







OPEN SOURCE DATA

FOR LANDSLIDES AND FLOODS RISK ASSESSMENT IN ROMANIA

Ovidius University of Constanța Faculty of Natural and Agricultural Sciences Partner No. 4









M A P S

GEOLOGIC MAPS

- Property of Romanian Institute of Geology;
- Scale 1:200 000;
- Provided online by geospatial.org

(<u>http://earth.unibuc.ro</u>) in Stereo 70 Projection, reprojected from Gauss-Kruger;

- Map sheets for study area are: Covasna L-35-XXI, Ploiești L-35-XXVII, Focșani L-35-XXII, Brăila L-35- XXVIII, Tulcea L-35-XXIX, Sulina L-35-XXX, Constanța L-35-XXXV and Mangalia K-35-V;
- Suitable for digitization: provides information about the type, spatial extent and age of the geological formation, as well for tectonic structure of the study area

Romania mosaic

Individual sheets











M A P S

THEMATIC MAPS

GEOMORPHOLOGICAL MAP OF ROMANIA

- Property of Romania Institute of Geography.
- Scale 1:1 000 000;
- R:S.R. Atlas, 1976, Sheet III-1
- Suitable for georeferencing and digitization: provides information about the relief type











M A P S

THEMATIC MAPS MAP OF THE LANDS WITH EXCESS MOISTURE

- Florea et al., 1978
- Scale 1:500 000;
- Suitable for georeferencing and digitization: shows the geographic occurrence, at national and district level, and intensity of the three kinds of excess of moisture: from groundwater, rainfall and by floods. The classes are defined according to intensity and the subclasses according to the nature (source) of the excess moisture.



	MA	P LEGE	ND
Caracterizanse classi și subclassi de teren (Peore concentores propri-z ze veder semblaste elementăr de sintută vedini de nore redezi ma jes)	Numărul unităță de teren pe hartă	Simbolul unități de teren Clasa Grupa Subclasa	Description of the land class and sub-class (For the characterization of the gauge-to see the significance of the solution observers at the lond ant given follow)
	Number for land unit on the map	Symbol of the Class Subclass Group	
Termusi matectate practic de exces de umiditate sau cu umarire accesina de durat Marte scurta san breiti	1 	1 115 e 127 d 226 g 227 d 398 h	Lands practically unaffected by excess milistore or with a very shart term or local excessive molecular
Terenuri slab sau rar afectate de exces de umiditale datorità apei freatice	10 ¹⁰ 11 10 ¹⁰ 2 11	II F 112 c 227 c	Lands slightly or rarely affected by excess moisture due to the groundwater
Terenuri istato sau rar afectate de exces de umiditate daturità apei de stagnare (la suprafiața sau in partea superinară a solului) provenită din precipitații		II W 227 f 454 e	Lands slightly or rarely affected by excess moisture due to the logging water (at surface or in the upper part of the soil), resulted from rainfall
Terenuri moderat afectate de exces de umiditate datantã apei finatice	10 10 10 10 10 10	III F 112 c 227 c	Lands moderately affected by excess moisture due to the groudwater
Teresuri moderat afectate de exces (temporar) de uniditate datorità apri de stagnare provenità dio procipitații	12 13 15	III W 23'7 e 23''7 e 454 e 112 I	Lands moderately affected by excess moisture (temporariy) due to the legging water resulted from rainfall
Terenuri moderat afectate de exces de umiditate datorità atti apei freatice, cit si apei de stagnare provenità din precipitati	11 16 11	III FW 224 b	Lands moderately affected by excess moisture due to both the groundwater and of the logging water resulted from rainfall
Termuri puternic afectate de exces de umiditate datonta apei finatice	11 18 11 11 18 11	IV F 116 I 227 b	Lands strongly affected by excess moisture due to the groundwater
Termuri puternic afectate de exces (temporar) de umiditate datorită apei de stașnore provenită din precipitații	10 10 10	IV W 24'3 d 24''3 d 247 l	Lands strongly affected by excess moisture (tempgrarity) due to the logging water resulted from rainfall
Asociații de terenuri slab sau rar afectate pină la fearte puternic afectate de exces de umiditate datorită apei freatice	11.祭 11	II-IV F 461 i	Land associations slightly or rarely up to very strpngly affected by excess moisture due to the groundwater
Asociații de terenuri stati seu rar afectate pină la puternic afectate de exces temporar de umiditate datorită apei de stagnare provenită din precipitații	23	II-IV W 237 g	Land associations slightly or rarely to strongly affected by excess moisture because of the logging water resulted from rainfall
Asociații de ferenuri moderat pină la poternic alectate de exces de unidate datorită apei freatice		III-IV F 171 b 177 b 454 b	Land associations moderately up to strongly affected by excess meiature due to the groundwater
Asociații de terenuri neafectate pină la moderat afectate de exces de uniditate de pantă	(A)	I-III P 106 j 206 j	Land associations unaffected, to moderately affected by slope excess moisture
Asociații de terenuri sialo pină la foarte puternic afectate de exces de uniditate de pantă		II-V P 104 j 204 j	Land associations slightly to very strongly affected by slope excess moisture
Assciații de terenuri neafectate sau slab afectate de exces de umiditate datorită inundațiilar (și eventual apei stagnante)	29-2	I-II R(W) 487 a	Land associations unaffected or slightly affected by excess moisture, due to floodings (and possibly logging water)
Aseciații de terenuri neafectate sau variat afectate de exces de umiditate dotorită inundațiidr și eventual apei freatice și/sau apei stagnante		1-IV R(F,W)488 a	Land associations unaffected or various affected by excess moisture due to floodings or possibly the groundwater and/or logging water
Assolață de terenuri slab pină la fearte puternic afectate de exces de umiditate detorită inundațiilor apei freatice și/sau apei stagnante	田東川	II-V R(F,W)483 a	Land associations slightly to very strongly affected by excess maisture due to of floodings, the groundwater and/or logging water
Teresuri ocupate de mlaștini și lacuri puțin adinci care ar putea fi desecate	Ju de	v	Lands covered by marshes and/or shallow lakes, which could be drained
Maştini Lacuri	0		Marshes Lakes
Pāduri			Forest land
Regiuni munttuse	E		Mountal region









M A P S

THEMATIC MAPS MAP OF SOILS EROSION

- Florea et al.1976
- Scale 1:500 000;
- Suitable for georeferencing and digitization: contains basic information concerning distribution and intensity of water and wind erosion, landslide and erosion risk. The soil erosion map is the main source of qualitative and quantitative general information concerning soil erosion both at nationwide level and at district (judet) level.











M A P S

THEMATIC MAPS SOILS MAP OF ROMANIA

- Florea et al., 1973
- Scale 1:500 000;
- Geologic Institute and Institute of Studies and Research in Pedology
- Suitable for georeferencing and digitization: provides information about soil associations and topsoil texture











SATELLITE IMAGES

LANDSAT IMAGERY

- The Landsat program offers the longest continuous global record of the Earth's surface;
- Since the early 1970s, Landsat has continuously and consistently archived images of Earth;
- Landsat sensors have a moderate spatialresolution. You cannot see individual houses on a Landsat image, but you can see large man-made objects such as highways. This is an important spatial resolution because it is coarse enough for global coverage, yet detailed enough to characterize human-scale processes such as urban growth.













SATELLITE IMAGES

LANDSAT IMAGERY











SATELLITE IMAGES

LANDSAT IMAGERY

IN FLOOD DETECTION

Landsat 8 images showing the flooding from Wittenberg town (Germany) on Elba river in the summer of 2013











EXISTING DIGITAL DATABASES

DEM (Digital Elevation Model) SOURCES

SRTM - Shuttle Radar Topography Mission (SRTM) is the latest project of creating a global altimetry numerical model, using data collected in February 2000 from a radar sensor mounted aboard space shuttle Endeavour. The project, coordinated by NASA (National Aeronautics and Space Administration) and NGA (National Geospatial-Intelligence Agency), pursued the realization and distribution of data to resolutions of 30 seconds of arc (SRTM30 data set designed to replace GTOPO30), 90 meters (SRTM90) and 30 meters (currently available only for USA).











EXISTING DIGITAL DATABASES

DEM (Digital Elevation Model) SOURCES

ASTER-GDEM – ASTER Global Digital Elevation Model is obtained by the method of stereoscopy from satellite images. ASTER is one of the main sensors mounted on the NASA Terra platform.

ASTER GDEM is an easy-to-use, highly accurate DEM covering all the land on earth, and available to all users regardless of size or location of their target areas.

Outline of ASTER GDEM

- * Global DEM for all the land area covered by ASTER.
- * Enhanced accuracy due to the use of multiple ASTER images over the same area.
- * User-friendly, allowing selective cropping.











EXISTING DIGITAL DATABASES

DEM (Digital Elevation Model) SOURCES

The ASTER GDEM is in GeoTIFF format with geographic lat/long coordinates and a 1 arc-second (30 m) grid of elevation postings.

The ASTER GDEM covers land surfaces between 83°N and 83°S and is composed of 22,600 1°-by-1° tiles.

ASTER GDEM tiles may be downloaded electronically from ERSDAC by visiting:

- http://www.gdem.aster.ersdac.or.jp/
- http://gdem.ersdac.jspacesystems.or.jp/

and from the LP DAAC by visiting:

- <u>https://wist.echo.nasa.gov/~wist/api/imswelcome/</u>
- http://reverb.echo.nasa.gov/reverb/

Format of ASTER DEM

File Name(Example of	ASTGTM_N35E135_dem.tif	ASTGTM_N35E135_num.tif	
N35~36,E135~136)	DEM file 36N 36N 35N 3601 pixels	QA plane file 135E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E 136E	
Output format	GeoTIFF, signed 16 bits		
Geographic coordinates	Geographic latitude and longitude		
Tile Size	3601-by-3601 pixels (1-by-1 degree)		
Posting interval	1 arc-second		
DN values	1m/DN referenced to the WGS84/EGM96 geoid-9999 for void pixels, and 0 for sea water body	Stacking number or reference DEM SRTM3:-1,-2 CDED:-6 Alaska DEM:-11 etc.	
Coverage	North 83 degrees to south 83 degrees, 22,600 tiles		









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- http://www.gdem.aster.ersdac.or.jp/
- <u>http://gdem.ersdac.jspacesystems.or.jp/</u> and from the LP DAAC by visiting:
- https://wist.echo.nasa.gov/~wist/api/imswelcome/
- http://reverb.echo.nasa.gov/reverb/

Comparison with other DEMs

	ASTER GDEM	SRTM3*	GTOPO30**	10 m mesh digital elevation data
Data source	ASTER	Space shuttle radar	From organizations around the world that have DEM data	1:25,000 topographic map
Generation and METI/NASA distribution		NASA/USGS	USGS	GSI
Release year	2009 ~	2003 ~	1996 ~	2008~
Data acquisition period	2000 ~ ongoing	11 days (in 2000)		
Posting interval 30m		90m	1000m	about 10m
DEM accuracy (stdev.) 7~14m		10m	30m	5m
DEM coverage	83 degrees north ~ 83 degrees south	60 degrees north ~ 56 degrees south	Global	Japan only
Areas with no ASTER data due to constant cloud cover (supplied by other DEM)		Topographically steep area (due to radar characteristics)	None	None









EXISTING DIGITAL DATABASES











Rainfall

EXISTING DIGITAL DATABASES

DEM (Digital Elevation Model) **SOURCES**

Precipitation data Catchment Extraction of catchment area Runoff Inundation DEM Simulation of flood inundation Extraction of slope angle Extraction of damage area Houses and roads Steep (black) Flood hazard map **ASTER data** Map information **Disaster 2** Gradual (white) Source: Flood evacuation map **River bank height** for Shizuoka City

ASTER GDEM APPLICATIONS

- Automated calculation of slope direction and angle, catchment area, faults, etc.
- Further achievements can be obtained by analyzing the DEM as a platform in combination with other data.

(flood hazard map)







EXISTING DIGITAL DATABASES

DEM (Digital Elevation Model) SOURCES

ASTER GDEM APPLICATIONS











EXISTING DIGITAL DATABASES

CORINE LAND COVER 2006













GRID CODE	CLC COD E	LABEL1	LABEL2	LABEL3	RGB
1	111	Artificial surfaces	Urban fabric	Continuous urban fabric	230-000-077
2	112	Artificial surfaces	Urban fabric	Discontinuous urban fabric	255-000-000
3	121	Artificial surfaces	Industrial, commercial and transport units	Industrial or commercial units	204-077-242
4	122	Artificial surfaces	Industrial, commercial and transport units	Road and rail networks and associated land	204-000-000
5	123	Artificial surfaces	Industrial, commercial and transport units	Port areas	230-204-204
6	124	Artificial surfaces	Industrial, commercial and transport units	Airports	230-204-230
7	131	Artificial surfaces	Mine, dump and construction sites	Mineral extraction sites	166-000-204
8	132	Artificial surfaces	Mine, dump and construction sites	Dump sites	166-077-000
9	133	Artificial surfaces	Mine, dump and construction sites	Construction sites	255-077-255
10	141	Artificial surfaces	Artificial, non-agricultural vegetated areas	Green urban areas	255-166-255
11	142	Artificial surfaces	Artificial, non-agricultural vegetated areas	Sport and leisure facilities	255-230-255
12	211	Agricultural areas	Arable land	Non-irrigated arable land	255-255-168
13	212	Agricultural areas	Arable land	Permanently irrigated land	255-255-000
14	213	Agricultural areas	Arable land	Rice fields	230-230-000
15	221	Agricultural areas	Permanent crops	Vineyards	230-128-000
16	222	Agricultural areas	Permanent crops	Fruit trees and berry plantations	242-166-077
17	223	Agricultural areas	Permanent crops	Olive groves	230-166-000
18	231	Agricultural areas	Pastures	Pastures	230-230-077











GRID CODE	CLC COD E	LABEL1	LABEL2	LABEL3	RGB
19	241	Agricultural areas	Heterogeneous agricultural areas	Annual crops associated with permanent crops	255-230-166
20	242	Agricultural areas	Heterogeneous agricultural areas	Complex cultivation patterns	255-230-077
21	243	Agricultural areas	Heterogeneous agricultural areas	Land principally occupied by agriculture, with significant areas of natural vegetation	230-204-077
22	244	Agricultural areas	Heterogeneous agricultural areas	Agro-forestry areas	242-204-166
23	311	Forest and semi natural areas	Forests	Broad-leaved forest	128-255-000
24	312	Forest and semi natural areas	Forests	Coniferous forest	000-166-000
25	313	Forest and semi natural areas	Forests	Mixed forest	077-255-000
26	321	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Natural grasslands	204-242-077
27	322	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Moors and heathland	166-255-128
28	323	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Sclerophyllous vegetation	166-230-077



UNIVERSITATEA OVIDIUS DIN CONSTANȚA Facultatea de Științe ale Naturii și Științe Agricole









GRID CODE	CLC COD	LABEL1	LABEL2	LABEL3	RGB
29	2 324	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Transitional woodland-shrub	166-242-000
30	331	Forest and semi natural areas	Open spaces with little or no vegetation	Beaches, dunes, sands	230-230-230
31	332	Forest and semi natural areas	Open spaces with little or no vegetation	Bare rocks	204-204-204
32	333	Forest and semi natural areas	Open spaces with little or no vegetation	Sparsely vegetated areas	204-255-204
33	334	Forest and semi natural areas	Open spaces with little or no vegetation	Burnt areas	000-000-000
34	335	Forest and semi natural areas	Open spaces with little or no vegetation	Glaciers and perpetual snow	166-230-204
35	411	Wetlands	Inland wetlands	Inland marshes	166-166-255
36	412	Wetlands	Inland wetlands	Peat bogs	077-077-255
37	421	Wetlands	Maritime wetlands	Salt marshes	204-204-255
38	422	Wetlands	Maritime wetlands	Salines	230-230-255
39	423	Wetlands	Maritime wetlands	Intertidal flats	166-166-230
40	511	Water bodies	Inland waters	Water courses	000-204-242











GRID	CLC	LABEL1	LABEL2	LABEL3	RGB
CODE	COD				
	E				
41	512	Water bodies	Inland waters	Water bodies	128-242-230
42	521	Water bodies	Marine waters	Coastal lagoons	000-255-166
43	522	Water bodies	Marine waters	Estuaries	166-255-230
44	523	Water bodies	Marine waters	Sea and ocean	230-242-255
48	999	NODATA	NODATA	NODATA	
49	990	UNCLASSIFIED	UNCLASSIFIED LAND SURFACE	UNCLASSIFIED LAND SURFACE	
50	995	UNCLASSIFIED	UNCLASSIFIED WATER BODIES	UNCLASSIFIED WATER BODIES	230-242-255









EXISTING DIGITAL DATABASES

ROMANIAN ADMINISTRATIVE UNITS AT COMUNE LEVEL

- Provided by ANCPI
- Provides information about the type and the area of administrative unit











EXISTING DIGITAL DATABASES

ROMANIAN SETTLEMENTS

- Provided online by geospatial.org
- This shapefile contains all the settlements in Romania in point layer format. The attributes table contains information such as settlement name and population.



