



USING KÖPPEN CLIMATE CLASSIFICATION LIKE DIAGNOSTIC TOOL TO QUANTIFY CLIMATE VARIATION IN SOUTHWEST BULGARIA

Hristo Popov

Sofia University St. Kliment Ohridski
Faculty of Geology and Geography.
Department of Climatology, Hydrology and Geomorphology
hpopov@gea.uni-sofia.bg

Data

In this article has been used average monthly temperatures and monthly precipitation data from six stations located in the Struma and Mesta valleys.

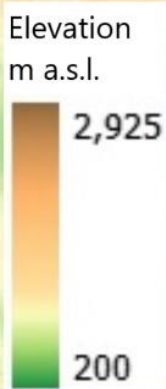
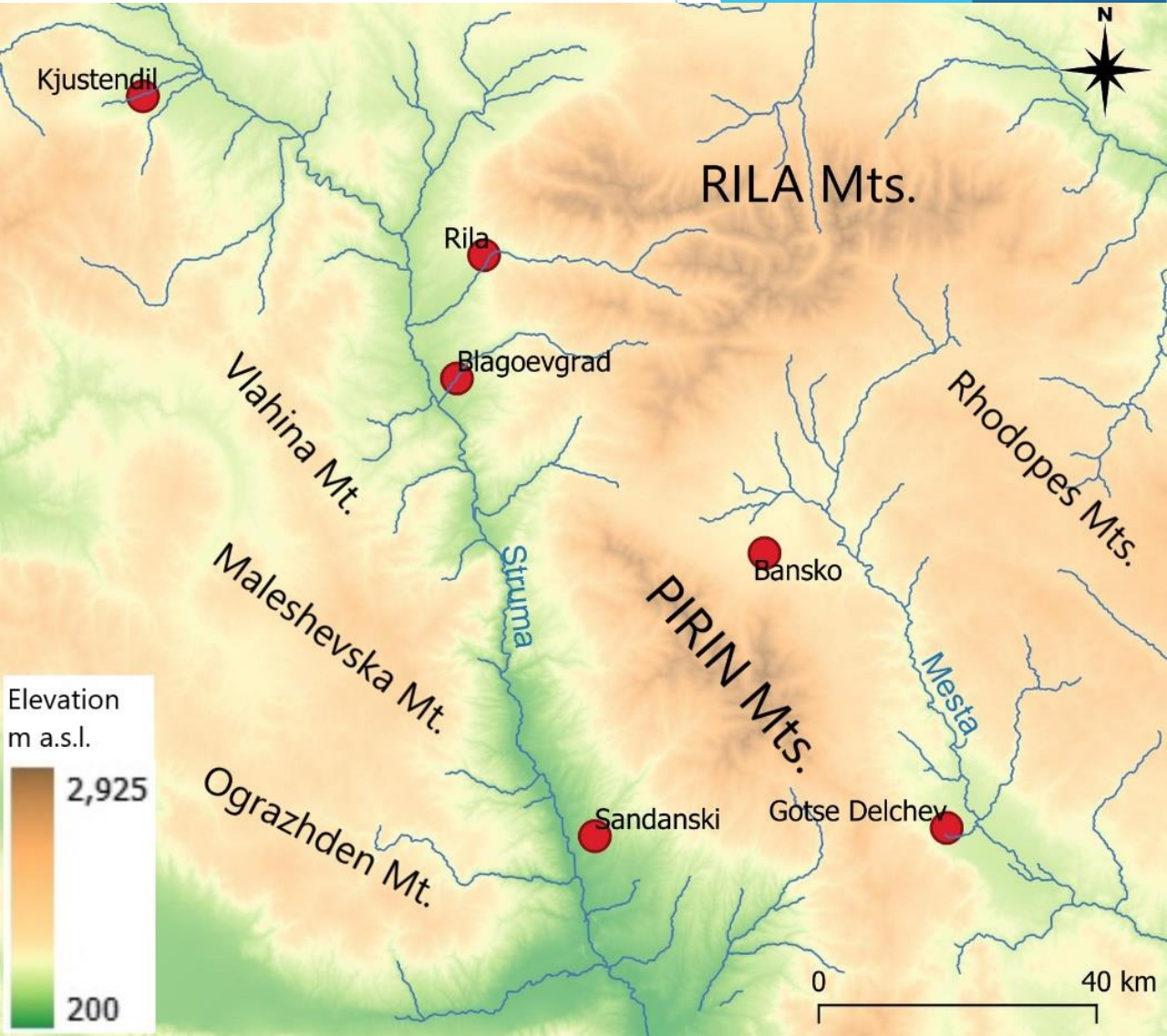
Four of the stations (Kustendil, Rila, Blagoevgrad and Sandanski) are located in the Struma Valley, and two stations (Bansko and Gotze Delchev) in Mesta Valley.

The data on the Struma Valley are for the period 1931- 2017. The data from the stations in the Mesta Valley are for the period 1931-1990.

Methods

- ▶ Brisse et al. (1982) introduce the expression "Annual Climate Type" (ACT), which is based on define index for every single year of study period.
- ▶ Planchon & Rosier (2005) used classification of W. Köppen to define ACT in Argentina.
- ▶ Quénel et al. (2008) and Eveno et al. (2016) define ACT in France
- ▶ Dubreuil et al. (2017) define ACT in Brazil

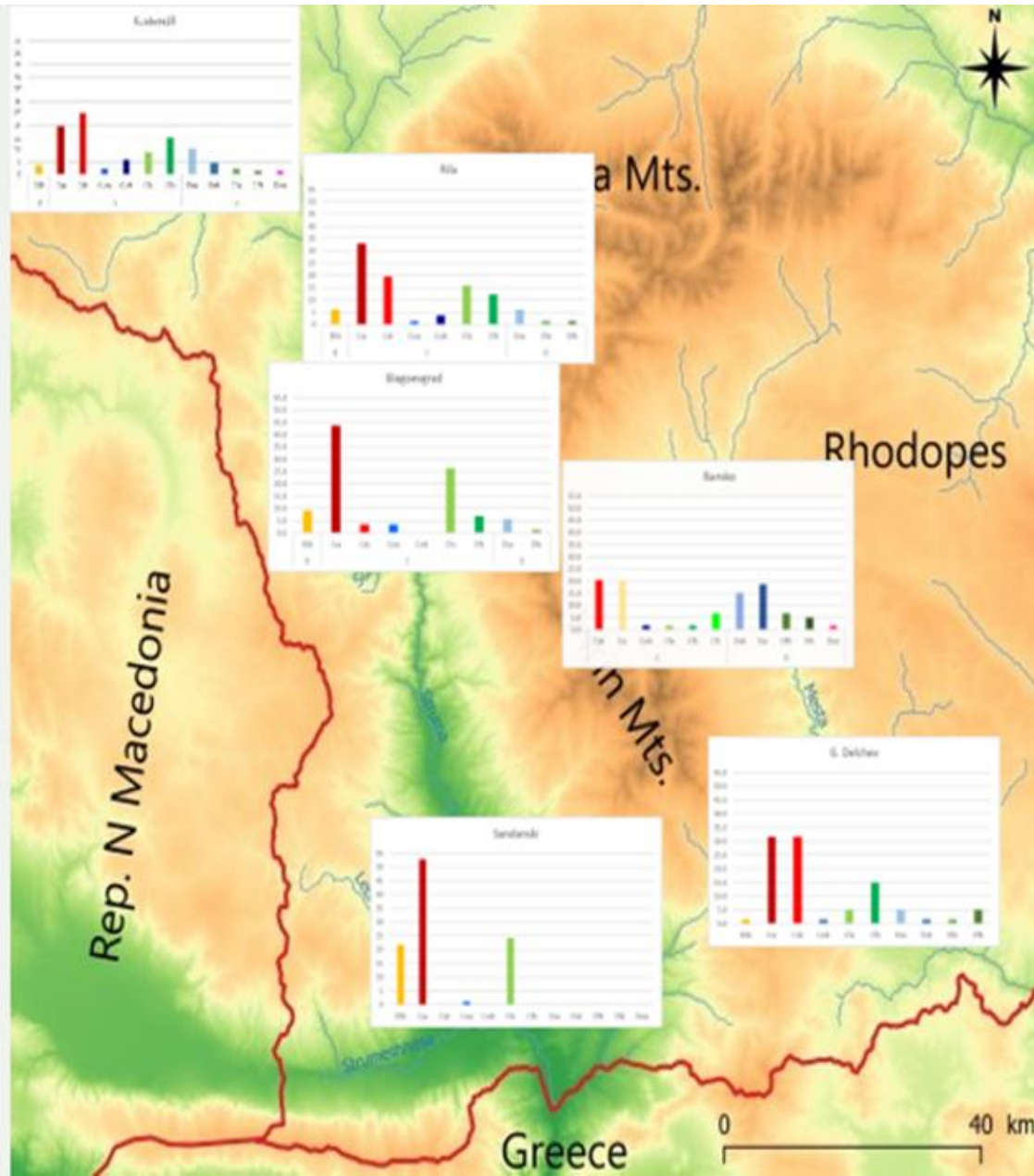
Study Area



Köppen climate classification scheme symbols

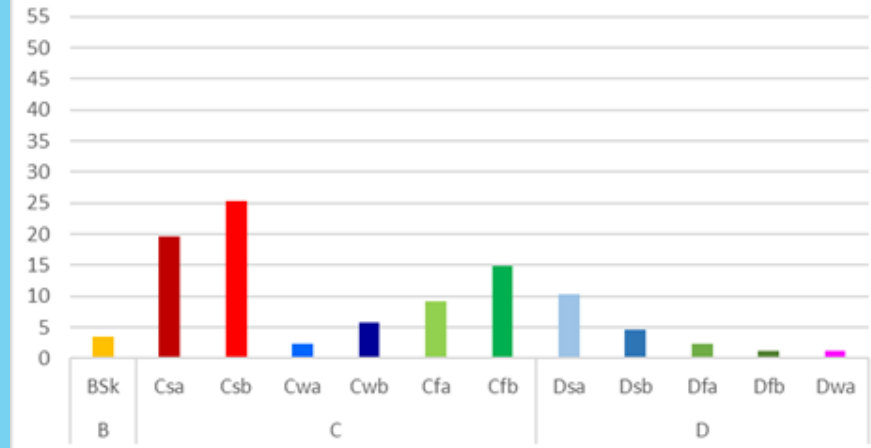
1st	2nd	3rd	Subtypes found in Bulgaria
B (Arid)	S (Steppe)	k (Cold)	BSk – Cold steppe climate
C (Temperate)	w (Dry winter)	a (Hot summer)	Cwa - Dry-winter humid subtropical climate
			Cwb - Dry-winter subtropical highland climate
	f (No dry season)		Cfa – Subtropical humid
		b (Warm summer)	Cfb – Subtropical highland climate with warm summer
			Cfc – Subtropical highland climate with cold summer
	s (Dry summer)		Csa – Mediterranean with hot summer
			Csb - Mediterranean with warm summer
c (Cold summer)		Csc - Mediterranean with cold summer	
D (Continental)	w (Dry winter)	a (Hot summer)	Dwa - Hot summer continental climates
			Dwb - Warm summer continental or hemiboreal climates
	f (No dry season)		Dfa - Hot-summer humid continental climate
		b (Warm summer)	Dfb – Warm humid continental climates
	s (Dry summer)		Dsa - Hot and dry summer continental climates
			Dsb - Warm and dry summer continental climates
		c (Cold summer)	Dwc -Dsc – Dfc – Boreal climates

Results

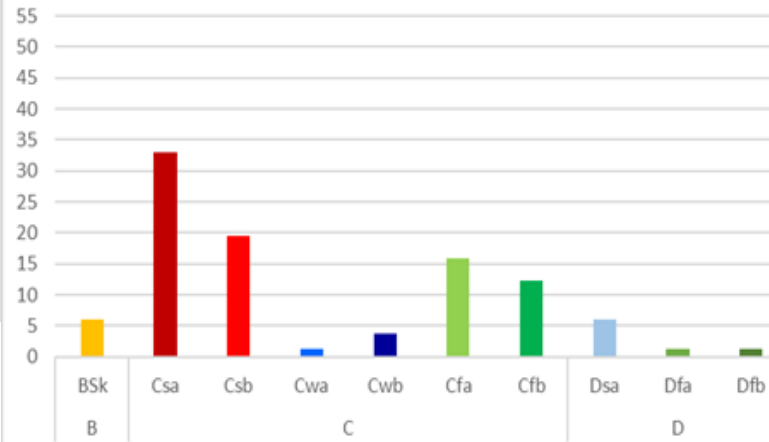


Results

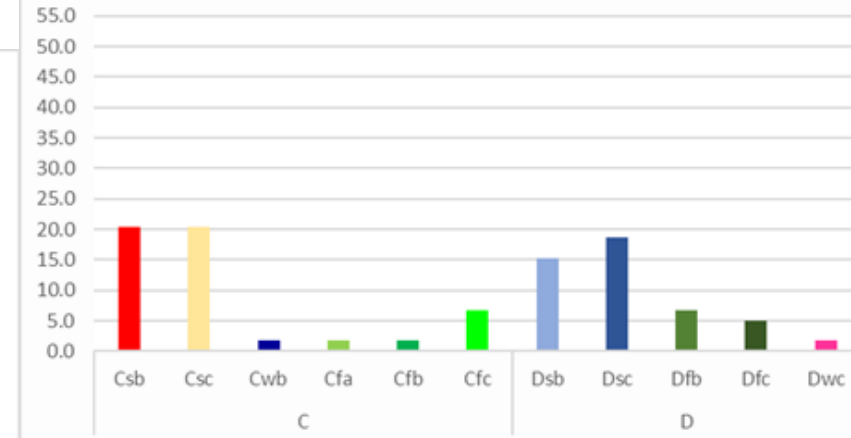
Kustendil



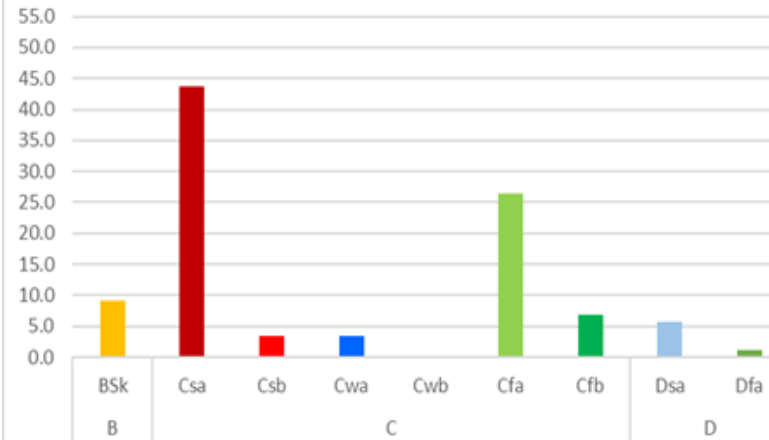
Rila



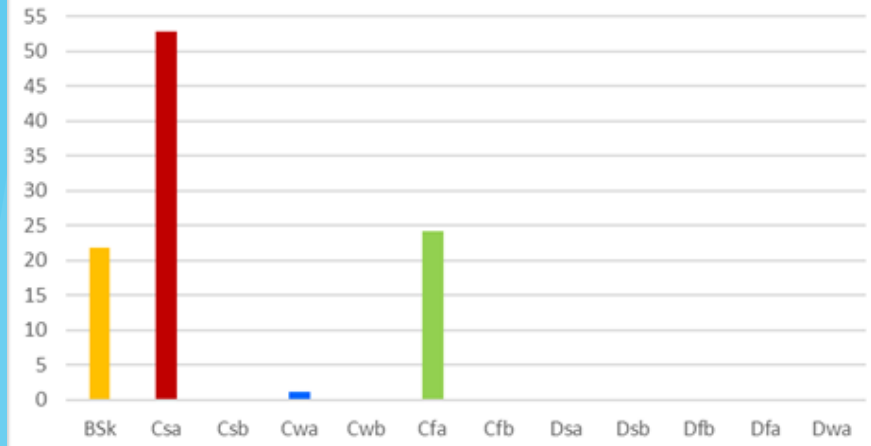
Bansko



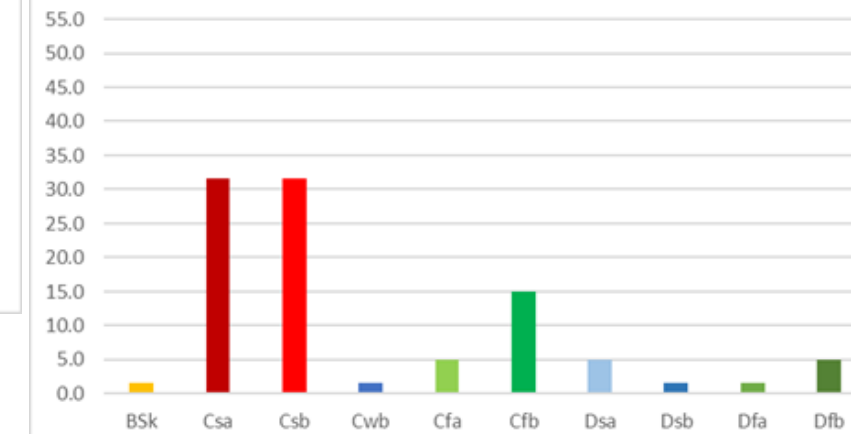
Blagoevgrad



Sandanski



G. Delchev



Conclusions

- ▶ The continental climates with cold winters - "D" cover 47% of the studied period in Bansko area.
- ▶ They are often registered in the Kyustendil valley where cold winters - "D" ACT is about 20%.
- ▶ The rest of the study area has significantly less continental influence. For the region of the Gotse Delchev valley and the middle reaches of the Struma the share of the years with cold winters "D" ACT is about 7-8%.
- ▶ The Mediterranean influence in the region is registered by the indices defining dry summer (Csa, Csb, Csc, Dsa, Dsb, Dsc). For the Valley of Mesta, the years with such indices are between 70 and 75%.
- ▶ For the Struma Valley, these indices (Csa, Csb, Csc, Dsa, Dsb, Dsc) cover between 53 and 60% of the study period.
- ▶ Regarding the indices characterizing the years as dry climate (BSk), their share is the largest for the region of Sandanski-Petrich field, where they reach 20%.

References

- ▶ Brisse H, Grandjouan R, De Ruffray P (1982) Les types de climats annuels, un mode d'expression des gradients climatiques intégrant les variations interannuelles. *La Météorologie* 1^{re} série **31**:39–81
- ▶ Planchon O, Rosier K (2005) Climat et variabilité climatique dans le Nord-Ouest de l'Argentine: problèmes posés et analyse durant la deuxième moitié du vingtième siècle. *Annales de l'Association Internationale de Climatologie* **2**:55–76
- ▶ Eveno M, Planchon O, Oszwald J, Dubreuil V, Quenol H (2016) Variabilité et changement climatique en France : analyses au moyen de la classification de Köppen et des « types de climats annuels ». *Climatologie* (**13**):47–70
- ▶ Dubreuil V, Fante KP, Planchon O, Neto JLS (2017) Les types de climats annuels au Brésil : une application de la classification de Köppen de 1961 à 2015. *EchoGéo* **41**:1–27
- ▶ Popov H (2018) Local climates of Vardar, Struma and Mesta valleys (Balkan Peninsula) according to the modified Köppen climate classification. *Bulletin of the Serbian Geographical Society* Volume **98**, Issue 1, Pages: 79-90.
<https://doi.org/10.2298/GSGD180428005P>
- ▶ Popov H (2022) Using Köppen Climate Classification Like Diagnostic Tool to Quantify Climate Variation in Lower Danube Valley for the Period 1961–2017. A. Negm et al. (eds.), *The Lower Danube River, Earth and Environmental Sciences Library*,
https://doi.org/10.1007/978-3-031-03865-5_8

Thank you for attention!
Merci!