CROSSDRO

ANNUAL NEWSLETTER 2022

Research partners:

Supported by:

February 2023

What is CROSSDRO?

CROSSDRO (*CROSS-sectoral impact assessment of DROughts in complex European basins*) is a EU JPI AXIS project that runs from September 2019 to March 2023. The CROSSDRO objectives are to:

- Better understand the multi- and cross-sectoral impact of droughts including the connection between physical and socioeconomic impacts and pathways.
- Better understand stakeholder needs and perceptions of drought.
- Examine drought impact across scales – catchment to European scale, and both historically and into the future.
- Our research is organised around the six work packages as shown in the Figure below
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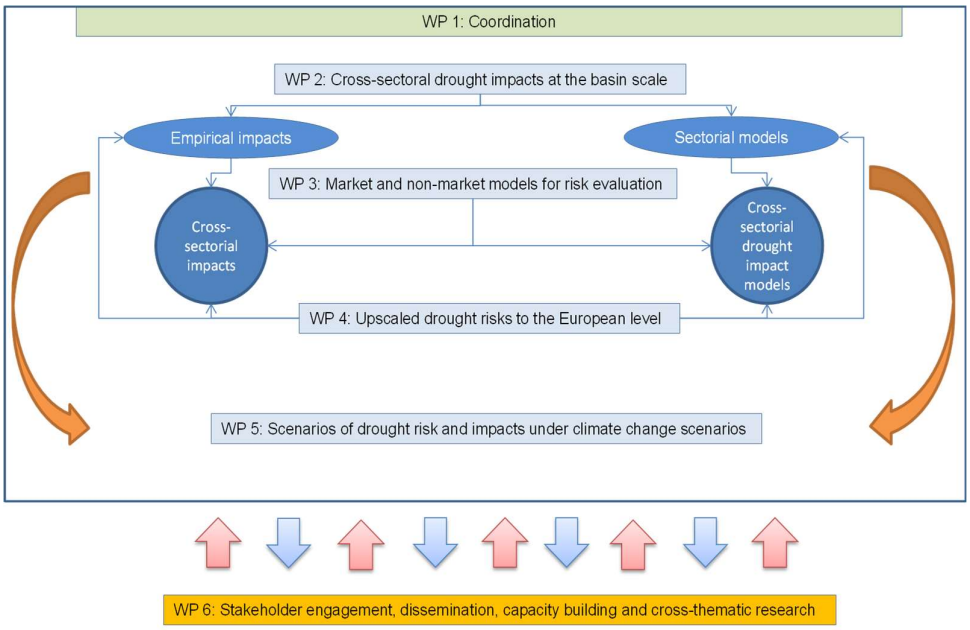


Where is the research taking place?

CROSSDRO is analysing drought in four European basins with different socio-ecological contexts and at the wider European scale. Case study basins include:

i) the upper Aragon basin in Northeast Spain,

ii) the German part of the Elbe basin,

iii) the Boyne basin in Ireland.

iv) the Moldovan part of Prut basin.

Who is involved?

CROSSDRO brings together scientists from five research institutions. The leading institution is the Spanish National Research Council, and the project coordinator is Sergio Vicente-Serrano. Partner institutions are University of Maynooth in Ireland (group leader C. Murphy), Lund University in

Sweden (group leader L. Eklundh), Research Institute of Field Crops “Selectia” in Moldova (group leader B. Boincean) and Potsdam Institute for Climate Impact Research in Germany (group leader T. Conradt).

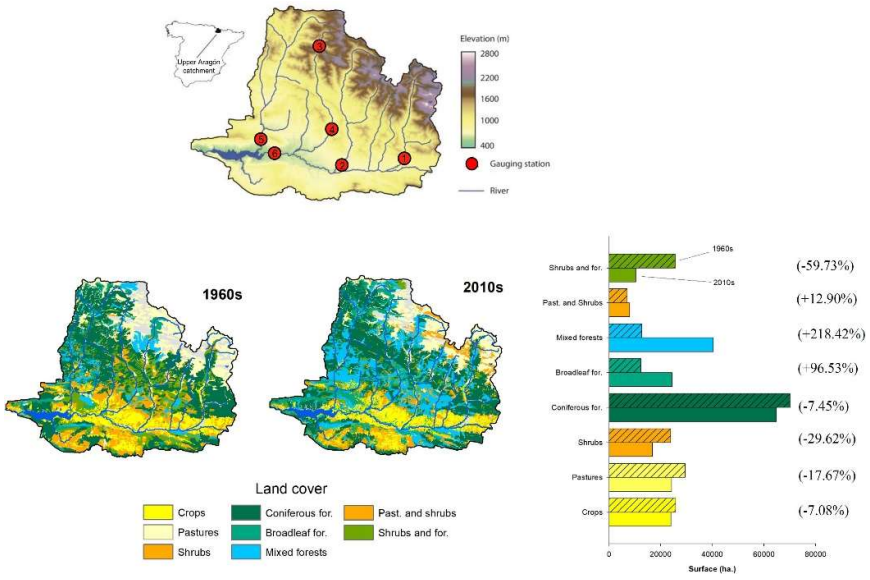
Progress in 2022

We are now approaching the end of the project and provide an update on the latest developments from the project in what has been a very busy 2022. The sections below highlight our scientific outputs, stakeholder engagement activities, media that our researchers have featured in and conference presentations we have delivered. If you have any questions or would like further details on any aspect, please get in contact with us. Contact details are available on the project website https://crossdro.csic.es/

Scientific Outputs

Hydro-climatic time-series and vegetation trends of the Upper Aragón catchment

Juez, C., Garijo, N., Nadal-Romero, E., Vicente-Serrano, S.M., (2022) Wavelet analysis of hydro-climatic time-series and vegetation trends of the Upper Aragón catchment (Central Spanish Pyrenees). Journal of Hydrology, 614: 128584



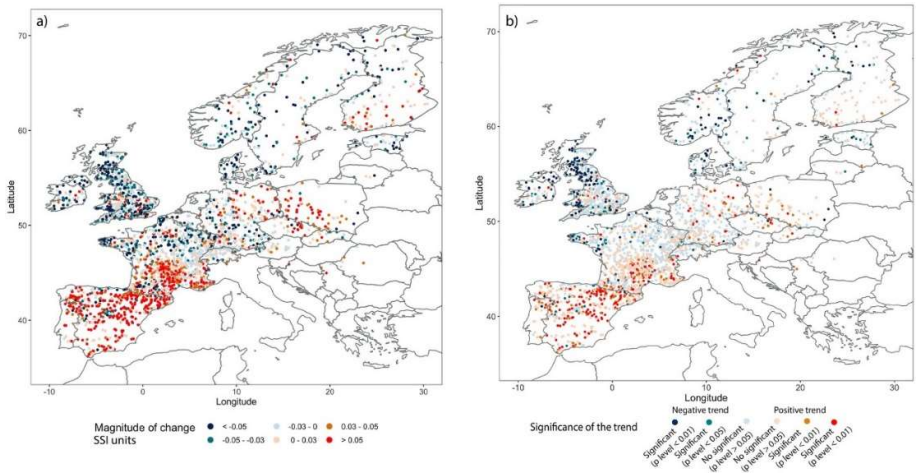
The Upper Aragón catchment location and topography with the gauging stations (top). Land-cover categories for 1960s and 2010s.

Water managers and researchers noted with concern a nearly generalized decline in Mediterranean rivers discharge over the last decades. Changes in climatic forces (precipitation and air temperature) and land use and land cover (LULC) changes characterized by re-vegetation and greenness are the two most possible explanations for this discharge decline. The direct impact on river discharge stemming from these changes is difficult to assess and their role is generally studied separately. Here, we use the method of wavelet transformation to interpret the time-scale dependency of catchment

discharge concerning the uneven temporal climatic fluctuations and re-vegetation processes. We analyzed the temporal variation of concurrent air temperature, precipitation and river discharge time-series for the Upper Aragón catchment, located in the Central Spanish Pyrenees. A long-term database collected over 60 years (1956–2020) was used. Land cover maps corresponding to different decades were used and the results indicated that the catchment experienced a significant increase in the area covered by mixed and broadleaf forests, mostly as a consequence of land abandonment. We show how temperature slightly increased and precipitation moderately decreased. However, catchment discharge experienced a sharp decline in its magnitude and also changes in its temporal variability dynamics. The relevance of the seasonal time-scales with regard to the available discharge is reduced, which strengthens the importance of the inter-annual time-scales for the catchment discharge dynamics. Furthermore, the catchment storage-discharge cycle at inter-annual time-scales is also reduced. Such changes can mostly be attributed to the changes in plant coverage, with an increasing weight in shaping hydrological processes at catchment scale due to the greenness effect. As such, we conclude that LULC changes have played a dominant role on the river discharge dynamics. Climatic trends, on the contrary, have been small, and they have played a secondary role in the decline of river discharge. Future research can use these observations to constrain the pace of upcoming water demands based on the available water resources at Mediterranean catchment scale.

The complex and spatially diverse patterns of hydrological droughts across Europe

Peña-Angulo, D., Vicente-Serrano, S.M.,, Domínguez-Castro, F., Lorenzo-Lacruz, J., Murphy, C., Hannaford, J., Allan, R., Tramblay, Y., Reig?Gracia, F, , El Kenawy, A. (2022) The complex and spatially diverse patterns of hydrological droughts across Europe. Water Resources Research, 58, e2022WR031976.



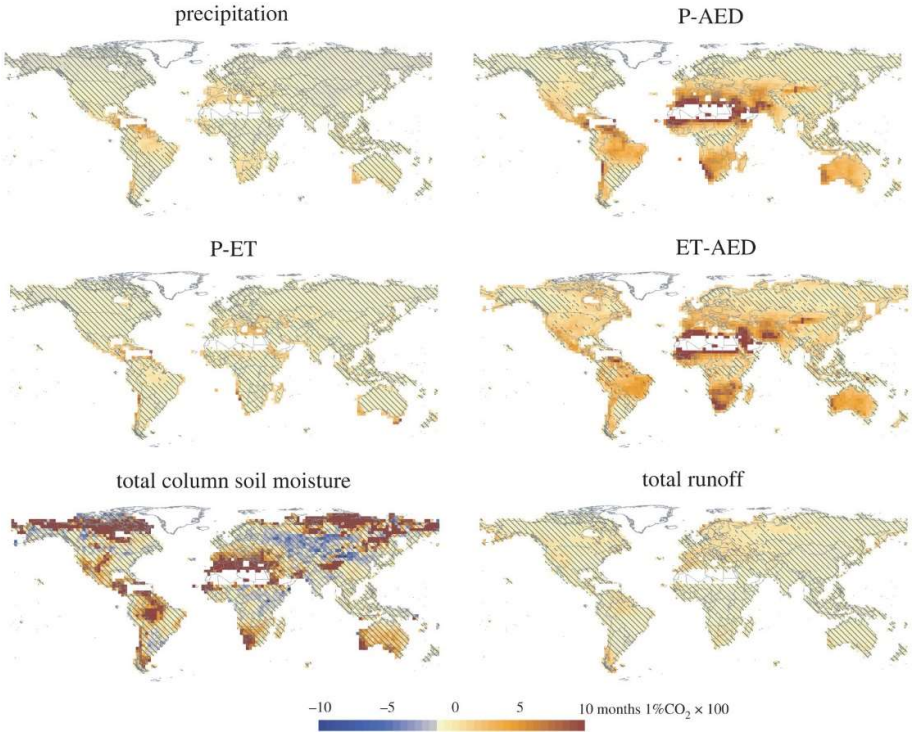
Trends in the severity of drought events from 1962 to 2017. (a) Spatial distribution of the magnitude of change in Standardized Streamflow Index (SSI) and (b) the corresponding significance of trends (at $p < 0.05$, $p < 0.01$) over the same period. Each circle represents one gauging station.

This study presents a new data set of gauged streamflow (N = 3,224) for Europe spanning the period 1962–2017. The Monthly Streamflow of Europe Dataset (MSED) is freely available at http://msed.csic.es/. Based on this data set, changes in the characteristics of hydrological drought (i.e., frequency, duration, and severity) were assessed for different regions of Europe. Due to the density of the database, it is possible to delimit spatial patterns in hydrological droughts trend with the greatest detail available to date. Results reveal bidirectional changes in monthly streamflow, with negative changes predominating over central and southern Europe, while positive trends dominate over northern Europe. Temporally, two dominant patterns were noted. The first pattern corresponds to a consistent downward trend in all months, evident for southern Europe. A second pattern was noted over central and northern Europe and western France, with a predominant negative trend

during warm months and a positive trend in cold months. For hydrological drought events, results suggest a positive trend toward more frequent and severe droughts in southern and central Europe and conversely a negative trend over northern Europe. This study emphasizes that hydrological droughts show complex spatial patterns across Europe over the past six decades, implying that hydrological drought behavior in Europe has a regional character. Accordingly it is challenging to adopt "efficient" strategies and policies to monitor and mitigate drought impacts at the continental level.

Global drought trends and future projections.

Vicente-Serrano, S.M., Peña-Angulo, D., Beguería, S., Domínguez-Castro, F., Tomás-Burguera, M., Noguera, I., Gimeno-Sotelo, L., El Kenawy, A. (2022) Global drought trends and future projections. Philosophical Transactions of the Royal Society A. A380, 2021028.

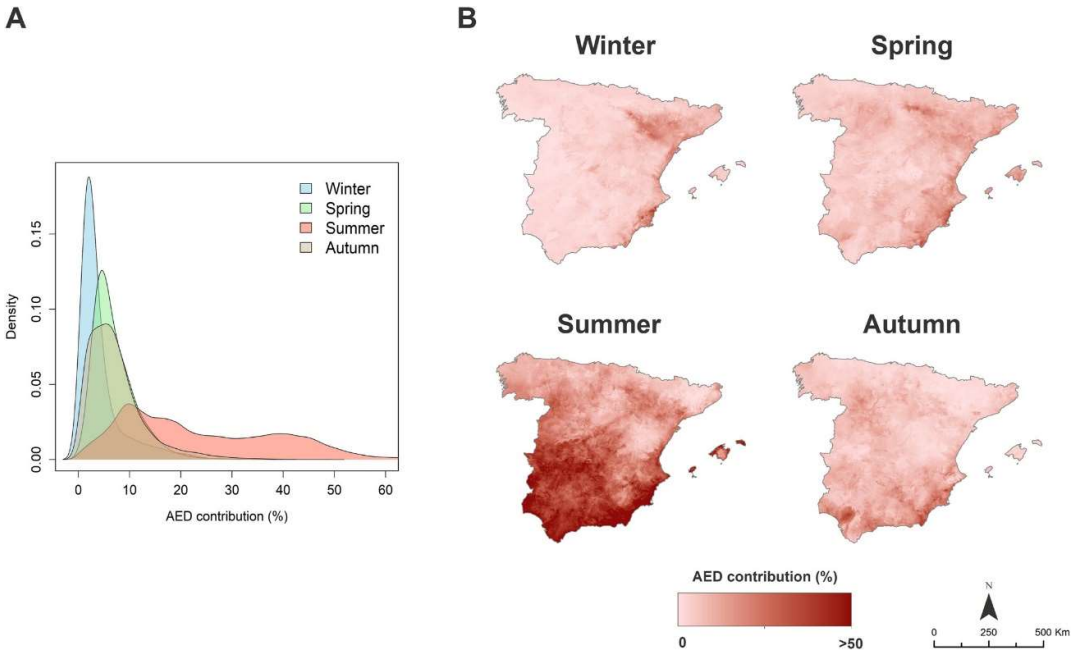


Spatial patterns of the change in drought duration between a scenario of preindustrial CO_2 concentrations and one of atmospheric CO_2 concentrations corresponding to the SSP5-85 scenario for the year 2100. The magnitude of change represents the median of the 12 models. Stripes correspond to areas in which less than 75% of the models show statistically significant changes.

Drought is one of the most difficult natural hazards to quantify and is divided into categories (meteorological, agricultural, ecological and hydrological), which makes assessing recent changes and future scenarios extremely difficult. This opinion piece includes a review of the recent scientific literature on the topic and analyses trends in meteorological droughts by using long-term precipitation records and different drought metrics to evaluate the role of global warming processes in trends of agricultural, hydrological and ecological drought severity over the last four decades, during which a sharp increase in atmospheric evaporative demand (AED) has been recorded. Meteorological droughts do not show any substantial changes at the global scale in at least the last 120 years, but an increase in the severity of agricultural and ecological droughts seems to emerge as a consequence of the increase in the severity of AED. Lastly, this study evaluates drought projections from earth system models and focuses on the most important aspects that need to be considered when evaluating drought processes in a changing climate, such as the use of different metrics and the uncertainty of modelling approaches.

The rise of Atmospheric Evaporative Demand is increasing flash droughts in Spain during the warm season

Noguera, I., Domínguez-Castro, F. Vicente-Serrano, S.M. (2022) The rise of Atmospheric Evaporative Demand is increasing flash droughts in Spain during the warm season. Geophysical Research Letters, 49, e2021GL097703

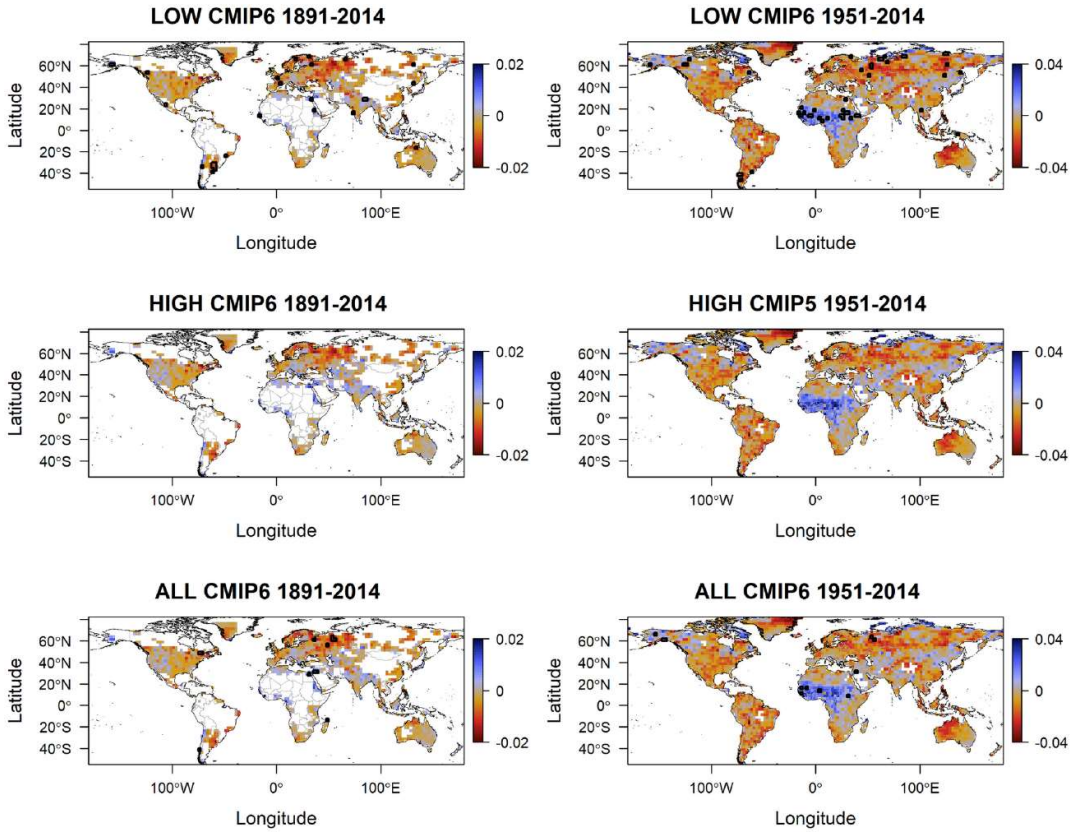


Seasonal (a) density of the average atmospheric evaporative demand (AED) contribution to the development of flash droughts and (b) its spatial distribution in mainland Spain and the Balearic Islands over the period 1961–2018.

Flash droughts are characterized by rapid development and intensification, generating a new risk for drought impacts on natural and socio-economic systems. In the current climate change scenario, the meteorological drivers involved in triggering flash droughts are uncertain. We analyzed the role of meteorological drivers underlying the development of flash droughts in Spain over the last six decades, evidencing that the effect of atmospheric evaporative demand (AED) on flash drought is mainly restricted to water-limited regions and the warm season. However, the contribution of the AED has increased notably in recent years and particularly in summer (~3.5% per decade), thus becoming a decisive driver in explaining the occurrence of the latest flash droughts in some regions of Spain. Our findings have strong implications for proper understanding of the recent spatiotemporal behavior of flash droughts in Spain and illustrate how this type of event can be related to global warming processes.

Do climate models capture observed precipitation trends?

Vicente-Serrano, S.M., García-Herrera, R., Peña-Angulo, D., Tomas-Burguera, M., Domínguez-Castro, F., Noguera, I., Calvo, N., Murphy, C., Nieto, R., Gimeno, L., Gutierrez, J.M., Azorin-Molina, C., El Kenawy, A. (2022) Do CMIP models capture observed precipitation trends? Climate Dynamics. 58, 2825-2842.

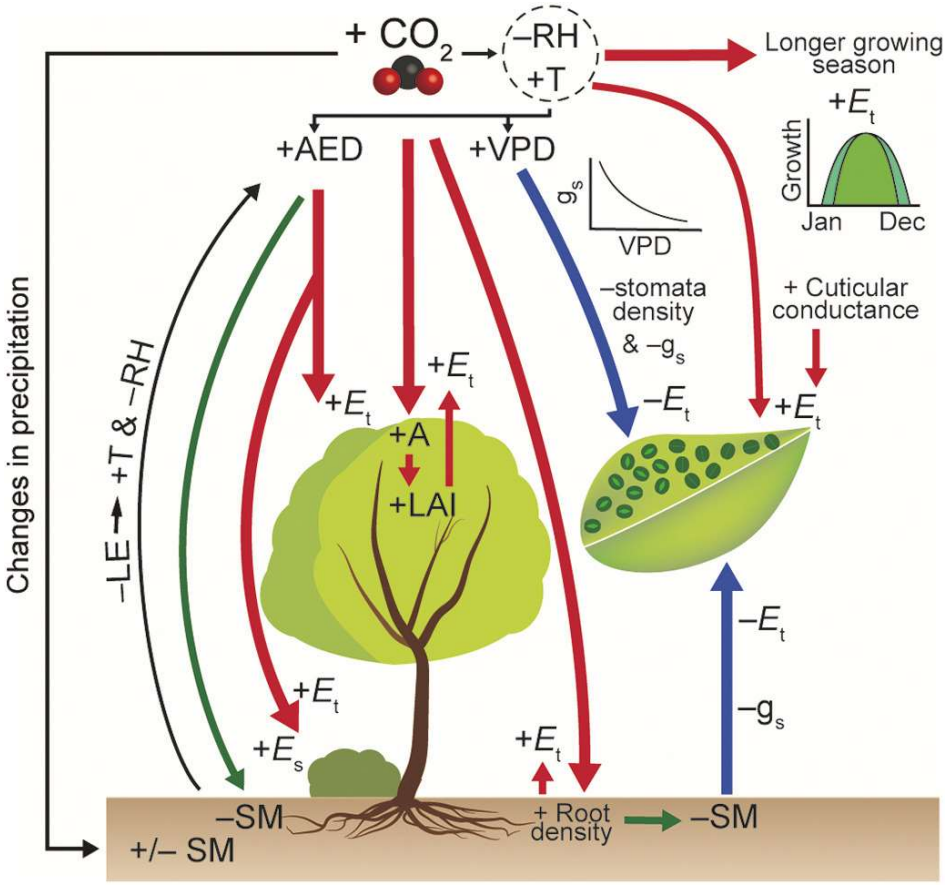


Spatial distribution of the average differences between the magnitude of change in annual precipitation of the individual models of each CMIP6 group of models and the magnitude of change in the GPCC observations. Areas with statistically significant differences between observations and model groups are delineated by black lines (90% of the models)

This study provides a long-term (1891–2014) global assessment of precipitation trends using data from two station-based gridded datasets and climate model outputs evolved through the fifth and sixth phases of the Coupled Model Intercomparison Project (CMIP5 and CMIP6, respectively). Our analysis employs a variety of modeling groups that incorporate low- and high-top level members, with the aim of assessing the possible effects of including a well-resolved stratosphere on the model's ability to reproduce long-term observed annual precipitation trends. Results demonstrate that only a few regions show statistically significant differences in precipitation trends between observations and models. Nevertheless, this pattern is mostly caused by the strong interannual variability of precipitation in most of the world regions. Thus, statistically significant model-observation differences on trends (1891–2014) are found at the zonal mean scale. The different model groups clearly fail to reproduce the spatial patterns of annual precipitation trends and the regions where stronger increases or decreases are recorded. This study also stresses that there are no significant differences between low- and high-top models in capturing observed precipitation trends, indicating that having a well-resolved stratosphere has a low impact on the accuracy of precipitation projections.

On the role of rising atmospheric CO2 on global plant transpiration.

Vicente-Serrano, Sergio M., Miralles, Diego G., McDowell, Nate, Brodribb, Tim, Domínguez-Castro, Fernando, Leung, Ruby, Koppa, Akash. (2022) On the role of rising atmospheric CO2 on global plant transpiration. Earth Science Reviews, 230, 104055.



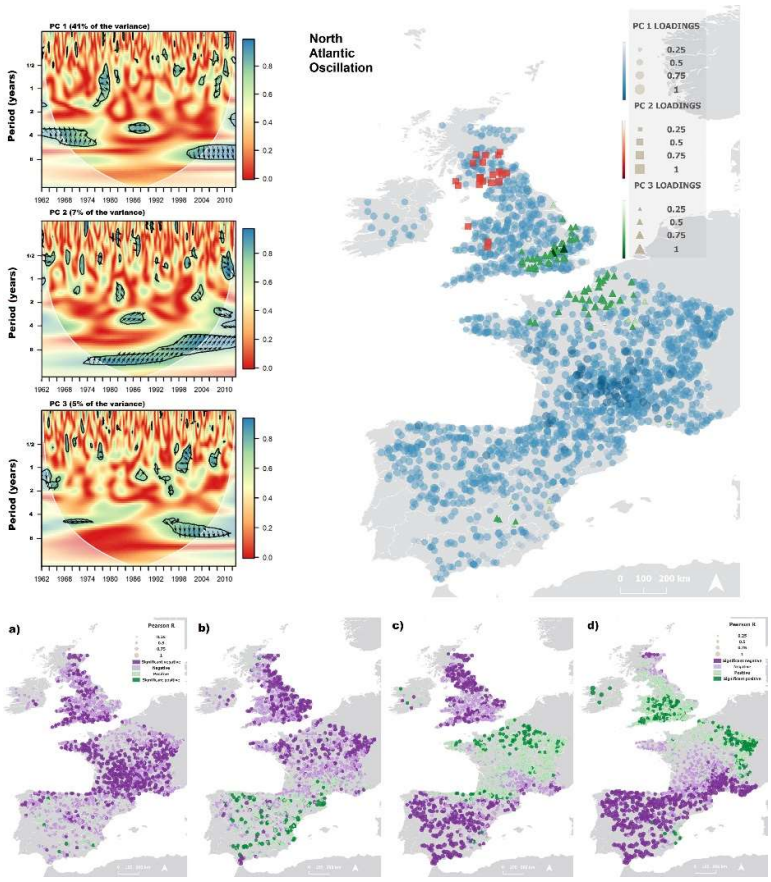
Scheme including the direct and indirect effects of enhanced aCO_2 on plant transpiration (E_t). E_s: soil evaporation, g_s: diffusive conductance of leaves, A: Photosynthesis, LAI: Leaf Area Index, AED: Atmospheric Evaporative Demand, LE: Latent Heat, SM: Soil moisture, VPD: Vapor Pressure Deficit, T: air Temperature, RH: Relative Humidity. Red lines represent positive influence on E_t. Blue lines represent a negative influence on E_t. Black lines represent climate fluxes and influences.

As CO2 concentration in the atmosphere rises, there is a need for improved physical understanding of its impact on global plant transpiration. This knowledge gap poses a major hurdle in robustly projecting changes in the global hydrologic cycle. For this reason, here we review the different processes by which atmospheric CO2 concentration affects plant transpiration, the several uncertainties related to the complex physiological and radiative processes involved, and the knowledge gaps which need to be filled in order to improve predictions of plant transpiration. Although there is a high degree of certainty that rising CO2 will impact plant transpiration, the exact nature of this impact remains unclear due to complex interactions between CO2 and climate, and key aspects of plant morphology and physiology. The interplay between these factors has substantial consequences not only for future climate and global vegetation, but also for water availability needed for sustaining the productivity of terrestrial ecosystems. Future changes in global plant transpiration in response to enhanced CO2 are expected to be driven by water availability, atmospheric evaporative demand, plant physiological processes, emergent plant disturbances related to increasing temperatures, and the modification of plant physiology and coverage. Considering the universal sensitivity of natural and agricultural systems to terrestrial water availability we argue that reliable future projections of transpiration is an issue of the highest priority, which can only be

achieved by integrating monitoring and modeling efforts to improve the representation of CO2 effects on plant transpiration in the next generation of earth system models.

Streamflow frequency changes across western Europe and interactions with North Atlantic Oscillation

Lorenzo Lacruz, J., Enrique Morán-Tejeda; Vicente-Serrano, S.M.; Jamie Hannaford; Celso García; Dhais Peña-Angulo; Conor Murphy. (2022) Streamflow frequency changes across western Europe and interactions with North Atlantic atmospheric circulation patterns. Global and Planetary Change (212) , 103797.



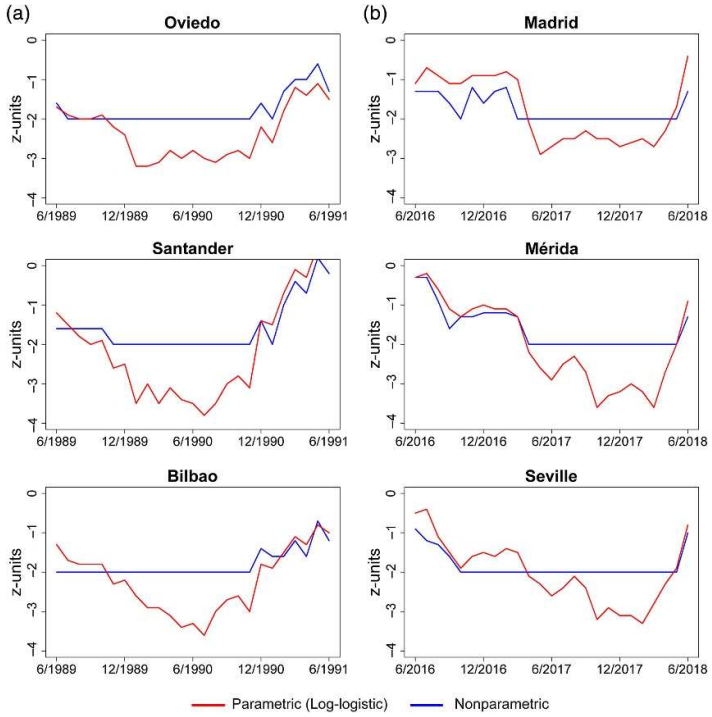
Summary of the influence of the NAO pattern on streamflow frequency changes across the study area. Left upper panels: Wavelet Coherence (WTC) power spectra between the NAO index and individual SSI series summarized by the three selected Principal Components. Right upper panel: spatial distribution of the loadings of the decomposed Wavelet Coherence scores between the SSI series and the NAO index. Lower panels: a) correlation coefficients between the NAO summer index and SSI series between 1962 and 1986; b) same between 1987 and 2012; c) correlation coefficients between the NAO winter index and SSI series between 1962 and 1986; d) same between 1987 and 2012.

This study identifies significant periodicities in streamflow dynamics across western Europe using a hydrological database encompassing 1874 monthly series from catchments in Ireland, the United Kingdom, France, Spain and Portugal, spanning the years 1962 to 2012. Significant and synchronous periodicities with the main atmospheric mechanisms over the North Atlantic sector are also identified using Cross Wavelet Transform and Wavelet Coherence analysis. Principal Components Analysis (PCA) were applied to the different Wavelet transforms analysis in order to summarize the results. These show the occurrence of a 7-years streamflow cycle in a large proportion of catchments within the study domain since the mid 1980's that was not present in earlier periods. The significance, intensity and persistence of the observed regional cycle follows a spatial gradient around the English Channel. We show how the transitive coupling of key atmospheric mechanisms is an

influencing factor causing the general change observed. These results suggest the occurrence of a regional change in the periodicities of streamflow across the western European domain. Our results emphasize the non-stationary interaction between streamflow and atmospheric circulation during recent decades and the prominent role of the North Atlantic Oscillation in the newly stablished streamflow cycles.

Assessment of parametric approaches to calculate the Evaporative Demand Drought Index

Noguera, I., Vicente-Serrano, S.M., Domínguez-Castro, F., Reig, F. (2022) Assessment of parametric approaches to calculate the Evaporative Demand Drought Index (EDDI). International Journal of Climatology. 42:834-849

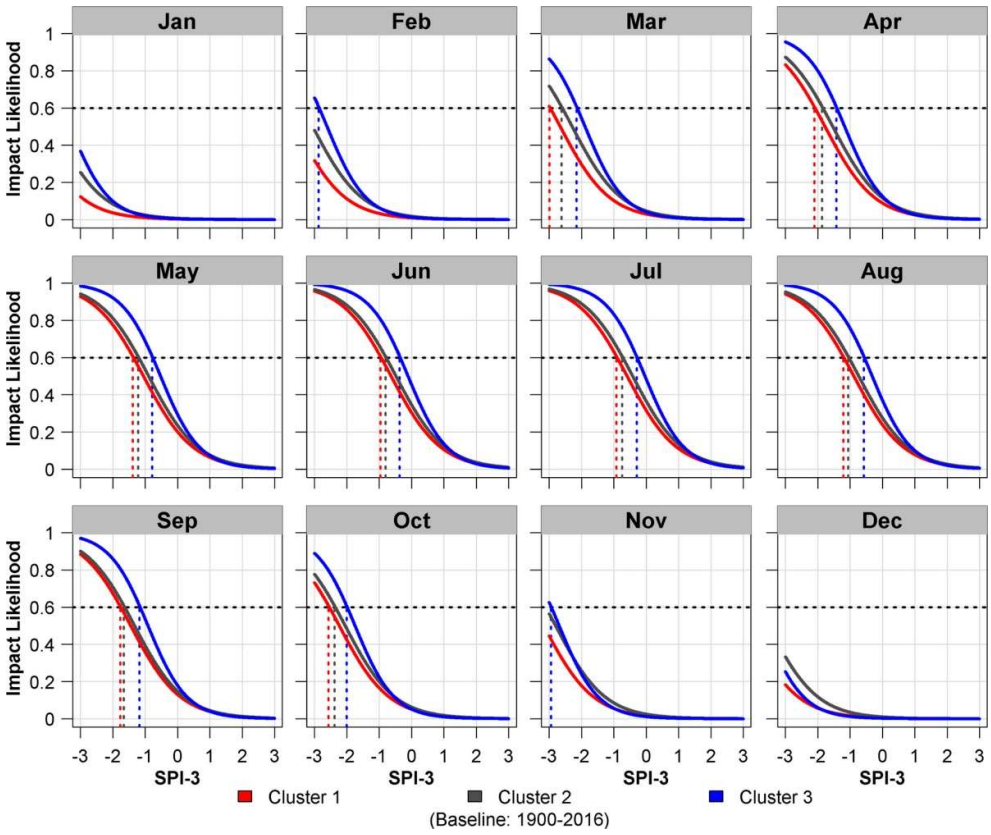


EDDI series during drought events of (a) 1990 (Oviedo, Santander and Bilbao) and (b) 2017 (Madrid, Mérida and Seville) at 12-month time scale, computed through a parametric and a nonparametric approach based on a reference period (1961–1989)

The Evaporative Demand Drought Index (EDDI), based on atmospheric evaporative demand, was proposed by Hobbins et al. (2016) to analyse and monitor drought. The EDDI uses a nonparametric approach in which empirically derived probabilities are converted to standardized values. This study evaluates the suitability of eight probability distributions to compute the EDDI at 1-, 3- and 12-month time scales, in order to provide more robust calculations. The results showed that the Log-logistic distribution is the best option for generating standardized values over very different climate conditions. Likewise, we contrasted this new parametric methodology to compute EDDI with the original nonparametric formulation. Our findings demonstrate the advantages of adopting a robust parametric approach based on the Log-logistic distribution for drought analysis, as opposed to the original nonparametric approach. The method proposed in this study enables effective implementation of EDDI in the characterization and monitoring of droughts.

Relating drought indices to cross sectoral impacts reported in newspaper articles

O'Connor, P., Murphy, C., Matthews, T. and Wilby, R.L. (2022) Relating drought indices to impacts reported in newspaper articles. International Journal of Climatology.Online Earlyview



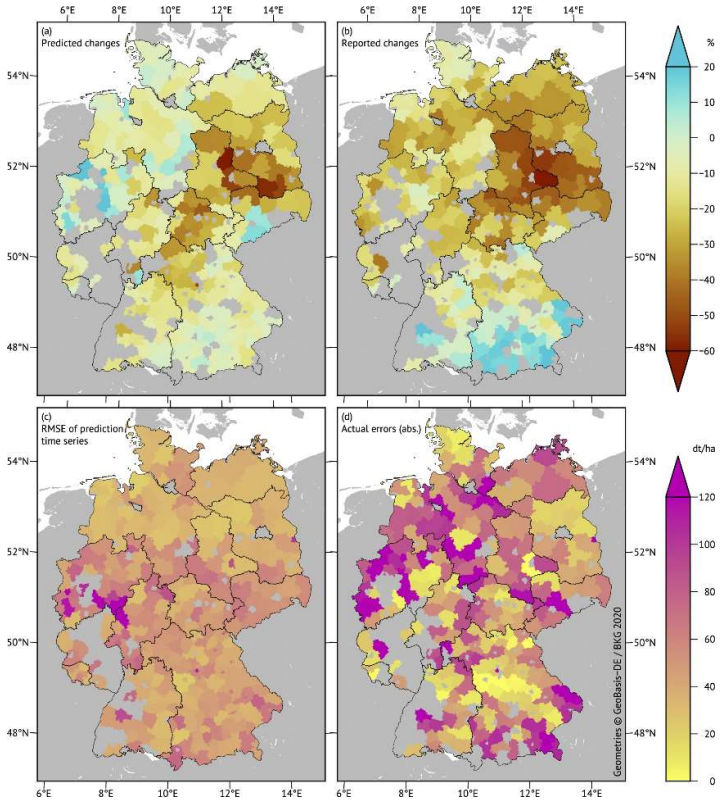
Predicted likelihood of reported impacts (monthly) from models generated using land-based impact articles and SPI-3 indices. Impact likelihoods for each cluster over the period 1900–2016 are shown for indices values ranging from −3 to 3. Indices values for each cluster resulting in a high reported impact likelihood (0.60) are also identified (dashed horizontal line)

Relating drought indicators and real-world impacts is fundamental for understanding and addressing drought vulnerability. We link drought indices and impacts from newspapers compiled in the Irish Drought Impacts Database (IDID) for the period 1900–2016. For three catchment clusters across the island of Ireland we link the Standardized Precipitation Index (SPI) with land-based impacts and the Standardized Streamflow Index (SSI) with water-based impacts by matching total reported articles per month with concurrent drought indices. Using logistic regression we find SPI-3 links best with land-based impact reports, whereas SSI-2 links best with water-based impact reports. Catchments in the east/southeast display the highest sensitivity to land- and water-based impacts; however, in summer months at low deficits northwestern catchments show a higher likelihood of impact reports. In winter months the likelihood of water-based impacts is considerably greater than the land-based equivalent, particularly in east/southeastern catchments. Moreover, the likelihood of news-worthy drought impacts has changed over the 117 year period. More severe deficits are required to induce a high likelihood (0.6) of land- and water-based impacts in east/southeastern and southwestern catchments during 1961–2016 compared with 1900–1960. Largest changes emerge in the southwest with SPI-3 values of −2.51 (<−3.00) required to reach the high impact likelihood threshold in the pre (post) 1961 period. Even greater reductions are found for water-based impacts in the southwest with SSI-2 values associated with high impact likelihoods changing from −2.04 to −2.58. Conversely, for catchments in the northwest more moderate drought deficits result in high impact likelihoods for both land-based (from <−3.00 to −2.32 SPI-3) and water-based

impacts (from <−3.00 to −2.29 SSI-2) for the 1961–2016 period. These findings show the value of newspaper archives for understanding regional sensitivities to drought plus their potential for underpinning a near real-time, drought monitoring and warning system in Ireland.

Predicting weather based crop yields in Germany

Conradt T (2022) Choosing multiple linear regressions for weather-based crop yield prediction with ABSOLUT v1.2 applied to the districts of Germany. Int J Biometeorol 66(11), 2287–2300.



Spatial characteristics of the silage maize yield prediction for the drought year 2018. a Predicted yield changes compared to the average district yields of the years 2012–2017. b Observed changes according to the official statistics. c Root-mean-square errors (RMSE) of all out-of-sample district yield predictions for the years 1999–2020. d Absolute values of prediction errors for 2018. a and b show relative deviations in percent (upper scale), c and d refer to absolute deviations in dt ha−1 (lower scale)

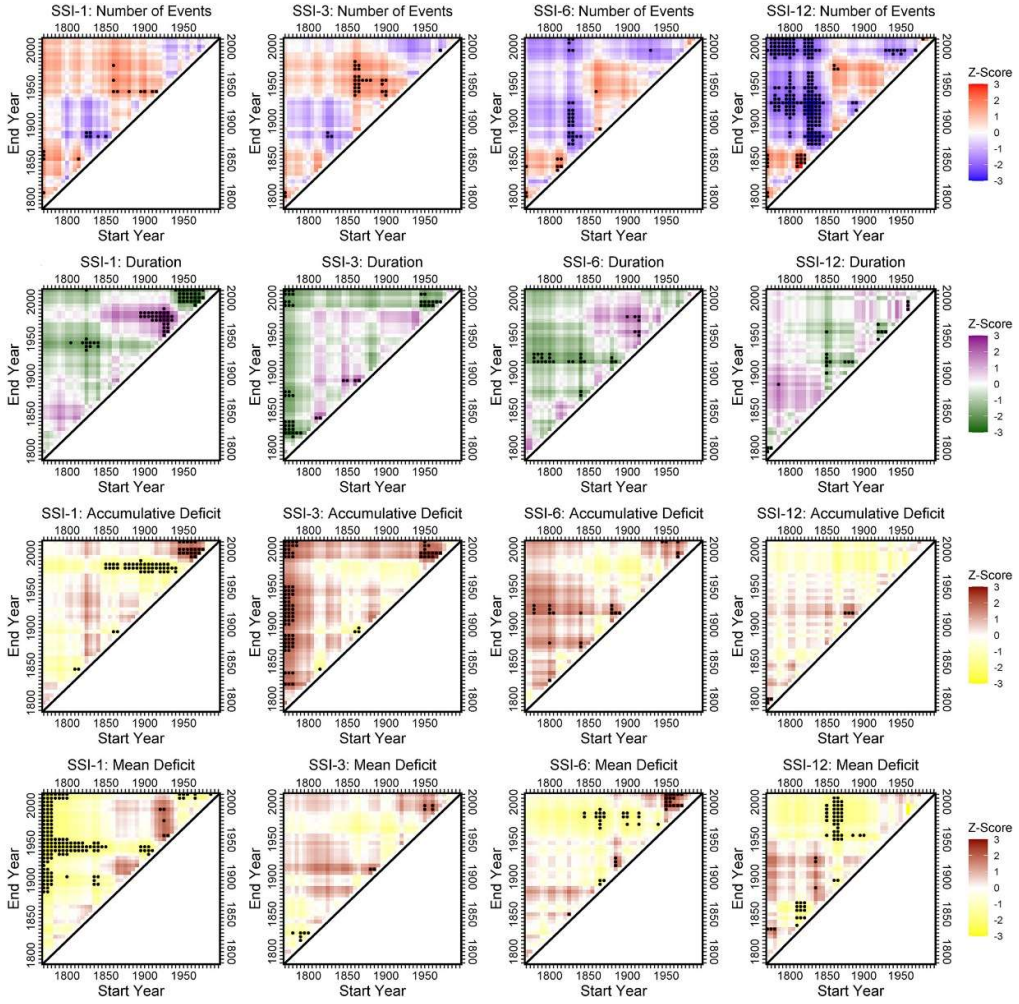
ABSOLUT v1.2 is an adaptive algorithm that uses correlations between time-aggregated weather variables and crop yields for yield prediction. In contrast to conventional regression-based yield prediction methods, a very broad range of possible input features and their combinations are exhaustively tested for maximum explanatory power. Weather variables such as temperature, precipitation, and sunshine duration are aggregated over different seasonal time periods preceding the harvest to 45 potential input features per original variable. In a first step, this large set of features is reduced to those aggregates very probably holding explanatory power for observed yields. The second, computationally demanding step evaluates predictions for all districts with all of their possible combinations. Step three selects those combinations of weather features that showed the highest predictive power

across districts. Finally, the district-specific best performing regressions among these are used for actual prediction, and the results are spatially aggregated. To evaluate the new approach, ABSOLUT v1.2 is applied to predict the yields of silage maize, winter wheat, and other major crops in Germany based on two decades of data from about 300 districts. It turned out to be absolutely crucial to not only make out-of-sample predictions (solely based on data excluding the target year to predict) but to also consequently separate training and testing years in the process of feature selection. Otherwise, the prediction accuracy would be over-estimated by far. The question arises whether performances claimed for other statistical modelling examples are often upward-biased through input variable selection disregarding the out-of-sample principle.

Historical droughts in Irish catchments 1767-2016

O'Connor, P., Murphy, C., Matthews, T. and Wilby, R.L. (2022) Historical droughts in Irish catchments 1767–2016. International Journal of Climatology,* 42*(11), 5442-5466.

Recent prolonged dry periods in summer 2018 and spring 2020 have reawakened interest in drought in Ireland, prompting questions regarding historical drought occurrence and potential long-term risks. Employing 250 years of monthly precipitation and flow reconstructions, we investigate historical drought in Irish catchments evaluating the characteristics (number of events, duration, and deficits) of moderate, severe, and extreme droughts as well as the propagation of meteorological to hydrological drought. Using standardized indices, we identify three distinct catchment types. Cluster 1 catchments, located in the wetter northwest are characterized by small areas, low groundwater storage, and the highest frequency of hydrological drought relative to other catchments. Cluster 3 catchments, located in the drier east and southeast have larger areas, greater groundwater storage, the highest frequency of meteorological drought but the least hydrological droughts. However, once established, droughts in Cluster 3 tend to be more persistent with large accumulated deficits. Cluster 2 catchments, located in the southwest and west, are intermediate to Clusters 1 and 3, with hydrological droughts typically of shorter durations, reduced accumulated deficits but greater mean deficits. The most extreme droughts based on accumulated deficits across all catchments occurred in 1803–1806, 1854–1859, 1933–1935, 1944–1945, 1953–1954, and 1975–1977. Although not as severe, droughts in 1887–1888, 1891–1894, and 1971–1974 also appear as significant extremes. Changes in drought characteristics reveal a complex picture with the direction, magnitude, and significance of trends dependent on the accumulation period used to define drought, the period of record analysed, and the reference period used to standardize indices. Of particular note is a tendency towards shorter, more intense meteorological and hydrological droughts. Our findings offer important insight for drought and water management in Ireland given the paucity of extreme droughts in short observed river flow records.



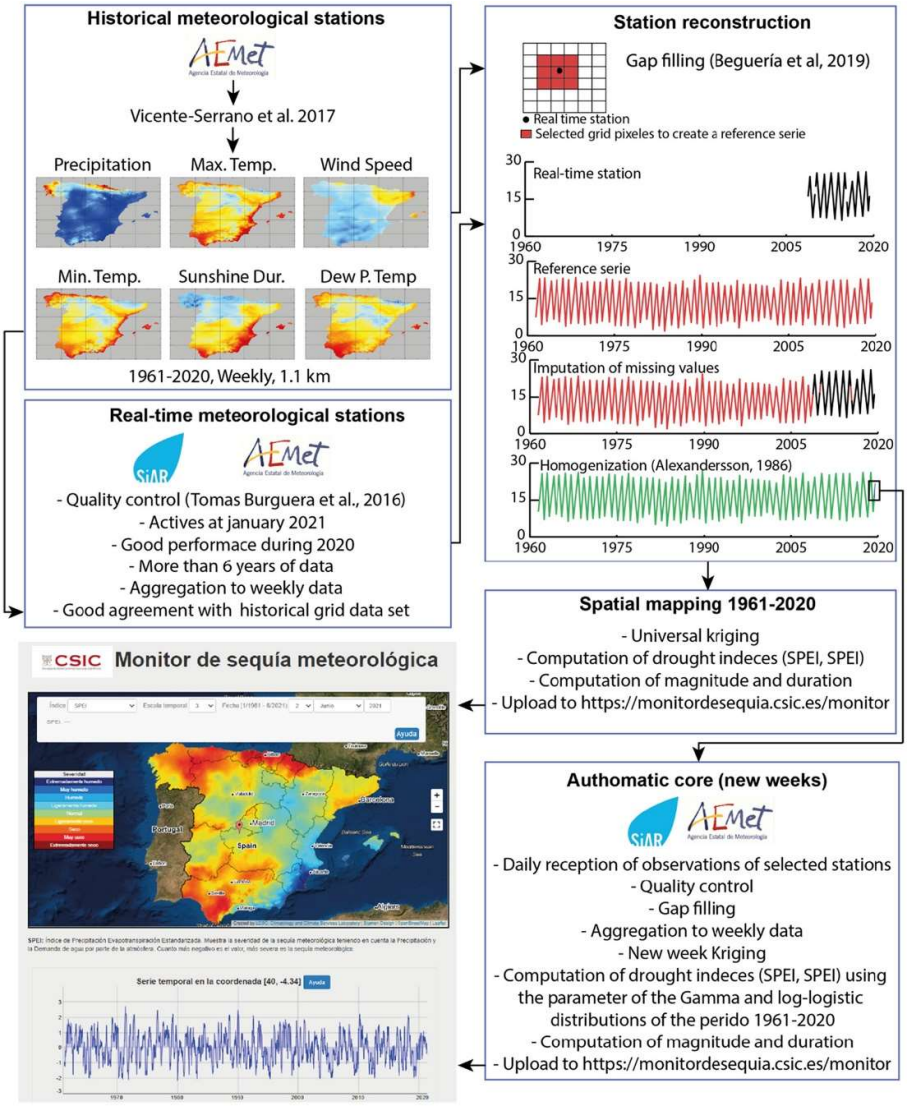
MK Zs scores for trends in the number of events, durations, accumulated and mean deficits of moderate hydrological droughts for varying start and end dates. Results are displayed for median reconstructions across all catchments with SSI values, derived from the Tweedie distribution and 1930–1999 reference period. MK Zs values are calculated for periods ranging from 30 to 245 years in 5 year increments for accumulation periods of 1, 3, 6, and 12 months. Black dots indicate test periods for which trends are significant at the 0.05 level

A near real-time drought monitoring system for Spain

Vicente-Serrano, S.M., Domínguez-Castro, F., Reig, F, Beguería, S., Tomas-Burguera, M., Latorre, B., Peña-Angulo, D., Noguera, I., Rabanaque, I., Luna, Y., Morata, A., El Kenawy, A. (2022) A near real-time drought monitoring system for Spain using automatic weather station network. Atmospheric Research 271, 106095.

Drought monitoring is essential to determine, at short time intervals, the main characteristics of drought events, such as their duration, severity, and spatial distribution. To ensure that drought monitoring represents a useful tool for governmental plans aimed at preventing or minimizing drought impacts, up-to-date information must be instantaneously accessible and it must provide high spatial and temporal resolution. This study presents a system that allows the automatic tracking of meteorological droughts in the Spanish territory, based on an open and easy-to-use online platform (https://monitordesequia.csic.es/monitor). This drought monitoring system provides two drought synthetic indices: the Standardised Precipitation Index (SPI) and the Standardised Precipitation Evapotranspiration Index (SPEI). Information is provided on a quasi-weekly basis, in a grid format, with a spatial resolution of 1.1*1.1 km, and with data from 1961 to the present time. This drought monitor is

updated based on the real-time information gathered from automatic stations, which in turn requires historic information to identify and track drought events. The drought indices are obtained from data processing (quality control, temporal series reconstruction, homogenisation, interpolation, and validation) using climatic variables (maximum and minimum temperatures, solar radiation, rainfall, dew point, and wind speed) which are provided by the Spanish Meteorology Agency and the Ministry of Agriculture of the Spanish Government. We performed a validation of the drought indices for the whole historical period (1961–2020). This allowed us to observe a strong spatial agreement between the indices obtained with the historical dataset and the indices from the monitoring dataset, especially for mainland Spain and the Balearic Islands (Pearson's r, SPI and SPEI >0.99). The presented real-time drought monitoring system represents a relevant and useful tool that allows for quick and effective actions to prevent and mitigate the effects of drought on society and ecosystems.



Summary of the procedure for developing the drought monitoring system.

Stakeholder engagement and media communication

The CROSSDRO project aims to develop practical guidance for future planning through the strong engagement of drought-sensitive stakeholders. While the Covid-19 pandemic has disrupted stakeholder engagement to some extent, there has been considerable work completed. Below is a flavour of our key achievements in these areas for 2022.

Field visits to local farms in Moldova to disseminate CROSSDRO findings



Farm visits to farmers in different districts of Moldova discussing the problems of soil health and resilience to droughts. In the farm "Gospodarul Rediu", Falesti district, where the farm manager is Mr.Kiktenco Nicolai highlighted that there are good possibilities to see real measures and results in promoting conservation agriculture system. The guests from USAS, from Colorado State University could also see the real opportunities for improving soil quality, allowing the transition to a more sustainable farming system. During this and other visits to the farm we have demonstrated the advantages of No-till sowing of winter cereal crops in reducing the production expenses together with improving the quality of the environment.

18 seminars for farmers at Selectia Research Institute of Field Crops


Seminars aimed at communicating the best agricultural practices that have been demonstrated to increase yields and simultaneously prevent soil degradation, water pollution, and maintain biodiversity at the farm and landscape level. Farmers could see the influence of different farming practices on the health of the roots grown in in crop rotations and in permanent cropping as well as soil compaction under the influence of different systems of soil tillage and fertilization in the crop rotations and in permanent cropping. They also become acquainted with the new varieties and hybrids for different crops with high yield potential, tolerance to droughts, pests and diseases, with high capacity to suppress weeds.

Advancing Moldova's National Climate Change Adaptation Planning

On 25th November,2022 a National Conference was organized under the auspices of her excellency the President of the Republic of Moldova Maia Sandu titled “Advancing Moldova's National Climate Change Adaptation Planning”. A report was presented at the conference by Prof.Boris Boincean:"Sustainable and climate-smart management of Chernozem soils in Moldova". Simultaneously a brochure was prepared under the title: "Nature -based solutions in adaptation to climate change" Prof. Boincean was nominated as the national consultant for the development of knowledge products in agriculture management and ecosystem services. Participants discussed the issues related to potential decrease in crop yields and adaptation to climate change, in particular to more frequent droughts. The crucial role of soil health was emphasized in providing ecosystem and social services. The causes of soil health deterioration were evaluated and the "Soil Resolution" was offered as the policy document to be promoted by the Parliament of the Republic of Moldova.

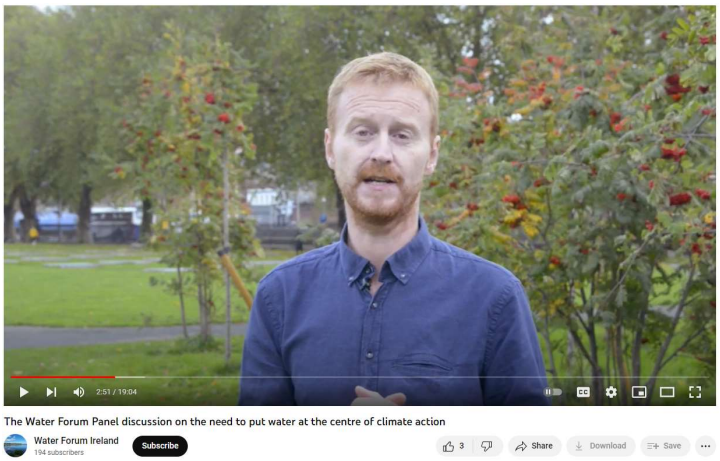
Prof. Boincean engages media on climate change impacts and adaptation for crops

On 8 September,2022,correspondents from 8 TV and Radio companies from Moldova and the European Community met at Selectia Research Institute of Field Crops to discuss the scientific achievements of the institute in decreasing the negative influence of global warming. Prof.Boris Boincean discussed the importance of using non-GMO locally produced seeds and breed varieties and hybrids for different field crops. The importance of sustainable and resilient soil management systems were emphasized, which reduce the negative impact of global warming and soil erosion from extreme weather conditions.

Prof. Vicente-Serrano on CNN Chile to discuss drought

https://www.youtube.com/watch?v=47f8RFfqIHo

Prof. Conor Murphy highlights the need to put water at the centre of climate action as part of Ireland's national Science Week.



https://www.youtube.com/watch?v=kSmZUs_Z8ig

https://thewaterforum.ie/science-week-panel-discussion-on-the-need-to-put-water-at-the-centre-of-climate-action/

The lack of rain and the decrease of reservoir water increase the fear of drought in Spain

https://www.lavanguardia.com/vida/20220208/8040323/temperatura-enero-consolida-tendencia-inviernos-vez-mas-calidos.html

In Spain it does not rain less, but the temperatures are getting warmer

https://www.csic.es/es/actualidad-del-csic/sergio-vicente-en-espana-no-llueve-menos-pero-las-temperaturas-son-cada-vez-mas

Is it possible to predict a drought? These Spanish scientists try

https://www.elconfidencial.com/tecnologia/ciencia/2022-02-25/prevision-sequia-espana-falta-lluvias_3379047/

La Niña hits half the world and fuels drought in Spain

https://www.abc.es/sociedad/abci-nina-golpea-medio-mundo-y-alimenta-sequia-espana-202202280024_noticia.html?ref=https%3A%2F%2Fwww.abc.es%2Fsociedad%2Fabci-nina-golpea-medio-mundo-y-alimenta-sequia-espana-202202280024_noticia.html

What will happen if we continue without rain and the drought continues?

https://www.ondacero.es/programas/julia-en-la-onda/audios-podcast/entrevistas/que-sucedera-seguimos-lluvias-continua-sequia_20220301621e578de2af800001dc75d9.html

A lethal avalanche and a historic drought: climate change hits northern Italy

https://elpais.com/clima-y-medio-ambiente/2022-07-06/un-alud-letal-y-una-historica-sequia-el-cambio-climatico-castiga-al-norte-de-italia.html

Reduce water in the city? It will be one of the largest droughts in a hundred years.

https://www.diariodepontevedra.es/articulo/pontevedra/reducir-agua-ciudad-sera-sequias-mas-grandes-cien-anos/20220801123407121235 1.html

The priority is always to maintain the urban water supply

https://www.laverdad.es/sociedad/prioridad-siempre-mantener-20220812135815-ntrc.html

A CSIC researcher reveals how water will be distributed in the droughts of the future

https://www.cope.es/programas/la-linterna/noticias/investigador-del-csic-desvela-como-repartira-agua-las-sequias-del-futuro-20221005_2327653

"The prospects for the future are not very good": a CSIC expert explains what we can do to alleviate the effects of drought

https://cadenaser.com/nacional/2022/11/22/las-perspectivas-para-el-futuro-no-son-muy-buenas-un-experto-del-csic-explica-que-podemos-hacer-para-paliar-los-efectos-de-la-sequia-cadena-ser/

Podcast: Drought and its cycles

https://programaagroconciencia.blogspot.com/2022/11/sequia-ciclos.html

Is this winter our fault?

https://www.elcorreo.com/sociedad/invierno-culpa-20230108100701-ntrc.html

What does climate change mean for Irish rivers?

https://www.rte.ie/brainstorm/2022/0519/1299872-irish-rivers-climate-change/

The subtle danger climate change poses to 'highly vulnerable' Ireland

https://www.irishtimes.com/environment/climate-crisis/2022/11/10/the-subtle-danger-climate-change-poses-to-ireland/

Collaboration and engagement with other drought related projects

Our research on CROSSDRO is highly collaborative and in 2022 we have been engaging and working with other European and nationally funded projects related to drought. Below is a list of projects that we have had sustained engaged with.

- Red española e iberoamericana sobre variabilidad climática y servicios climáticos en ecosistemas terrestres y marinos. LINCGLOBAL-CSIC.
- Mechanisms of hydrological drought variability across Europe (MEHYDRO). i-LINK CSIC.
- Mid-mountain adaptation to climate change - LIFE MIDMACC, LIFE18 CCA/ES/001099. LIFE Programme EU
- Riesgo de eventos meteorológicos e hidrológicos extremos en España: impactos, escenarios futuros y herramientas para mejorar la resiliencia y adaptación al cambio climático (EXMERISK). Ministry of Science and Innovation. Spain
- Evaluación a largo plazo de los cambios en la CUbierta vegetal en los parques nacionales españoles y su conexión con los procesos de VAriabilidad y cambio CLImático. Spanish Ministry for the Ecological Transition-Spanish Organism of National Parks.
- Development of methodology for complex monitoring and prediction of drought and fire weather conditions in Ukraine. UCRAN-CSIC.
- Irish Droughts: Environmental and Cultural Memories of a Neglected Hazard. Interdisciplinary Project funded by the Irish Research Council (IRC) Coalesce Scheme.
- HydroPredict: Ensemble Riverflow Scenarios for Climate Change Adaptation. Funded by the Irish Environmental Protection Agency
- WaterFutures: WFD Future Scenarios and Management Tools. Funded by the Irish Environmental Protection Agency

Presentations at international conferences

Vicente-Serrano, S.M. The complex multi-sectorial impacts of drought in the Spanish Pyrenees. In Extreme events in the atmosphere and the ocean. 14 March 2022. Lisboa. On-line.

Iván Noguera, Fernando Domínguez-Castro, and Sergio M. Vicente-Serrano How does the rise of atmospheric water demand affect flash drought development in Spain? EGU 2022.

Vicente-Serrano, S.M. Near real time drought monitoring in Spain using automatic weather station data. Network of Drought Observatories in the EU. Ispra (Italy) 16-17 Junio 2022

Vicente-Serrano, S.M., Javier Zabalza, Iván Noguera, Dhais Peña-Angulo, Carmelo Juez, Conor Murphy, Fernando Domínguez-Castro, Lars Eklundh, Hongxiao Jin, Tobias Conradt, Jorge Lorenzo-Lacruz, Ahmed El Kenawy. Cross-interactions of ecological and hydrological droughts in the central Spanish Pyrenees. 7th IAHR Europe Congress, September 7th – 9th, 2022, Athens, Greece.

Contact us

Project website: https://crossdro.csic.es/

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