

HYDROLOGICAL RISK ASSESSMENT AND DROUGHT MONITORING: PRECIPITATION-RUNOFF RELATIONSHIP IN THE CÔA RIVER BASIN 2(1979-2009)



Fundação para a Ciência e a Tecnologia



Universidade de Minho
Faculdade de Engenharia



Associação Laboratório de Sustentabilidade e Tecnologia em Montanhas Regionais



Instituto de Ciências da Terra
Instituto de Estudos Avançados

Regis Pacheco Cassino Junior
CIMO, LA SusTEC, ICT e FCP
regisjunior@ipb.pt

Sandra Sarmiento
ICNF - Direção Regional Norte
Sandra.Sarmiento@icnf.pt

Renato Henriques
Instituto de Ciências da Terra
rhenriques@ict.uminho.pt

Tomás de Figueiredo
CIMO, LA SusTEC
tomasfig@ipb.pt

This study was supported by the Fundação para a Ciência e a Tecnologia, I.P. (Portugal), through the doctoral grant PRT/BD/154880/2023 awarded to Regis Cassino Junior, within the framework of the collaboration protocol between FCT and the Fundação CIMA Parque. The authors also acknowledge FCT for financial support through national funds from FCT/MCTES (PIDDAC) to CIMO (UIDB/00690/2020 and UIDP/00690/2020) and SusTEC (LA/P/0007/2020), as well as to the Institute of Earth Sciences (ICT) and the Institute for Research and Advanced Studies (IFRA) of the University of Minho.

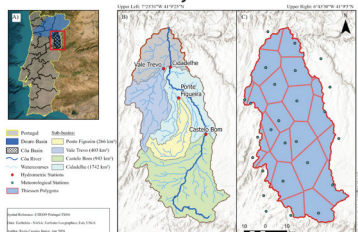
Introduction

Increasing aridity and climate variability in central Portugal are intensifying hydrological risks. The precipitation-runoff relationship is key for understanding and predicting hydrological response, which includes extremes generating risk, commonly amplified in seasonally contrasting climates

Objectives

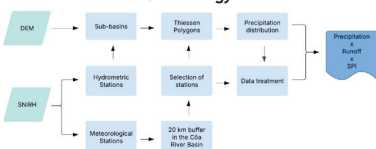
Analyse the precipitation-runoff relationship in the Côa River basin (1979-2009), in order to characterise its hydrological behaviour under climate variability and support hydrological risk assessment.

Study Area

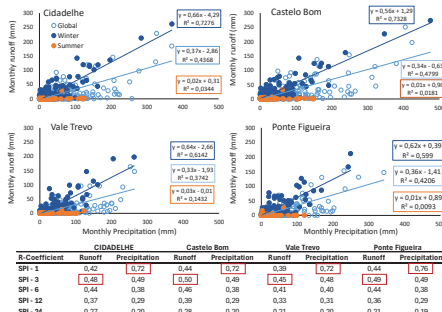


A - Location of the Côa River basin in Portugal. B - Sub-basins defined by hydrometric stations. C - Influential weather stations and their respective Thiessen polygons.

Methodology



Results



	CIDADELHE	Castelo Bom	Vale Trevo	Ponte Figueira
R-Coefficient	0.42	0.44	0.39	0.44
SPI - 1	0.42	0.44	0.39	0.44
SPI - 3	0.48	0.50	0.45	0.49
SPI - 6	0.44	0.46	0.41	0.44
SPI - 12	0.37	0.29	0.33	0.36
SPI - 24	0.27	0.25	0.23	0.21

Discussion

- The precipitation-runoff relationship is clearly differentiated by season:
 - Winter:
 - Cidadelhe → $R^2 = 0,73$
 - Castelo bom → $R^2 = 0,73$
 - Vale trevo → $R^2 = 0,61$
 - Ponte Figueira → $R^2 = 0,60$
 - Summer:
 - Cidadelhe → $R^2 = 0,03$
 - Castelo bom → $R^2 = 0,02$
 - Vale trevo → $R^2 = 0,14$
 - Ponte Figueira → $R^2 = 0,01$
- Reflecting greater hydrological connectivity during rainy periods.
- SPI correlated strongly with precipitation at the 1-month scale.
- The relationship between SPI and runoff highlights the greater sensitivity of runoff to accumulated anomalies at the seasonal scale.

Conclusion

- A considerable proportion of runoff is explained primarily by precipitation.
- Runoff generation is significantly more efficient in winter than in summer.
- Strong relationship with runoff confirms that SPI is an agile monitoring tool.
- Seasonality governs hydrological response and must be integrated into modelling and risk assessment frameworks for this basin.

RISCOS



ASSOCIAÇÃO PORTUGUESA DE RISCOS, PREVENÇÃO E SEGURANÇA