



Extreme Phenomena in Dobrogea - Floods and Droughts PhD eng. Carmen Maftei



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OUTLINES

- Introduction
- Study area
- Drought
- Floods
- Conclusion



Drought and floods!

Study area

Dobrudja's climate is temperate - continental and is divided in 2 units (Paltineanu Cr., 2000):

- (I) the Western units contains the Danube Delta, its south, two lagoons (Razim and Sinoe lake); there extension varies from 20 to 50km to the littoral. The climate of this unit is continental influenced by the Black Sea.
- (II) the Eastern units contains the rest of territory where the climate is temperate continental.



Drought



2007 TerraMetri

Location	Lat	Long	Elev - Meters	1965 - 2005 Avg precip - mm	1965 - 2005 Avg temp (⁰ C)
Tulcea	45° 11'	28°49'	4.36	461.84	11.49
Jurilovca	44°46'	28°53'	37.65	378.39	11.14
Corugea	44°44'	28°20'	219.2	434.67	11.57
Harsova	44°41'	27°57'	37.51	408.82	11.74
Cernavoda	44°21'	28°03'	87.17	487.60	11.00
Medgidia	44°15'	28°16'	69.54	449.92	11.01
Constanta	44°13'	28°38'	12.8	423.04	11.04
Adamclisi	44°08'	28°00'	158	484.54	11.15
Mangalia	43°49'	28°35'	6	427.74	10.86
Sulina	45°09'	29°39'	2.08	261.63	9.94



isotherms mean teperature from station 1965-2005 - 11.04 11.57 57 - 11 74

Limita.shp



- The multi-annual mean temperatures vary in small limits $(10-12^{\circ}C)$,
- The temperatures decrease from the coast and from the Danube to interior
 - The smallest temperature was registered at Corugea - on the centre (9.9°C) and
 - the highest at Constanta $(11.7^{\circ}C)$ on the littoral.
- The multi-annual mean precipitation vary in large limits (260–500 mm approximately), the highest values being registered in the North and center of the region.
- The precipitation increase from the coast and from the Danube to interior
 - The lowest precipitation was registered on the coast, respectively at Harşova (408 mm at 37.31m), on the Danube, and
 - the highest at Tulcea (462 mm) in the N

Methodology

- to identify trend an discontinuities in data series
 - In order to facilitate the trend computation in the precipitation patterns we used the concept of "normalized variable" introduced by Steinberger and Gazit-Yaari with one modification: the annual precipitation is normalized by the regional multi-annual mean precipitation
 - As break (change) test we used the non-parametric test: Pettitt, Lee & Heghinian and Hubert segmentation procedure
- drought indexes
- remote sensing technique



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The results shows:

the coastal areas is the most exposed area to the drought. The frequency of occurrence of excessive aridity in this area exceeds sometimes 70%. in continental areas semi-arid class is dominant

 The LST (Land Surface Temperature) map shows that the LST values for the study area vary between 22°C and 48°C which is consistent with the ground meteorological data measured by Constanta station.

The highest LST values are obtained for the building area (40°C - 48°C).
For the area covered by vegetation, the LST varies between 31°C and 37°C, the higher values being obtained for the sparse vegetation spot



Date:	June 7, 2000
Satellite Overpass GMT Local Time	Time 8.32 11.32
Weather Station D Air Temp (°C) Humidity (%) w (g/cm ²) Mean LST (°C) At 7 am: At 13 am:	ata 23.3 82 2.3 21.2 48
At 11.30 am	: 42.31
Remote sensed LS Mean LST (°C)	Г 41.58

Conclusion 1

- after 1997 the mean annual temperature increases with 0.8°C
- After 1995 the annual precipitation increase on the littoral and the West part of Dobrogea and decrease on the Danube Delta and Lagunar complex
- Dobrogea region is characterized by a non- uniform distribution of rainfall in space and time
- The values of the De Martonne aridity index computed for the period 1965-2005 have allowed the separation of the investigated territory into two large areas:
 - a drier one in the east, which is strongly influenced by the Black Sea,
 - a moderate one in the West part of Dobrogea
- The remote sensing and Grid computing techniques offer the possibility to compute several drought indexes at regional scales. In the same time it can become an operational tool for drought early warning involving data acquisition, processing and analysis leading to drought monitoring.

The flood delineation



- HEC-RAS: developed by the Hydrologic Engineering Center (HEC) for River Analysis System (RAS).
 - hydraulic analysis program
 - analysis stream channel
 - determination floodplain

Case study



- Data inputs:
 - the instantaneous maximum discharge data obtained by the Pearson III distribution (50, 100, 500, 1000 return period)
 - river geometry obtained by HEC GEORAS
- Under steady flow
 - upstream boundary condition used is the discharge
 - downstream boundary condition used is "normal depth"
- Parameter
 - Manning Roughness coefficient, *n*
- Water surface profiles were computed from one cross section to the next by solving the energy equation.

WS for 1000 and 50 return period



Conclusion 2

- Rapid preparation of geometry data
- Floodplain maps can include several flow scenarios
- high resolution elevation models produce maps with more details.

- HEC-RAS is a one dimensional model,
 - computes single water surface elevations for each cross section .
 - flow will come out of bank earlier than in reality and the water surface elevation in the overbanks will be slightly lower than in reality.
- HEC RAS can be accepted to watershed -level analysis planing and design.



Thank you!

