

Climate change-controlled dendroecological signal in *Pinus pinea* in Southern Spain

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1 Introduction

Tree rings provide information about forest response to climate change. Shifts in the tree-ring sensitivity to climate and enhanced growth synchrony among stands indicate a reaction to common limiting factors acting at large scale. (Andreu *et al.*, 2007; Di Filippo *et al.* 2010).

2 Objectives

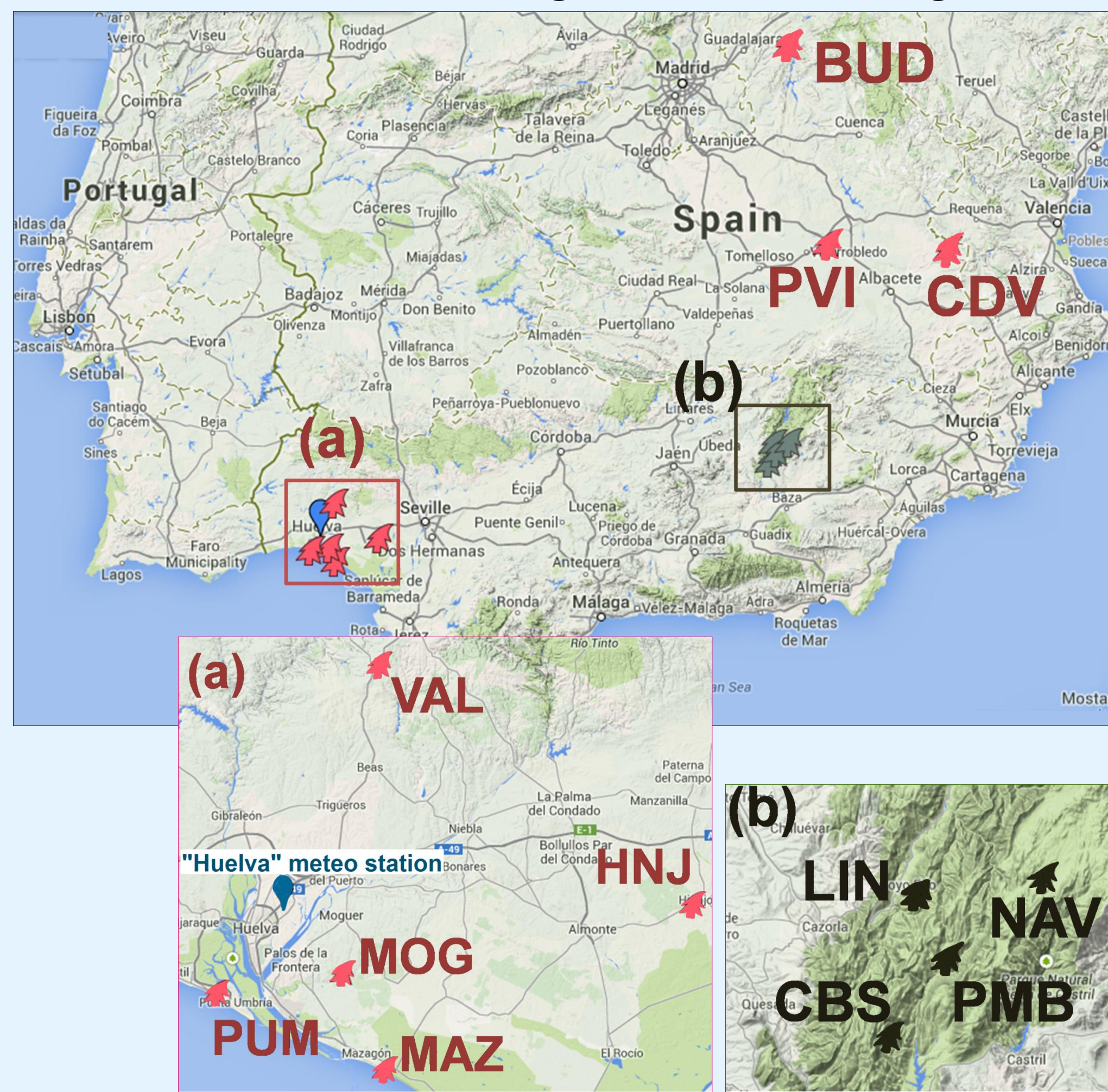
Growth variability was studied over the dendrochronological time-span of *Pinus* populations from S Spain to detect any change in the sensitivity to climate and synchrony among series.

4 Methods

- A common climatic signal for the Huelva chronologies was extracted with principal component analysis (PCA).
- The 1st component (PC1) was used for climate-growth correlations (Pearson r).
- The PCA, the PC1-climate correlations and the inter-annual tree-ring width variability (mean sensitivity) were computed for running windows (30 years).
- Running-interval (30 years) correlations were computed between PC1 and chronologies from La Mancha and Cazorla.

3 Materials

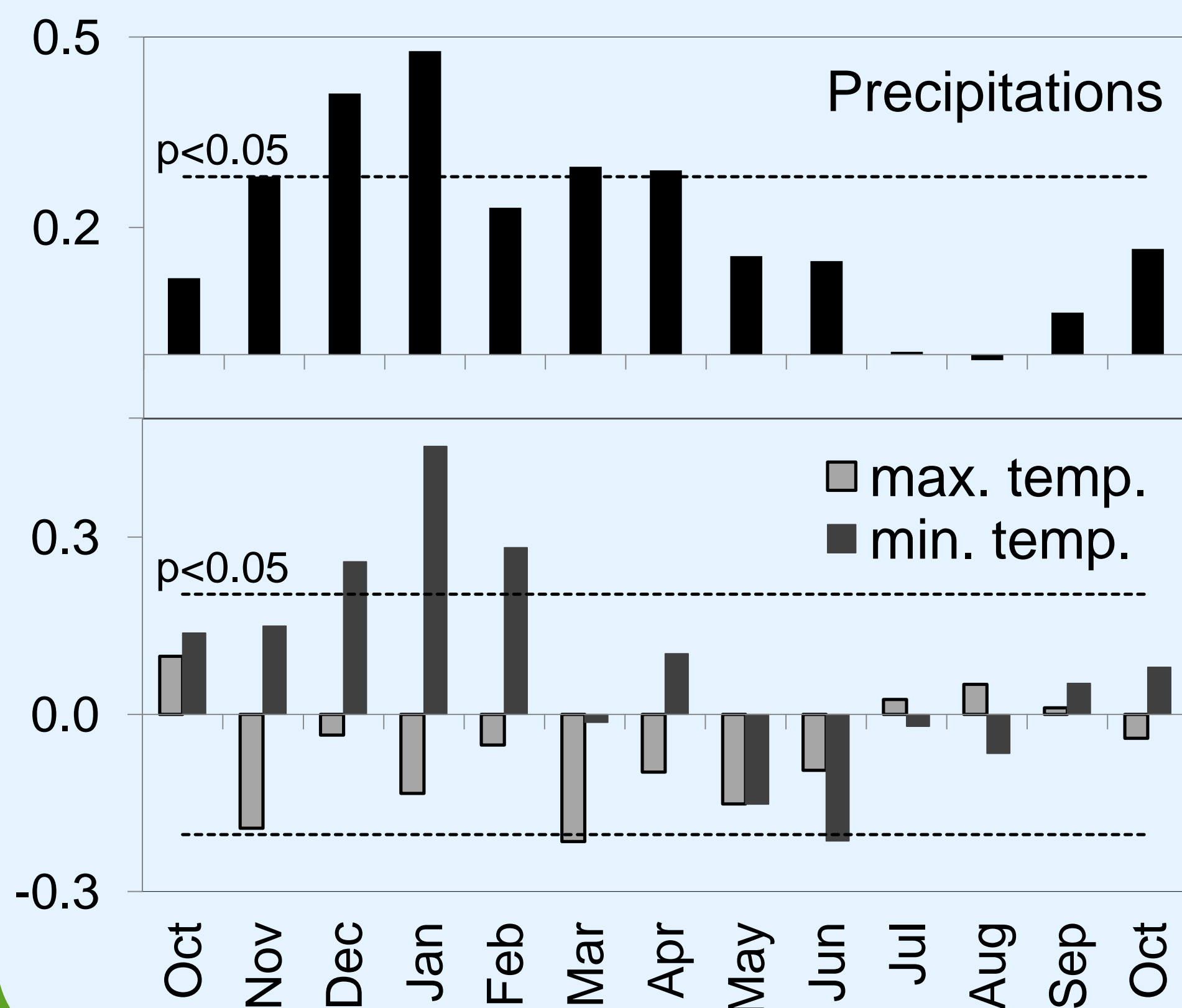
Standardized tree-ring width chronologies



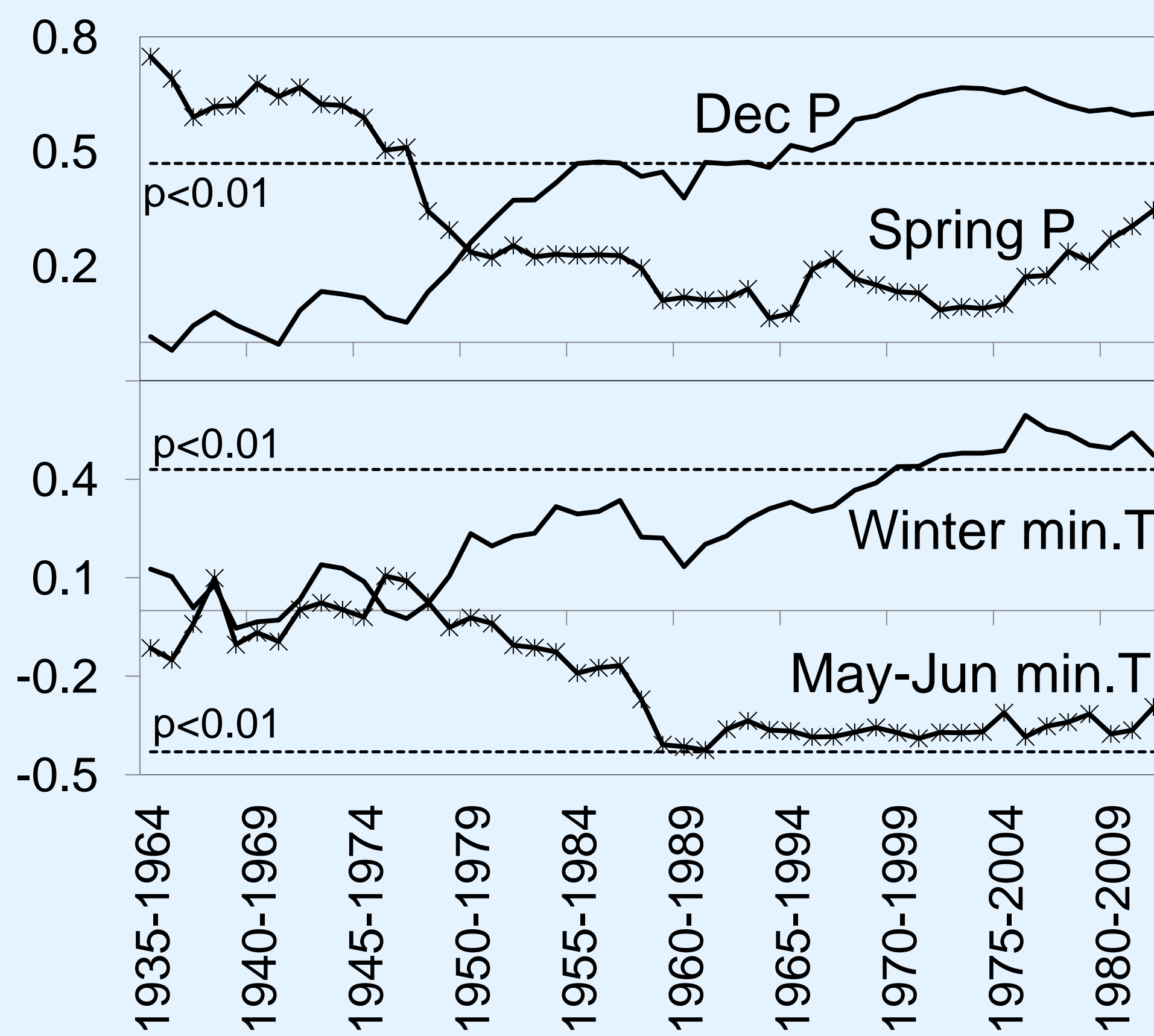
		Altitude (m)	EPS>0.85	
Huelva	VAL	260	1879-2011	Newly collected samples
	PUM	0	1924-2011	
	MOG	30	1927-2012	
	MAZ	0	1934-2011	
La Mancha	HNJ	70	1866-2012	Briongos & Cerro-Barja, ITRDB
	BUD	1055	1894-2001	
	PVI	720	1894-1999	
Cazorla	CDV	705	1926-2001	Dominguez-Delmás <i>et al.</i> , 2013
	LIN	1130	1840-2009	
	NAV	1640	1693-2009	
	PMB	1560	1511-2009	
	CBS	1850	1506-2010	

5 Results

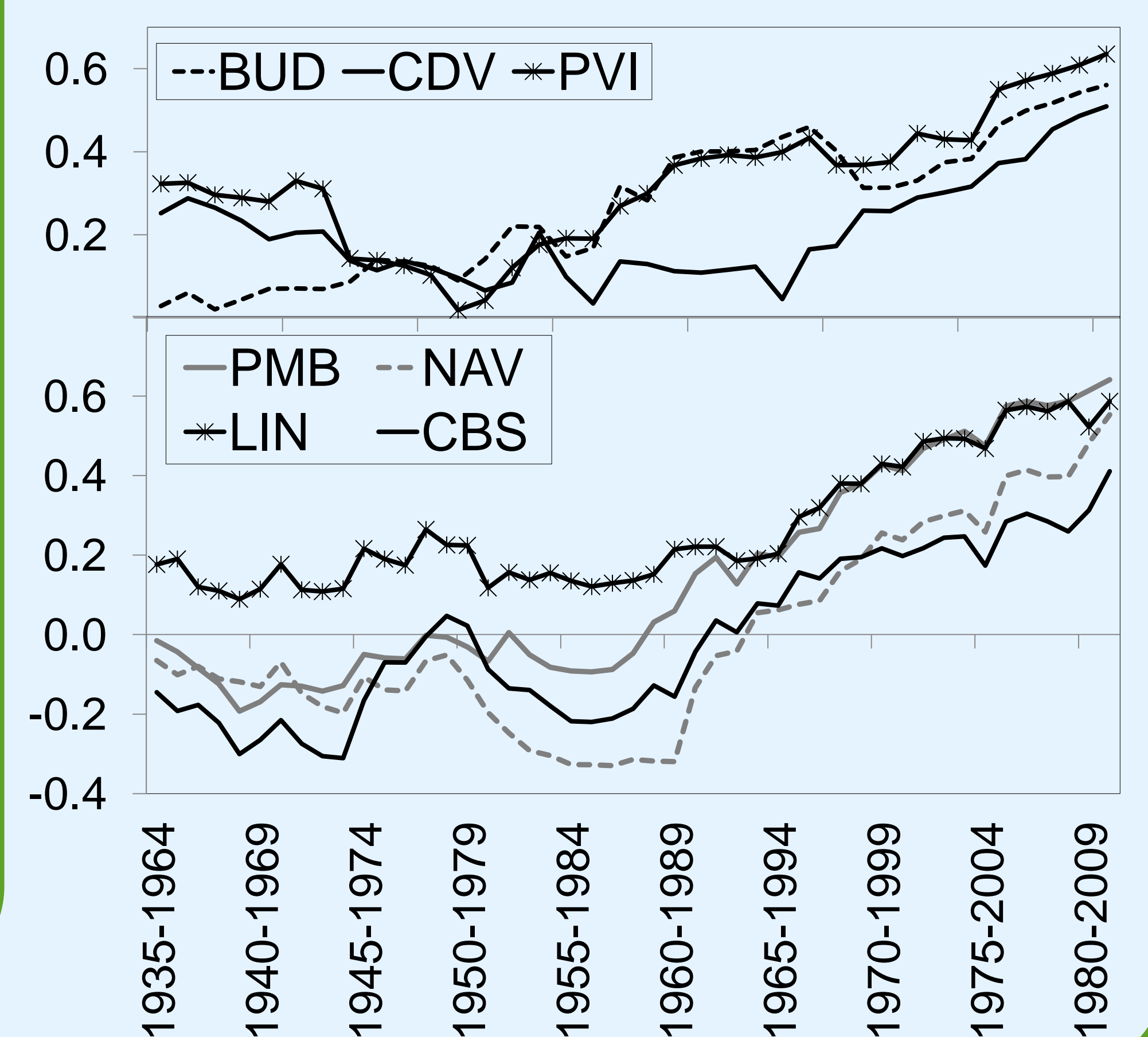
Huelva PC1-climate correlations: *P. pinea* growth depends on water availability from previous winter and spring and is limited by high temperatures.



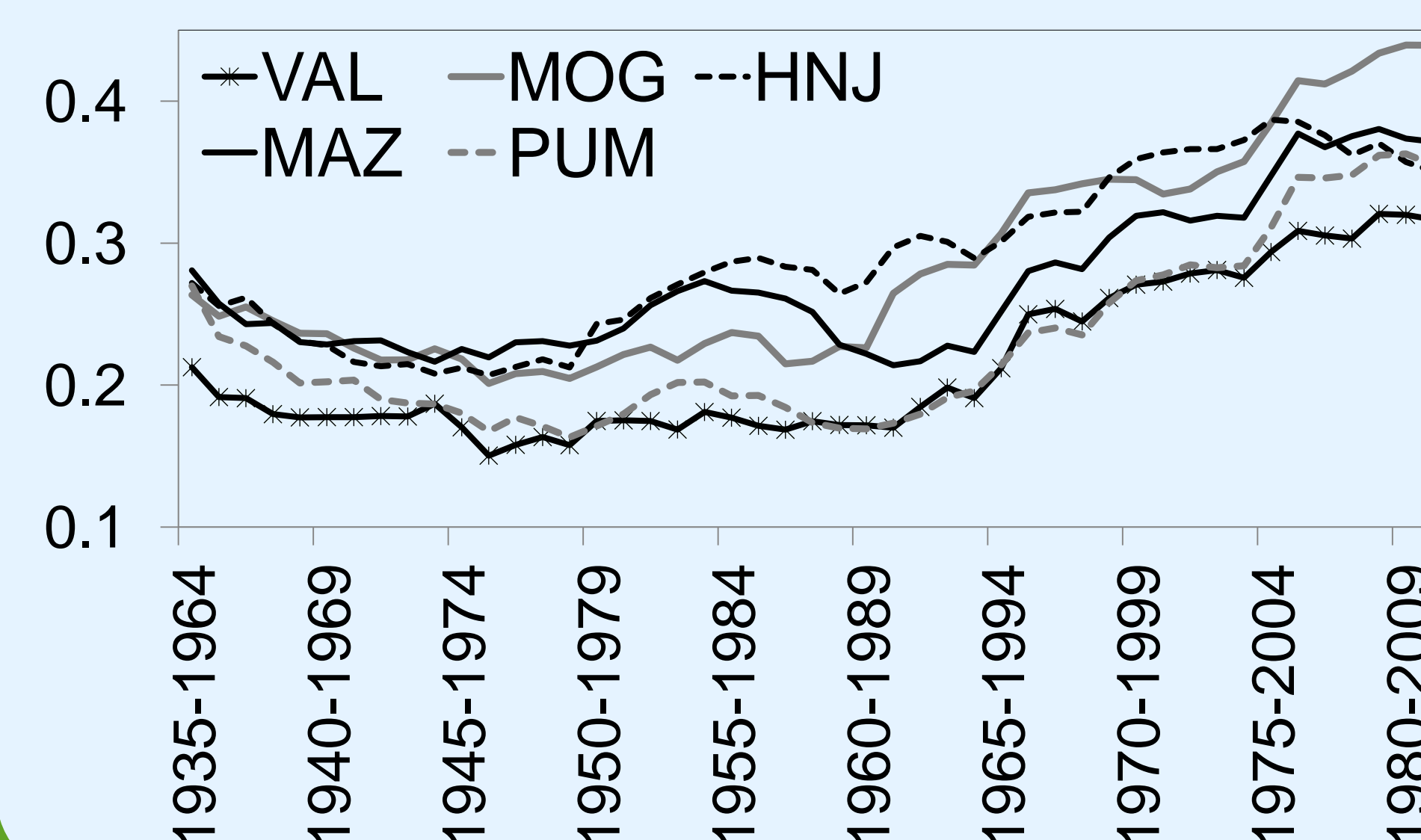
Huelva PC1-climate running correlations: *P. pinea* growth enhanced its correlation to winter and reduced the correlation to spring.



Running correlations between Huelva PC1 and *P. pinea* from La Mancha and *P. nigra* from Cazorla: correlations among populations increased.



Mean sensitivity of Huelva chronologies: *P. pinea* trees enhanced their sensitivity to climate.



6 Concluding remarks

The shifts in the climate-growth relationships and the increased sensitivity in Huelva suggest a common reaction to changing climate in the region. The enhanced growth synchrony among different populations in S Spain may indicate the action of large-scale environmental changes which induce more restricting conditions for growth.

References

- Dominguez-Delmás M *et al.*, 2013. Radial growth variations of black pine along an elevation gradient in the Cazorla Mountains (South of Spain) and their relevance for historical and environmental studies. *European Journal of Forest Research* 132(4)
- Andreu L *et al.*, 2007. Climate increases regional tree-growth variability in Iberian pine forests. *Global Change Biology* 13
- Di Filippo A *et al.*, 2010. Climate change and oak growth decline: dendroecology and stand productivity of a Turkey oak (*Quercus cerris* L.) old stored coppice in Central Italy. *Annals of Forest Science* 67