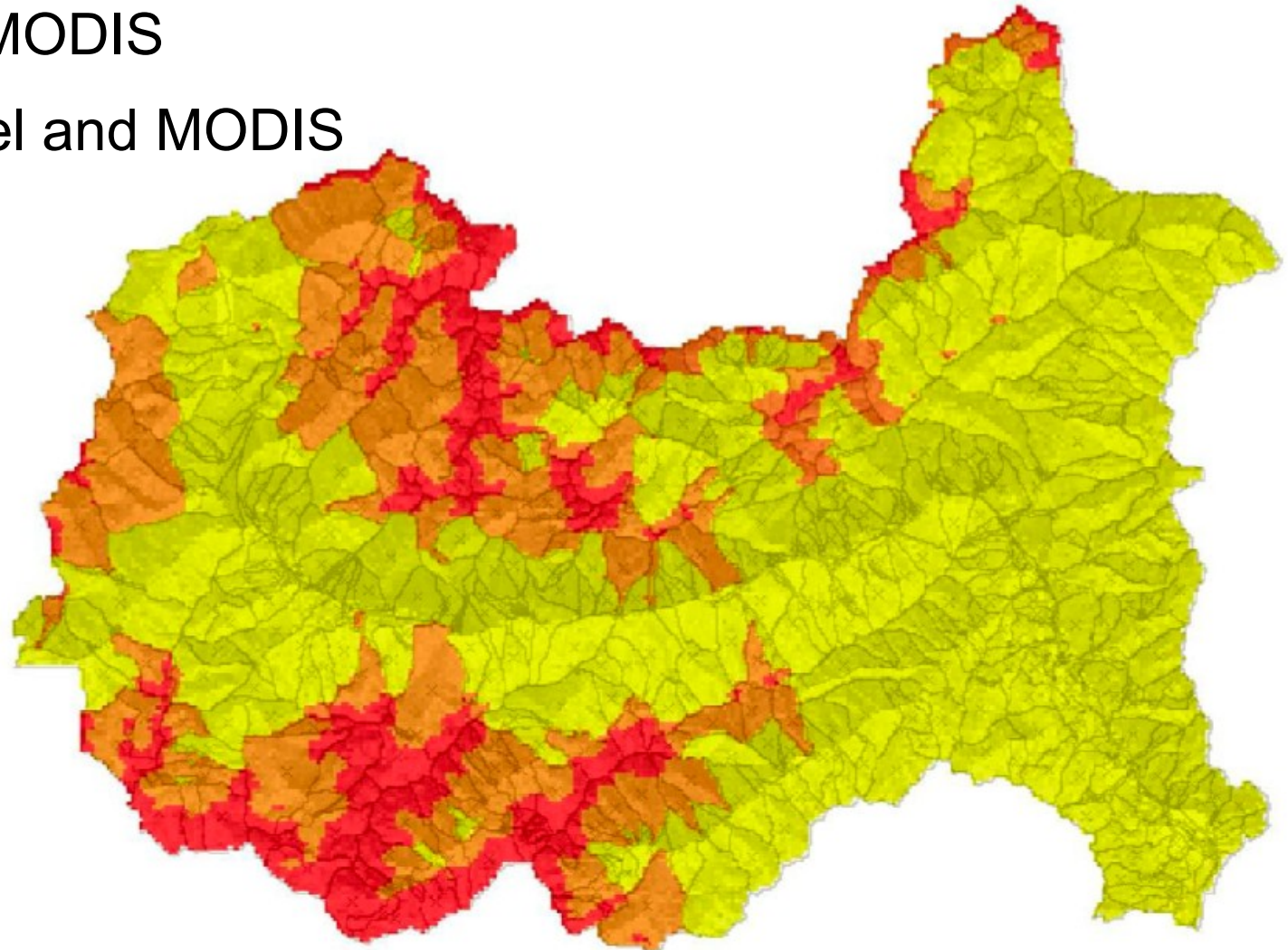
JGRASS h.energybalance

MODIS image and its unsupervised classification – winter 2008



JGRASS h.energybalance

-  No snow
-  Snow just for MODIS
-  Snow for model and MODIS



JGRASS h.newage

- implementation of the Duffy model
- works on a structure of hillslopes and links
- calculates the full mass balance considering also the evapotranspiration
- outputs are:
 - ◆ discharge in every point of the basin
 - ◆ saturated water content for each hillslope
 - ◆ unsaturated water content for each hillslope

JGRASS h.newage

Case study: development and application of the model for the whole Adige basin in Italy. Evaluation of the component of the hydrological balance in case of water scarcity for the local water administration authority,

JGRASS h.newage

The screenshot displays the JGRASS h.newage software interface, which is a web-based GIS application. The interface is organized into several main sections:

- Project Browser (left):** Shows a tree view of the project structure, including folders for 'newage' and 'project', and a list of layers such as 'net_passirio_3basins', 'basins_passirio_3basins', 'net_passirio_block', 'basins_passirio_block', 'basins_passirio_2', 'net_passirio', 'windstations', 'tributaries', 'temperaturestations', 'rainstations', 'ofttakes', 'pressurestations', 'dams', 'hydrometers', 'humiditystations', 'basins_passirio_width1', 'basins_passirio_width0', 'basins01', and 'net'.
- Pannello principale del modello (top left):** Contains input fields for 'Data inizio [yyyy-MM-DD HH:MM]', 'Data fine [yyyy-MM-DD HH:MM]', 'Passo temporale in minuti', and 'Percorso del file di output'.
- Pannello di esecuzione (top right):** Includes a button 'Esegui il modello h.adige' and a description: 'Il modello può essere eseguito in questa sezione una volta fornite tutte le informazioni necessarie.'
- Pannello di Import/Export (middle right):** Features buttons for 'Esporta parametri' and 'Importa parametri', with the text: 'In questo pannello può essere esportata o caricata la configurazione di esecuzione del modello.'
- Campi degli shapefiles (middle left):** Lists various shapefile parameters such as 'Campo uso suolo', 'Campo netnum', 'Campo quota del baricentro', 'Campo numerazione pfafs.', 'Campo elevazione inizio rete', 'Campo elevazione fine rete', 'Campo ID punti monitoraggio', 'Campo della distanza media sup. (sat < 20%)', 'Campo della distanza media sup. (sat < 50%)', 'Campo distanza media sup. (sat > 50%)', 'Campo della varianza sup. (sat < 20%)', 'Campo della varianza sup. (sat < 50%)', 'Campo varianza sup. (sat > 50%)', 'Campo della distanza media sub.', and 'Campo della varianza sub.'.
- Parametri del modello (middle right):** Lists model parameters including 'Velocità superficiale', 'Velocità subsuperficiale', 'Evapotraspirazione con Penman', 'Numeri di pfafstetter per output', 'Portata per unità di area iniziale', 'Frazione di portata sup iniziale', 'Frazione di portata sub iniziale', 'Conducibilità idraulica saturata [m/h]', 'Coefficiente mstexp', 'Coefficiente specyield', 'Porosità del suolo', 'Valore costante per evapotraspirazione', 'Costante di saturazione', 'Frazione di portata sup/veloce per ghiacciai', and 'Frazione di portata sub/lenta per ghiacciai'.
- Piani delle geometrie di input (bottom left):** Lists input geometry planes: 'Piano degli idrometri', 'Piano delle dighe', 'Piano delle immissioni laterali', 'Piano delle derivazioni', 'Piano del reticolo idrografico', and 'Piano dei basini'.
- Scalarset di input (bottom right):** Lists input scalar sets: 'Dati scarichi dighe', 'Dati degli idrometri', 'Dati immissioni laterali', 'Dati delle derivazioni', and 'Dati di pioggia'.

JGRASS h.newage

▼ Piani delle geometrie di input

Di seguito devono essere inseriti i nomi dei piani delle geometrie necessari per il modello.

Piano degli idrometri	hydrometers
Piano delle dighe	dams
Piano delle immissioni laterali	tributaries
Piano delle derivazioni	oftakes
Piano del reticolo idrografico	net_passirio
Piano dei bacini	basins_passirio

▼ Scalarset di input

Di seguito devono essere inseriti gli scalarset con i dati necessari al modello.

Dati scarichi dighe	edia/BUNDELE/newage/modelli_nuovi/THEBIGTEST/simulazione2005/dams.csv	...
Dati degli idrometri	BUNDELE/newage/modelli_nuovi/THEBIGTEST/simulazione2005/hydrometers.csv	...
Dati immissioni laterali	BUNDELE/newage/modelli_nuovi/THEBIGTEST/simulazione2005/tributaries.csv	...
Dati delle derivazioni		...
Dati di pioggia	nuovi/THEBIGTEST/simulazione2005/energy_swe100_glacier_2005_05_new.csv	...
Dati della vegetazione	BUNDELE/newage/modelli_nuovi/THEBIGTEST/simulazione2005/vegetation.csv	...

JGRASS h.newage

▼ Parametri del modello

Di seguito devono essere inseriti tutti i parametri del modello.

Velocità superficiale

Velocità subsuperficiale

Evapotraspirazione con Penman

Numeri di pfafter per output

Portata per unità di area iniziale

Frazione di portata sup iniziale

Frazione di portata sub iniziale

Conducibilità idraulica satura [m/h]

Coefficiente mstexp

Coefficiente specyield

Porosità del suolo

Valore costante per evapotraspirazione

Costante di saturazione

Frazione di portata sup/veloce per ghiac

Frazione di portata sub/lenta per ghiacci

▼ Campi degli shapefiles

Di seguito devono essere inseriti tutti i parametri correlati alle geometrie. Tutti i campi sono necessari.

Campo uso suolo

Campo netnum

Campo quota del baricentro

Campo numerazione pfafs.

Campo elevazione inizio rete

Campo elevazione fine rete

Campo ID punti monitoraggio

Campo della distanza media sup. (sat < 20%)

Campo della distanza media sup. (sat < 50%)

Campo distanza media sup. (sat > 50%)

Campo della varianza sup. (sat < 20%)

Campo della varianza sup. (sat < 50%)

Campo varianza sup. (sat > 50%)

Campo della distanza media sub.

Campo della varianza sub.

JGRASS h.newage

▼ Pannello principale del modello

In questa sezione devono essere inseriti i parametri principali del modello.

Data inizio [yyyy-MM-DD HH:MM]	<input type="text" value="2005-05-01 00:00"/>
Data fine [yyyy-MM-DD HH:MM]	<input type="text" value="2005-05-10 00:00"/>
Passo temporale in minuti	<input type="text" value="30"/>
Output completo del modello	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/TH"/> ...
Output modello Livelli	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/TH"/> ...

▼ Sezione dei dati di input

In questa sezione devono essere inseriti i dati di input per il modello

Portata di testa	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/THEB"/> ...
Input portate artificiali	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/THEB"/> ...
Input portate da confluenze	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/THEB"/> ...
File delle sezioni in input	<input type="text" value="/media/BUNDELE/newage/modelli_nuovi/THEB"/> ...
Input livello di valle	<input type="text"/> ...

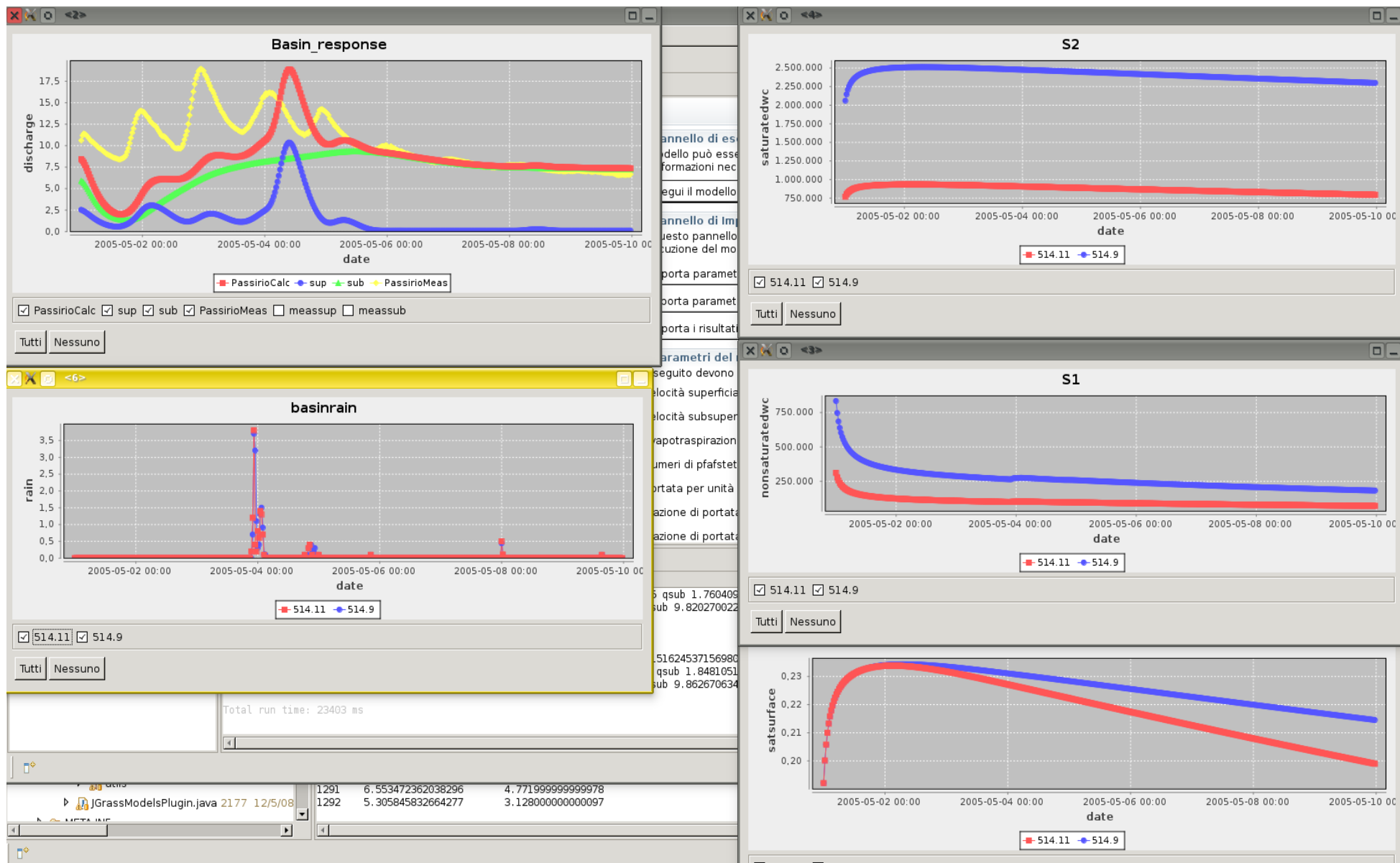
▼ Pannello di esecuzione

Il modello può essere eseguito in questa sezione una volta fornite tutte le informazioni necessarie.

▼ Pannello di Import/Export

In questo pannello può essere esportata o caricata la configurazione di esecuzione del modello.

JGRASS h.newage



JGRASS h.saintgeo

- one dimensional steady flow model
- intakes and outflow downstream are considered
- real sections can be modeled
- different roughness coefficients can be considered for each part of a section
- case study: flow propagation in the rivers of the Venice lagoon basin to predict the flow of salt water that tends to rise the river at its mouth

JGRASS h.saintgeo

▼ Main model parameters

Here the main model parameters are inserted.

Start date [yyyy-MM-DD HH:MM]

End date [yyyy-MM-DD HH:MM]

Timestep in minutes

Full model output ...

Level model output ...

▼ Input data section

In this section the input data to the model have to be supplied

Head discharge ...

Input artificial flow ...

Input confluence flow ...

Input sections file ...

Input downstream level ...

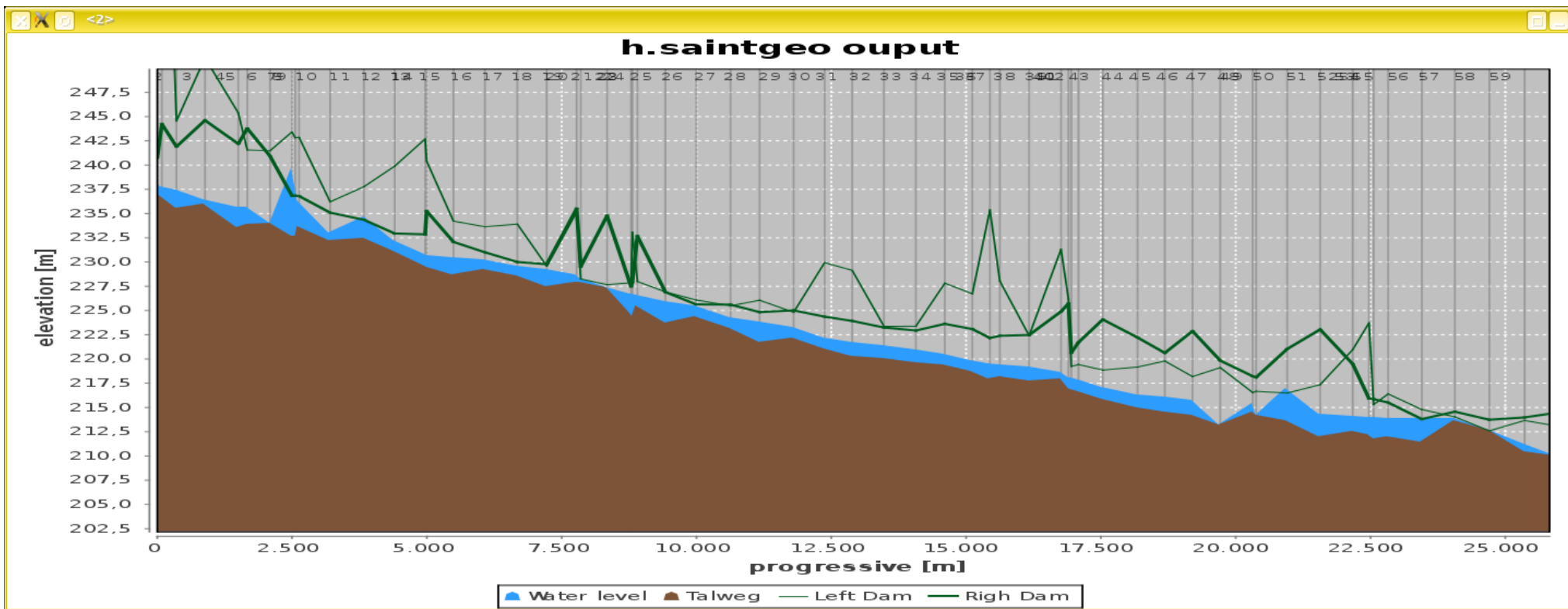
▼ Execution panel

Once completed to insert all the needed informations for the model, here the model can be executed.

▼ Import/Export panel

In this panel the configuration of a model execution can be exported to file or loaded from file.

JGRASS h.saintgeo



JGRASS: OPENMI - OMS

- JGrass models are planning to be ported into OMS framework
- JGrass will be compatible with the standards OMS
- other OMS applications will be integrated in JGrass:
 - Basin
 - GwflowCasc
 - Soltab
 - Debris flow
 - ...

Thanks for the attention...

Questions?