

Supplementary material

Article

Climate change projections of aridity conditions in the Iberian Peninsula

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Abstract: The assessment of aridity conditions is a key factor for water management and the implementation of mitigation and adaptation policies in agroforestry systems. Towards this aim three aridity indices were computed for the Iberian Peninsula (IP): the De Martonne Index (DMI), the Pinna Combinative Index (PCI), and the Erinç Aridity Index (EAI). These three indices were first computed for the baseline period 1961–1990, using a gridded observational data (E-OBS), and, subsequently, for the periods 2011–2040 (short-range) and 2041–2070 (medium-range) using an ensemble of six Regional Climate Models (RCMs) experiments generated by the EURO-CORDEX project. Two Representative Concentration Pathways (RCPs) were analyzed, an intermediate anthropogenic radiative forcing scenario (RCP4.5) and a fossil-intensive emission scenario (RCP8.5). Overall, the three indices disclose a strengthening of aridity and dry conditions in central and southern Iberia until 2070, mainly under RCP8.5. Strong(weak) statistically significant correlations were found between these indices and the total mean precipitation (mean temperature) along with projected significant decreasing(increasing) trends for precipitation(temperature). The prevalence of years with arid conditions (above 70% for 2041–2070 under both RCPs) are projected to have major impacts in some regions, such as southern Portugal, Extremadura, Castilla-La Mancha, Comunidad de Madrid, Andalucía, Región de Murcia, Comunidad Valenciana, and certain regions within the Aragón province. The projected increase in both the intensity and persistence of aridity conditions in a broader southern half of Iberia will exacerbate the exposure and vulnerability of this region to climate change, while the risk of multi-level desertification should be thoroughly integrated into regional and national water management and planning.

Keywords: Aridity indices; Climate change; Projections; EURO-CORDEX

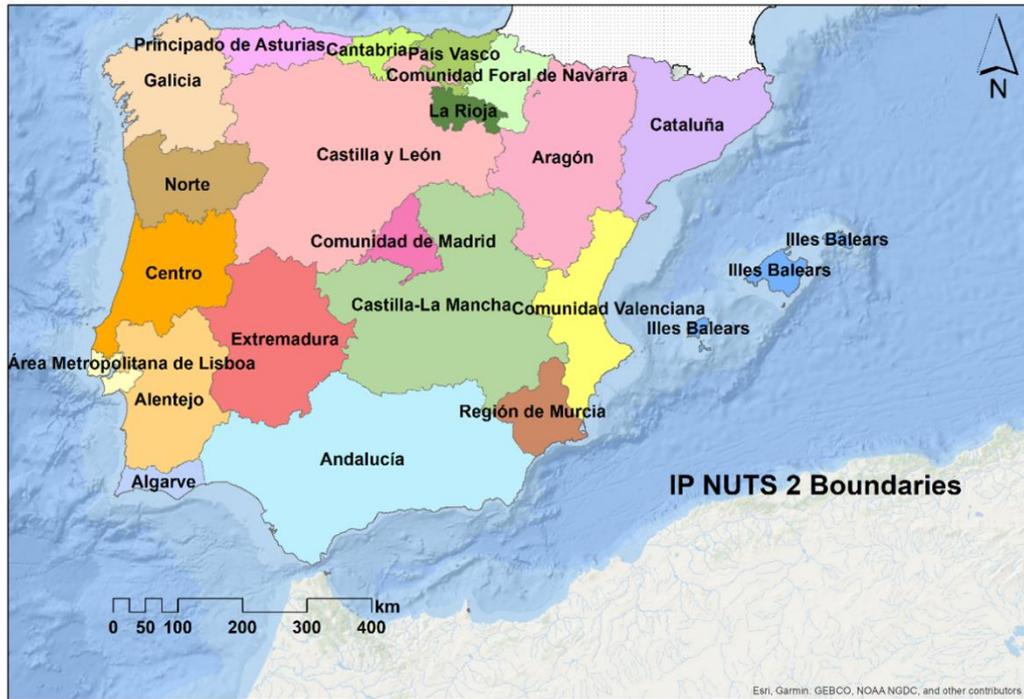


Figure S1. Iberian Peninsula (IP) study area with the respective Nomenclature of Territorial Units for Statistics (NUTS) NUTS 2 boundaries.

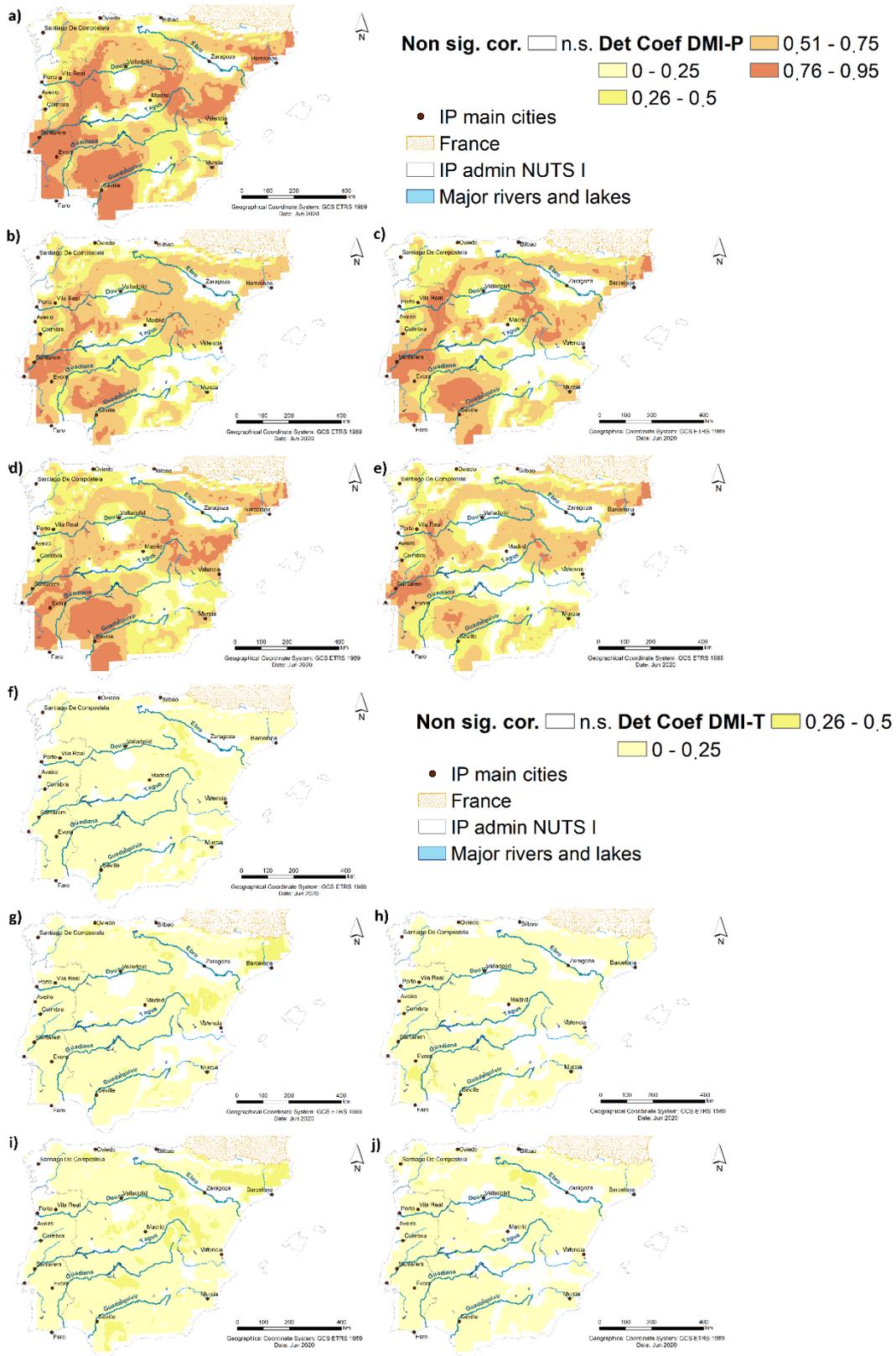


Figure S2. Statistically significant correlations (at a 5% significance level) between DMI and P and respective determination coefficient between (a) 1961–1990, (b) 2011–2040 and (d) 2041–2070 under RCP4.5; (c) 2011–2040 and (e) 2041–2070 under RCP8.5. For (f – j) the same as to (a – e) but between DMI and T.

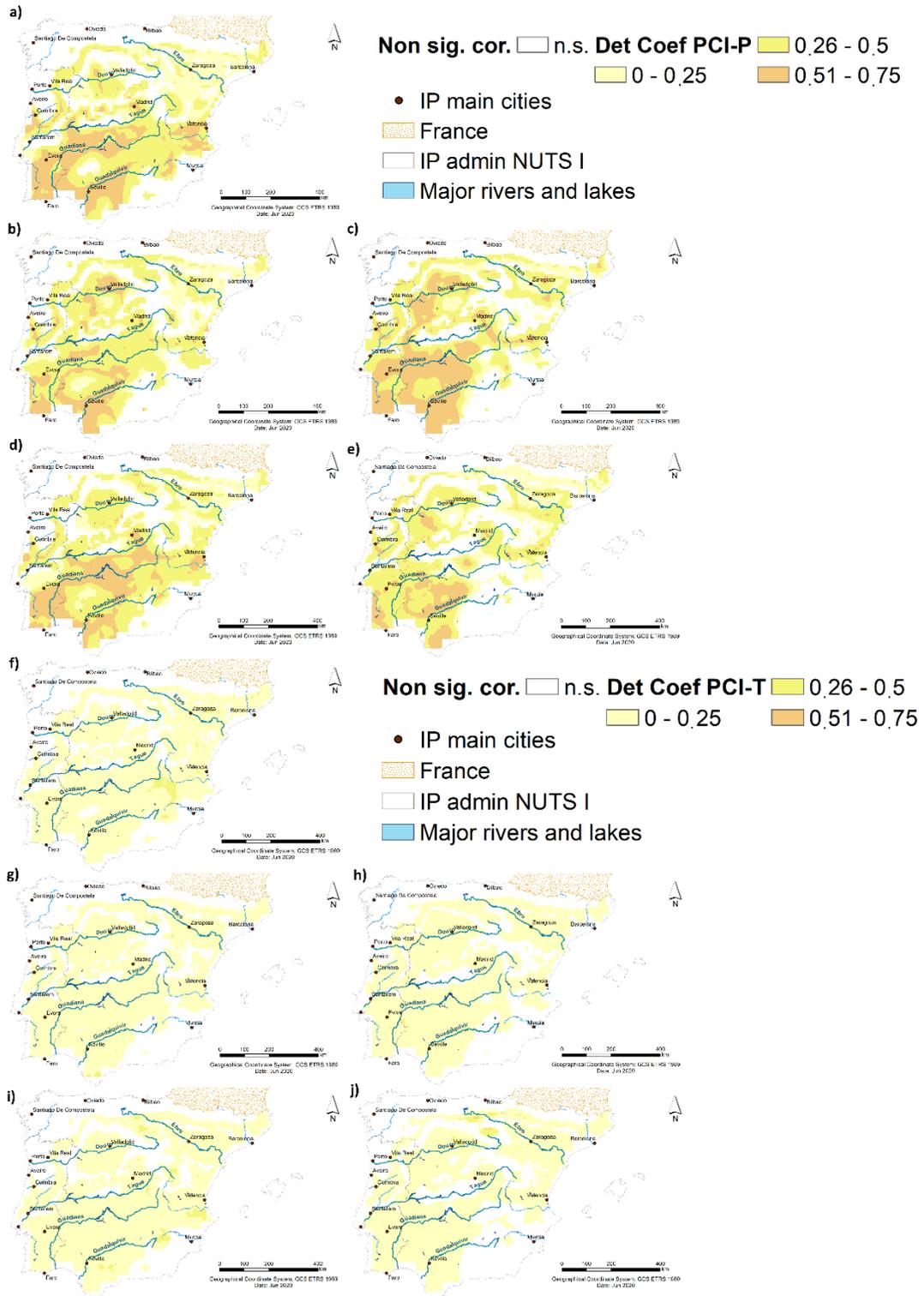


Figure S3. Statistically significant correlations (at a 5% significance level) between PCI and P and respective determination coefficient between (a) 1961–1990, (b) 2011–2040 and (d) 2041–2070 under RCP4.5; (c) 2011–2040 and (e) 2041–2070 under RCP8.5. For (f – j) the same as to (a – e) but between PCI and T.

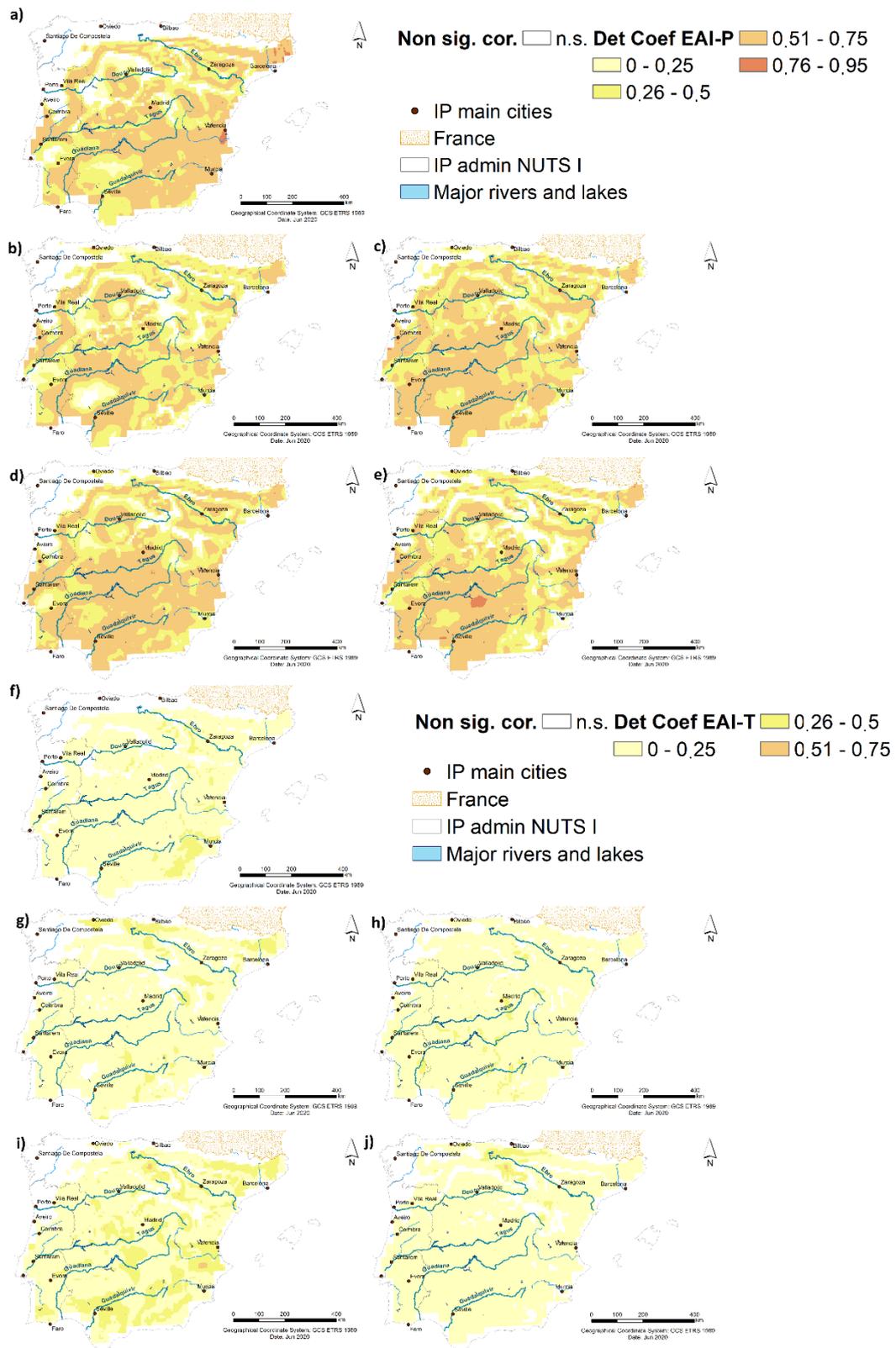


Figure S4. Statistically significant correlations (at a 5% significance level) between EAI and P and respective determination coefficient between (a) 1961–1990, (b) 2011–2040 and (d) 2041–2070 under RCP4.5; (c) 2011–2040 and (e) 2041–2070 under RCP8.5. For (f – j) the same as to (a – e) but between EAI and T.