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Agroclimatic zoning of wine denominations of origin in Portugal: current and future conditions

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1. Motivation & Objectives

Weather and climatic conditions have a strong implication on wine production and quality. High-resolution agroclimatic zoning over 50 protected denominations of origin (DOs) in Portugal is carried out using two agroclimatic indices commonly applied in viticultural zoning (dryness and Huglin indices).

2. Data & Methods

For this purpose, a high-resolution dataset of climate data over Portugal and for 1981–2015 (baseline) is used. Furthermore, climate change projections are assessed based on two anthropogenic forcing scenarios (RCP4.5 and RCP8.5), retrieved from a 5-member climate model ensemble over two future periods (medium-range: 2041–2070, and long-range: 2071–2100). An optimized compound index was isolated from a principal component analysis applied to the time mean spatial patterns of the two selected indices, for baseline and over vineyard cover areas in each region only.

3. Results

The spatial variability of the climatic conditions of the Portuguese DOs (Figure 1a) is highlighted in Figures 1b (annual mean precipitation) and 1c (annual mean temperature). For the future periods, and regardless of the scenario, significant changes in the agroclimatic conditions are projected for most of the DOs. In future scenarios, strong upward trends in the growing-season mean temperatures, along with an overall strengthening of dryness are projected (not shown).

The projected changes in the classes of the Compound Index, which combines DI and HI, are noteworthy (Figure 2). This is particularly clear in south-eastern Portugal and north-eastern Portugal along the upper Douro Valley, where classes from 8 to 11 will prevail in the future period, particularly under RCP8.5.

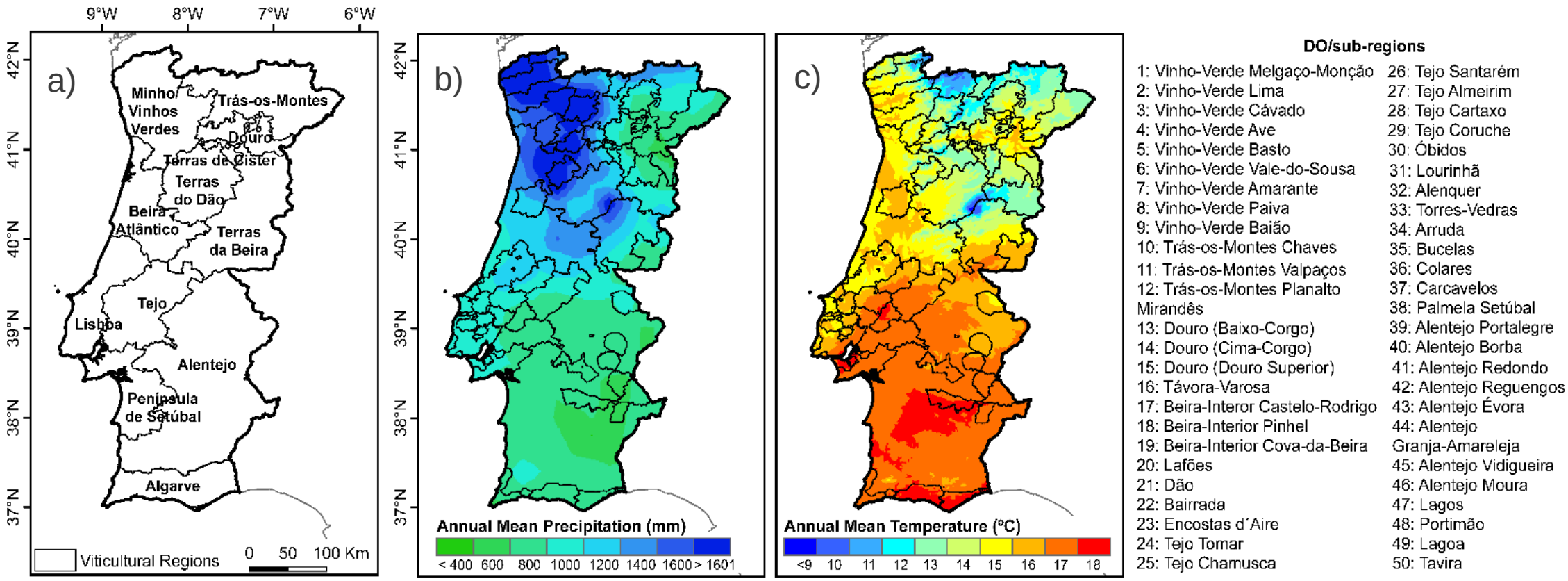


Figure 1. (a) Winemaking regions in mainland Portugal. (b) Annual mean precipitation for mainland Portugal and for the 1981-2015 period. (c) Annual mean of daily mean air temperature for mainland Portugal and for the 1950-2015 period (adapted from http://doi.org/10.1002/joc.6248).

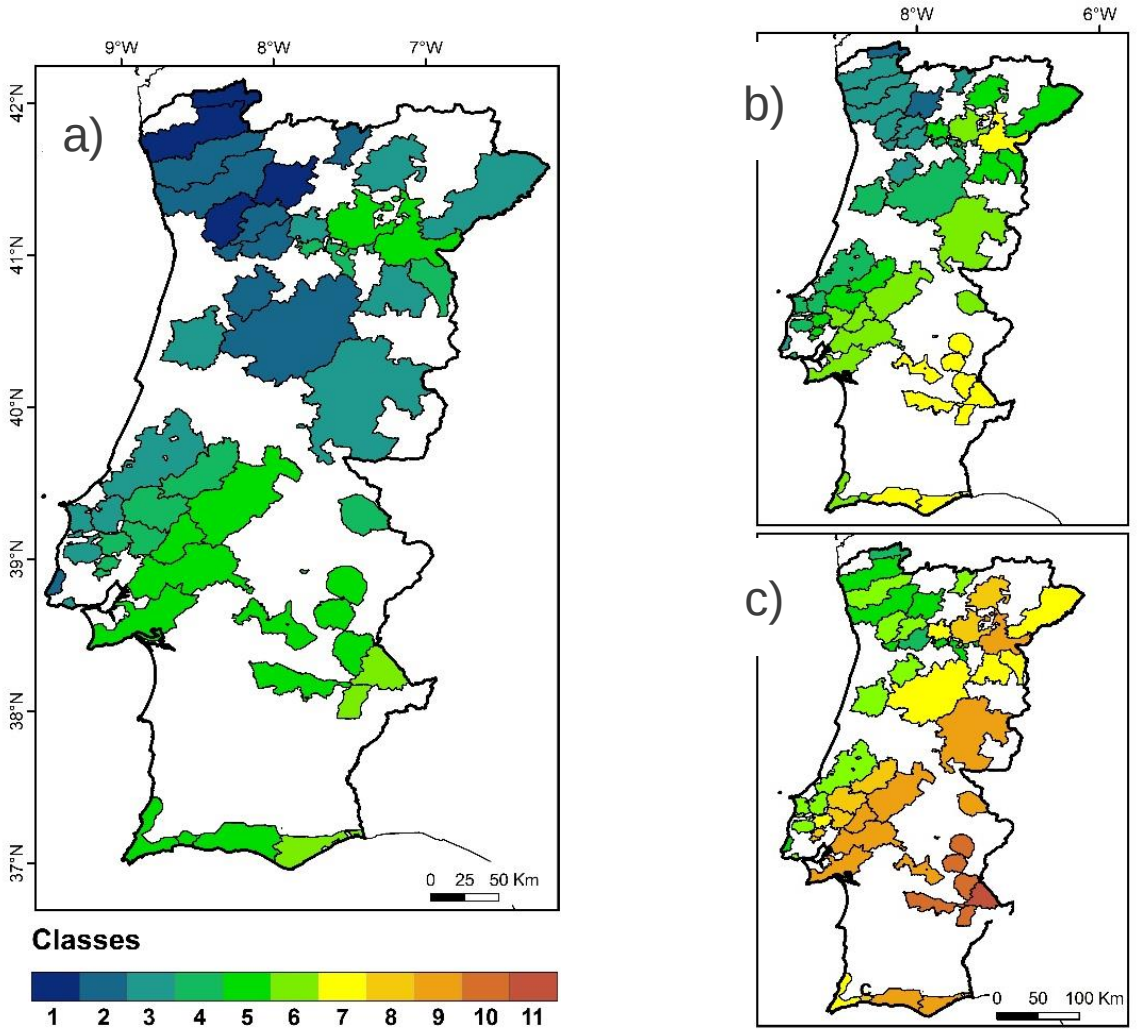
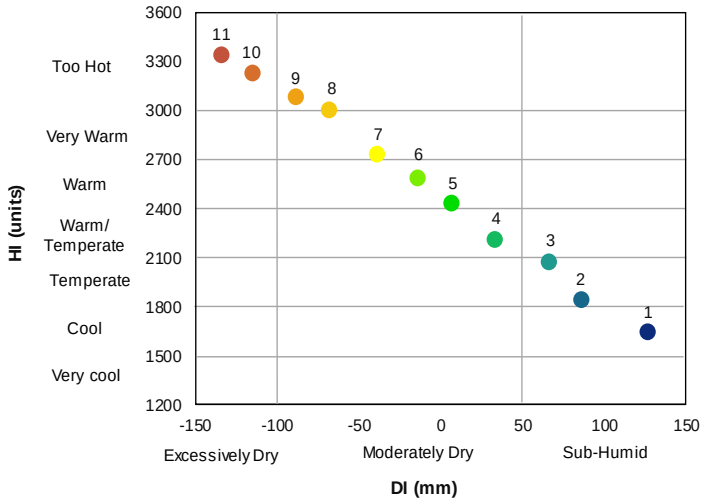


Figure 2. Maps of the different DI-HI combined bioclimatic classes – Compound Index – of the DOs and sub-regions over mainland Portugal for (a) the baseline period (1981–2015), and future periods of (b) 2071–2100, under RCP4.5; and (c) 2071–2100, under RCP8.5. The plot below represents the 11 classes of the Compound Index as a function of the area-mean DI and HI (adapted from http://doi.org/10.1002/joc.6248).



4. Conclusions

As Portuguese DOs are projected to become much drier than currently, irrigation or the selection of new varieties are likely adaptation measures to maintain the viability and sustainability of regional viticulture in future decades.

New research methods and decision support tools should be applied to assist stakeholders in developing more climate change-resilient viticulture.

The Clim4Vitis project (Climate change impact mitigation for European viticulture: knowledge transfer for an integrated approach, WIDESPREAD-05-2017 Twinning, European Union's Horizon 2020 research and innovation programme, under grant agreement nº 810176) has been very active in promoting capacity building activities and knowledge transfer to the European winemaking sector.

For more detailed information on this study please see our recent publication:

Santos, M.; Fonseca, A.; Fraga, H.; Jones, G. V.; Santos, J. A. (2020). **Bioclimatic conditions of the Portuguese wine denominations of origin under changing climates**. *International Journal of Climatology*, 40: 927-941 (http://doi.org/10.1002/joc.6248)

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and visit the Clim4Vitis website at: https://clim4vitis.eu/

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