

## BUTLLETÍ INFORMATIU

Desembre 2019

Final d'any és un bon motiu per fer balanç de les activitats desenvolupades per l'associació, i tenir una mirada sobre les principals publicacions en l'àmbit de la meteorologia i la climatologia de la Mediterrània.

Des de l'ACAM volem desitjar-vos unes **molt bones festes**, i un millor 2020, ple de bona meteorologia.

---

## NOTICIES ACAM

---

### Congrès MetMed

El mes de març es va dur a terme el 7è congrés internacional MetMed, International Conference on Meteorology and climatology, co-organitzat per l'ACAM. En aquesta ocasió es va celebrar a Palma de Mallorca, i va contar amb el suport de la Universitat de les Illes Balears i del Centre d'Estudis Ambientals del Mediterrani de València. Durant els tres dies que va durar, més d'un centenar de comunicacions entre pòsters i orals es van portar a terme agrupades en sis blocs temàtics: climatologia, processos i aplicacions, mesures remotes i in-situ, models numèrics, interaccions atmosfera-superfície en condicions semiàrides, i fenòmens extrems. Més informació en aquest enllaç:

<http://www.metmed.eu/home.htm>

---

### Simulacre sobre les negociacions de la COP

El passat més d'abril, l'ACAM va donar suport i va col·laborar a una iniciativa desenvolupada a AULA Escola Europea, on estudiants del batxillerat internacional van convertir-se durant un dia en negociadors per assolir un acord per a reduir les emissions de gasos d'efecte hivernacle i complir els ODS 2030 i els Acords de París de la COP 21. Els estudiants representaven els governs que conformen la Unió pel Mediterrani. Un resum de com va anar tot plegat en aquest enllaç:

<https://www.emetsoc.org/students-negotiate-cop21-implementation/>

### Assemblea General i Congrés de l'EMS 2019

Com cada any, el diumenge previ a la celebració de la trobada anual, a començaments de setembre, va tenir lloc la 21a edició de l'Assemblea General de l'EMS (European Meteorological Society), de la qual l'ACAM és membre des del 2015. Enguany la Universitat de Lyngby (Copenhaguen, Dinamarca) va allotjar l'esdeveniment. Diversos foren els acords de l'Assemblea. Es van aprovar els informes del President i de la tresoreria, i l'ingrés de dues noves entitats: la Societat Meteorològica d'Estònia com a membre de ple dret i l'Institut Meteorològic Danès,

com a membre associat. També es va aprovar l'elecció de Paulína Valová i Jordi Mazón, de la Societat Meteorològica d'Eslovàquia i de l'ACAM, respectivament, com a nous membres del Consell de l'EMS. En aquest enllaç més informació: <https://www.emetsoc.org/about-ems/council/council-composition/>

L'ACAM serà part de l'òrgan màxim de decisió de l'EMS pel període 2019-2021. Finalment, es van esbossar les principals línies del pla estratègic de l'EMS 2020-2023.

Per a més informació sobre el decurs de l'Assemblea, feu clic a l'enllaç ([https://www.emetsoc.org/wp-content/uploads/2019/10/GA21\\_Minutes\\_a\\_dopted\\_2019-10-25.pdf](https://www.emetsoc.org/wp-content/uploads/2019/10/GA21_Minutes_a_dopted_2019-10-25.pdf))

El proper congrés s'esdevindrà el 6 de setembre del 2020, a Bratislava.

---

## **XXV Jornades de Meteorologia Eduard Fontserè**

Com cada any senar, al mes de novembre es van desenvolupar les jornades de meteorologia Eduard Fontserè amb una durada de tres dies. Enguany però, va ser una edició especial, ja que se celebraven els 25 anys de jornades. Per aquesta raó es van centrar en un sol bloc titulat "25 anys de meteorologia I climatologia". Totes les ponències tenien una breu mirada al coneixement de fa 25 anys sobre el tema de la ponència, per parlar del present i futur. Totes les ponències presentades, pòsters exposats i presentació del premi, es recullen al llibre de les Jornades, que està a disposició de tots els i les associades que no el tinguin. Teniu un recull fotogràfic d'aquestes XXY JEF en el següent enllaç:

<https://photos.app.goo.gl/9BeKNw6qjf6WRpic8>

---

## **Premi internacional de meteorologia Eduard Fontserè 2019**

El treball guanyador d'aquesta edició va ser per al paper Fewer clouds in the Mediterranean: consistency of observations and climate simulations events frequency and intensity overview, de Sánchez-Lorenzo et al. El tribunal va destacar la qualitat i la dificultat de triar un article guanyador. L'article es pot consultar en obert aquí:

<https://www.nature.com/articles/srep41475>

L'acta del jurat i més informació a <http://acam.cat/ca/RPremisEF2019>

---

## **24 equacions per 25 jornades**

Per tal de commemorar les 25 jornades de meteorologia Eduard Fontserè vam elaborar i editar un petit pòster amb 24 equacions de la física de l'atmosfera, una per cada un dels anys de l'entitat. Aquest pòster està a disposició de tots els i les associades. Si no el teniu i en voleu un, contacteu amb nosaltres per fer-vos arribar un exemplar.

---

## **NOTICIES METEO**

### **Cent anys de la IAMAS**

Enguany es compleixen els cent anys d'existència de l'Associació Internacional de Meteorologia i Ciències Atmosfèriques IAMAS (per les seves sigles en anglès: International Association of Meteorology and Atmospheric Sciences). La IAMAS va ser fundada l'any 1919 en el si de la Unió Internacional de Geodèsia i Geofísica (IUGG) i el seu objectiu és la coordinació de la recerca meteorològica a nivell mundial, identificant els problemes principals i dirigint els esforços vers la seva solució. S'estructura en diverses comissions temàtiques. Com a associació científica amb recursos limitats la seva acció no és gaire coneguda i ha quedat sempre en un segon pla per darrera de l'acció de l'OMM, amb caràcter principalment operatiu. Trobareu més informació sobre l'associació a <http://www.iamas.org/>.

### **Les Notes d'Estudi a Internet**

El passat més d'Octubre el SMC va posar a disposició del usuari, a la seva web, la versió escanejada en PDF de les 69 "Notes d'Estudi" que va publicar l'antic SMC d'Eduard Fontserè en el període 1921-1938. Les Notes d'Estudi del Servei Meteorològic de Catalunya era una publicació amb caràcter irregular on es publicaven resultats de recerca d'interès per la meteorologia catalana i també resultats d'observacions especials com eren, a l'època, les observacions aerològiques. Podreu trobar les Notes a <https://www.meteo.cat/wpweb/divulgacio/publicacions/publicacions-de-lantic-smc/>

### **Predictors d'AEMET al centre de control de vols de Gavà**

Des del passat estiu el centre de control de vols de Barcelona, situat a Gavà, prop de l'aeroport de Barcelona compta amb la presència i assessorament de predictors de l'AEMET. Mitjançant un acord entre l'AEMET i ENAIRE, personal d'AEMET s'ha incorporat al centre d'ENAIRE per facilitar informació meteorològica de primera mà i assessorament als controladors de vols. Si la presència de personal meteorològic és normal als aeroports, és la primera vegada que aquest assessorament als centres de control de vol es fa amb personal integrat als mateixos. [http://www.aemet.es/es/noticias/2019/06/predictores\\_cualificados\\_centro\\_de\\_control\\_barcelona](http://www.aemet.es/es/noticias/2019/06/predictores_cualificados_centro_de_control_barcelona)

### **Congrés sobre Meteotsunamis**

Els meteotsunamis són tsunamis generats per les condicions meteorològiques. Les rissagues que afecten cada any a Menorca en són un exemple; però hi ha molts altres llocs de la Mediterrània i arreu del món on també es produeixen. Per tal de posar en comú els coneixements existents i avançar en nous estudis es va celebrar a Split, Croàcia, els dies 8 a 11 de Maig la primera conferència mundial sobre aquest tema específic. Hi van participar membres del grup de meteorologia de la Universitat de les Illes Balears i també de l'AEMET. La web del congrés encara està activa i podeu trobar més informacions a <http://jadran.izor.hr/~vilibic/mts2019/>

### **Dades meteorològiques dels Pirineus a l'ICGC**

Un acord signat per la Fundació Endesa, el SMC i l'ICGC el dia 11 de Març ha permès que la primera cedeixi més de 20000 cartes hidrogràfiques que contenen 70 anys de dades climatològiques dels Pirineus i que provenen de les centrals hidràuliques de la zona. El material s'ha dipositat a la Cartoteca de Catalunya i la seva consulta és oberta a tothom. <https://www.icgc.cat/es/El-ICGC/Actualidad3/Noticia-319-La-Fundacio-Endesa-cedeix-dades-climatiques-historiques-al-SMC-que-es-dipositen-a-l-ICGC>

---

## **PUBLICACIONS 2019**

---

### **Publicacions a Tethys 2019**

Al llarg del 2019 s'ha publicat un article a Tethys – Journal of the Mediterranean Meteorology and Climatology, editada conjuntament per l'ACAM i la Universitat de les Illes Balears.

On the relationship between the 500 hPa height fluctuation and the atmosphere thickness over Iran and the Middle East, de Rousta et al. L'article es pot descarregar aquí: <http://www.tethys.cat/en/node/570>

Des d'aquest butlletí volem animar a l'estudiantat a que enviïn articles de la seva recerca en els treballs de final de màster o doctorat, així com al professorat i investigadors i investigadores a que considerin Tethys per a les seves publicacions. Tethys està indexada a Scopus, Emerging Sources Citation Index, i està classificada com a revista de qualitat per la FECYT.

---

### **Publicacions destacables al 2019**

Durant el 2019 investigadors d'arreu han centrat la seva recerca en la millora del coneixement de la dinàmica meteorològica i climàtica de la Mediterrània. Tot seguit fem un petit resum d'aquestes publicacions i la

ressenya corresponent d'algunes de les publicacions que s'han publicat aquest 2019 en revistes indexades JCR.

Miglietta MM, Rotunno R. *Development mechanisms for Mediterranean tropical-like cyclones (medicanes)*. *Q J R Meteorol Soc* 2019;1–17.

<https://doi.org/10.1002/qj.3503>

Development mechanisms for Mediterranean tropical-like cyclones (medicanes), de Mario Marcello Miglietta, Richard Rotunno. Los *medicanes* son procesos ciclónicos con características similares a los ciclones tropicales que, en ocasiones se producen en el Mediterráneo. A través de varios casos de estudio, el artículo demuestra que el núcleo de los *medicanes* está producido por un aislamiento de aire cálido. Las diferentes casuísticas en su génesis, permiten a los autores hacer una tipología de *medicanes*.

<https://doi.org/10.1002/qj.3503>

Mathbout S, Lopez- Bustins JA, Royé D, Martin-Vide J, Benhamrouche A. *Spatiotemporal variability of daily precipitation concentration and its relationship to teleconnection patterns over the Mediterranean during 1975–2015*. *Int J Climatol*. 2019;1–21.

<https://doi.org/10.1002/joc.6278>

Spatiotemporal variability of daily precipitation concentration and its relationship to teleconnection patterns over the Mediterranean during 1975–2015. Un análisis exhaustivo de la concentración de la precipitación (CI) en toda la cuenca mediterránea muestra una tendencia al alza de este índice en Francia, norte de la península Ibérica y Túnez. Patrones de teleconexión como la Western Mediterranean Oscillation (WeMO) y la Mediterranean Oscillation (MO) juegan un papel muy importante en la explicación de la variabilidad espacio-temporal del índice.

<https://doi.org/10.1002/joc.6278>

Tomas-Burguera, M., Vicente-Serrano, S. M., Beguería, S., Reig, F., and Latorre, B.: *Reference crop evapotranspiration database in Spain (1961–2014)*, *Earth Syst. Sci. Data Discuss.*, 2019, <https://doi.org/10.5194/essd-2019-64>.

Reference crop evapotranspiration database in Spain (1961–2014). Los autores crean una nueva base de datos sobre evapotranspiración de referencia (ET<sub>o</sub>) cubriendo la España peninsular y las Islas Baleares para el periodo 1961-2014 a una resolución espacial de 1,1 km y una resolución temporal semanal. Esta base de datos es la única contribución de estas características al conocimiento sobre la demanda atmosférica evaporativa.

<https://doi.org/10.5194/essd-2019-64>

Wagner, B., Vogel, H., Francke, A. et al. *Mediterranean winter rainfall in phase with African monsoons during the past 1.36 million years*. *Nature* 573, 256–260 (2019) [doi:10.1038/s41586-019-1529-0](https://doi.org/10.1038/s41586-019-1529-0)

Mediterranean winter rainfall in phase with African monsoons during the past 1.36 million years. A partir de la información sedimentaria extraída del Lago Ohrid (Albania, Macedonia) se ha reconstruido la precipitación de invierno de los últimos 1,36 millones de años. Los resultados sugieren que los incrementos de temperatura del mar propician las formaciones ciclónicas y las bajas presiones del Atlántico Norte que han sido determinantes en momentos interglaciares y de alta concentración de gases de efecto invernadero.

<https://doi.org/10.1038/s41586-019-1529-0>

Olcina J, Serrano-Notivoli R, Miró J, Meseguer-Ruiz O. *Tropical nights in the Spanish Mediterranean coast: recent*

evolution (1950–2014). *Climate Research*, 78, 225–236, <https://doi.org/10.3354/cr01569>

Tropical nights in the Spanish Mediterranean coast: recent evolution (1950–2014). Utilizando la información observacional de todas las estaciones meteorológicas del sector sur de la costa mediterránea, se detectó una tendencia positiva en el número de noches tropicales de los últimos 30 años. Este incremento se constató tanto en frecuencia, como en duración e intensidad de los eventos.

<https://doi.org/10.3354/cr01569>

Peña-Angulo D, Nadal-Romero E, González-Hidalgo JC. Spatial variability of the relationships of runoff and sediment yield with weather types throughout the Mediterranean basin. *Journal of Hydrology*, 571, 390–405, <https://doi.org/10.1016/j.jhydrol.2019.01.059>

Spatial variability of the relationships of runoff and sediment yield with weather types throughout the Mediterranean basin. Se analizan las relaciones entre los patrones sinópticos atmosféricos y la erosión y sedimentación en 9 países de la cuenca mediterránea. El análisis muestra asociaciones espaciales entre el tipo de precipitación y la escorrentía, que determina la sedimentación en el Mediterráneo y es clave para la toma de decisiones en la conservación del suelo.

<https://doi.org/10.1016/j.jhydrol.2019.01.059>

Esper, J., Klippel, L., Krusic, P.J. et al. Eastern Mediterranean summer temperatures since 730 CE from Mt. Smolikas tree-ring densities. *Clim Dyn* (2019) doi:10.1007/s00382-019-05063-x

Eastern Mediterranean summer temperatures since 730 CE from Mt. Smolikas tree-ring densities. A partir de 192 series de anillos de crecimiento de algunos de los árboles más antiguos de Europa ubicados en el Mt. Smolikas al norte de Grecia, se hace una reconstrucción de las temperaturas de verano desde el año 730 CE. Los resultados muestran al periodo 1985-2014 como el más cálido desde el s.XI.

<https://doi.org/10.1007/s00382-019-05063-x>

Lazoglou, G., Anagnostopoulou, C., Tolika, K. et al. A review of statistical methods to analyze extreme precipitation and temperature events in the Mediterranean region. *Theoretical and Applied Climatology*, 136, 99–117 (2019) doi:10.1007/s00704-018-2467-8

A review of statistical methods to analyze extreme precipitation and temperature events in the Mediterranean region . Se comparan varios métodos estadísticos del Extreme Value Theory (EVT) para identificar cuál es el más apropiado para estudiar los eventos extremos en el área Mediterránea. Generalized Pareto Distributions (GPD) caracterizan adecuadamente precipitación y temperatura, mientras que Generalized Extreme Value (GEV) funciona muy bien con los valores extremos más altos.

<https://doi.org/10.1007/s00704-018-2467-8>

Llabrés-Brustenga, A., Rius, A., Rodríguez-Solà, R. et al. Quality control process of the daily rainfall series available in Catalonia from 1855 to the present. *Theor Appl Climatol* 137, 2715–2729 (2019) doi:10.1007/s00704-019-02772-5

Quality control process of the daily rainfall series available in Catalonia from 1855 to the present. Utilizando un innovador

método de control de calidad de datos diarios de precipitación, se analizan casi dos mil series climáticas en Cataluña desde 1855. Esta metodología exhaustiva de control de calidad tiene una clara vocación aplicada para servicios meteorológicos y un gran potencial de uso en modo operativo.

<https://doi.org/10.1007/s00704-019-02772-5>

Rivoire, P., Trambly, Y., Neppel, L., Hertig, E., and Vicente-Serrano, S. M.: Impact of the dry-day definition on Mediterranean extreme dry-spell analysis, *Nat. Hazards Earth Syst. Sci.*, 19, 1629–1638, <https://doi.org/10.5194/nhess-19-1629-2019>, 2019

Impact of the dry-day definition on Mediterranean extreme dry-spell analysis. La determinación de día seco únicamente a partir de un umbral de precipitación apreciable puede ser engañoso, especialmente en ambientes de alta evapotranspiración como la cuenca mediterránea. Los autores exploran la relación entre la duración de las rachas secas y la demanda evaporativa de la atmósfera para concluir que esta última debería ser incluida para definir conceptualmente un día seco.

<https://doi.org/10.5194/nhess-19-1629-2019>

Udina M, Soler MR, Olid M, Jiménez-Esteve B, Bech J. Pollutant vertical mixing in the nocturnal boundary layer enhanced by density currents and low-level jets: two representative case studies. *Boundary-Layer Meteorology*. 1573-1472 (2019)

Pollutant vertical mixing in the nocturnal boundary layer enhanced by density currents and low-level jets: two representative case studies. Utilizando datos del Centro de investigaciones de la Baja Atmósfera (CIBA) y el modelo WRF-CMAQ, se analizan los efectos de dos

circulaciones típicas de la capa límite nocturna en la dispersión de los contaminantes. Las corrientes de densidad aumentan la mezcla turbulenta por difusión vertical en su parte frontal, mientras que los low-level jets son capaces de transportar los contaminantes hacia la capa residual.

<https://doi.org/10.1007/s10546-019-00483-y>

Barriendos, M., Gil-Guirado, S., Pino, D., Tuset, J., Pérez-Morales, A., Alberola, A., Costa, J. Balasch, J.C. Castelltort, X., Mazon, J., Ruiz-Bellet, J.L. Climatic and social factors behind the Spanish Mediterranean flood event chronologies from documentary sources (14th-20th centuries). *Global Planet. Change*, 182, UNSP 102997, 2019

The Spanish Mediterranean river basin provides a good background for studying floods from documentary and bibliographical sources within the specialty of historical climatology. This study region's long history of human occupation and climatic conditions together determine a high risk of flooding. As a result, there exists an enormous amount of documentary heritage containing flood information. However, the heterogeneity of documentary sources and different approaches to classifying floods through historical documents can generate some biases and uncertainties about the quantity and quality of the available data.

For this reason, this paper proposes a methodology for reconstructing historical floods based on cross-referencing documentary sources. This approach, together with additional archival work, has allowed us to increase the number of flood series for the Spanish Mediterranean coast by 17% and has generated a surprising increase of 233% in the number of flood cases detected.

The data obtained have allowed us to analyze the variability of floods and their relationship with climatic and social factors from the fourteenth century to the present.

Different climatic oscillations related to the Little Ice Age are detected between the 14th and 19th centuries. Additionally, we detected a strong influence of the defense infrastructures and urban growth, which explain the recent flood trends. However, the difficulty in analyzing the influence of social factors on long-term flood behavior invites us to reflect on the need for further work for emphasizing these issues.

<https://doi.org/10.1016/j.gloplacha.2019.10.2997>

Tejedor, E., de Luis, M., Barriendos, M., Cuadrat, J.M., Luterbacher, J., Saz, M.A. Rogation ceremonies: a key to understanding past drought variability in northeastern Spain since 1650. *Clim. Past.*, 15, 5, 1647-1664, 2019.

In the northeast of the Iberian Peninsula, few studies have reconstructed drought occurrence and variability for the pre-instrumental period using documentary evidence and natural proxies. In this study, we compiled a unique dataset of rogation ceremonies - religious acts asking God for rain - from 13 cities in the northeast of Spain and investigated the annual drought variability from 1650 to 1899 CE. Three regionally different coherent areas (Mediterranean, Ebro Valley, and Mountain) were detected. Both the Barcelona and the regional Mediterranean drought indices were compared with the instrumental series of Barcelona for the overlapping period (1787-1899), where we discovered a highly significant and stable correlation with the Standardized Precipitation Index of May with a 4-month lag ( $r = -0.46$  and  $r = -0.53$ ;  $p < 0.001$ , respectively). We found common periods with prolonged droughts (during the mid and late 18th century) and extreme drought years (1775, 1798, 1753, 1691, and 1817) associated with more atmospheric blocking situations. A superposed epoch analysis (SEA) was performed showing a significant decrease in drought events 1 year after the volcanic events, which might be explained by the decrease in evapotranspiration due to

reduction in surface temperatures and, consequently, the higher availability of water that increases soil moisture. In addition, we discovered a common and significant drought response in the three regional drought indices 2 years after the Tambora volcanic eruption. Our study suggests that documented information on rogation ceremonies contains important independent evidence to reconstruct extreme drought events in areas and periods for which instrumental information and other proxies are scarce. However, drought index for the mountainous areas (denoted Mountain later in the text) presents various limitations and its interpretation must be treated with caution.

<https://doi.org/10.5194/cp-15-1647-2019>

Fava, V., Curto, J.J., Llasat, M.C. Changes in summer temperatures and rainfall in the northeastern Iberian Peninsula in the late 1960s and the weakening of the Iberian thermal low. *Meteorol. Atmos Phys.*, 131, 5, 1367-1386, 2019.

Changes in a number of important climatic variables in the northeastern part of the Iberian Peninsula (NE IP) were detected in summers around the end of the 1960s. From 1950 to 1966, we found significant correlations between the Summer North Atlantic Oscillation (SNAO) and frontal precipitation. This could be explained, on the one hand, by the withdrawal of the Azores High to the west which enhanced the frequency of cold advections in the north IP, and, on the other hand, by a high occurrence of an anticyclonic pattern over the west Mediterranean that enhanced the precipitation in NE IP by advecting moist air which, in turn, reinforced the storms linked to the frontal activity coming from the Atlantic. This pattern was also linked in this period to the strengthening of the Iberian Peninsula summer thermal low and to the increase in second-quadrant wind at the Ebro Observatory. Nevertheless, an abrupt rise of the vorticity at sea level in the western Mediterranean was detected around

1967. This rise was related to the steep increase in the SNAO, the expansion of the Azores High to central Europe in summer, and an increase of the anticyclonic regime. This contributes to explaining the simultaneous drop in frontal precipitation in NE IP, the weakening of the IP summer thermal low, the drop of the second-quadrant daily wind run, and the steep rise of the diurnal temperature range (DTR) at the Ebro Observatory.

<https://doi.org/10.1007/s00703-018-0643-0>

Rigo, T., Berenguer, M., Llasat, M.D. An improved analysis of mesoscale convective systems in the western Mediterranean using weather radar. *Atmos. Res.*, 227, 147-156, 2019.

This article studies the life cycle of the well-organised mesoscale convective systems (MCSs) that affect Catalonia and surrounding regions, using a weather radar composite with sophisticated corrections and lightning data over a full period of five years. Nearly 350 MCSs were identified and analysed for the 2012-2016 period after applying size and duration criteria to 438,000 radar composites. MCSs are responsible for the majority of flood events in the region of interest and in many other areas around the world. We have analysed the main radar parameters and lightning properties, looking for differences between the systems depending on the season of the year. Autumn and spring show the highest frequency of MCSs, but there are considerable differences between their properties for the two seasons. More specifically, lightning activity, maximum reflectivity and duration are higher in autumn than in winter, although the total accumulated rainfall may be lower. This higher convective activity is associated with the warmer sea surface temperature of the Mediterranean and a large number of cyclones that affect the region of analysis.

<https://doi.org/10.1016/j.atmosres.2019.05.001>

Insua-Costa, D., Miguez-Macho, G., Llasat, M.C. Local and remote moisture sources for extreme precipitation: a study of the two catastrophic 1982 western Mediterranean episodes. *Hydrol. Earth Syst. Sci.*, 23, 9, 3885-3900, 2019.

Floods and flash floods are frequent in the south of Europe resulting from heavy rainfall events that often produce more than 200 mm in less than 24 h. Even though the meteorological conditions favourable for these situations have been widely studied, there is a lingering question that still arises: what humidity sources could explain so much precipitation? To answer this question, the regional atmospheric Weather Research and Forecasting (WRF) model with a recently implemented moisture tagging capability has been used to analyse the main moisture sources for two catastrophic flood events that occurred during the autumn of 1982 (October and November) in the western Mediterranean area, which is regularly affected by these types of adverse weather episodes. The procedure consists in selecting a priori potential moisture source regions for the extreme event under consideration, and then performing simulations using the tagging technique to quantify the relative contribution of each selected source to total precipitation. For these events we study the influence of four possible potential sources: (1) evaporation in the western Mediterranean; (2) evaporation in the central Mediterranean; (3) evaporation in the North Atlantic; and (4) advection from the tropical and subtropical Atlantic and Africa. Results show that these four moisture sources explain most of the accumulated precipitation, with the tropical and subtropical input being the most relevant in both cases. In the October event, evaporation in the western and central Mediterranean and in the North Atlantic also had an important contribution. However, in the November episode tropical and subtropical moisture accounted for more than half of the total accumulated



rainfall, while evaporation in the western Mediterranean and North Atlantic played a secondary role and the contribution of the central Mediterranean was almost negligible. Therefore, remote sources were crucial: in the October event they played a similar role to local sources, whereas in the November case they were clearly dominant. In both episodes, long-distance moisture transport from the tropics and subtropics mostly occurred in mid-tropospheric layers, via well-defined moisture plumes with maximum mixing ratios at medium levels.

<https://doi.org/10.5194/hess-23-3885-2019>

Turco, M., Marcos-Matamoros, R., Castro, X., Canyameras, E., Llasat, M.C. Seasonal prediction of climate-driven fire risk for decision-making and operational applications in a Mediterranean region. *Sci. Total Environ.*, 676, 577-583, 2019.

In this paper, we assess and develop a climate service focused on the production of seasonal predictions for summer wildfires in a Mediterranean region through a participatory approach with end-users. We start by building a data-driven model that links a drought indicator (Standardised Precipitation Evapotranspiration Index; SPEI) with a series of burned areas in Catalonia (northeastern Spain). Afterwards, we feed this model with SPEI forecasts obtained through a combination of the antecedent observed conditions and climatology. Finally, we assess the forecasting skill of the system by using cross-validation to evaluate the predictions as if they had been made operationally. Our fire forecasting system reveals an untapped and useful burned area predictive ability. We argue that this source of predictability is mostly attributable to the effect of observed initial conditions on summer drought conditions. This system was conceived with the stakeholders, merging climate-driven predictions with information that is of interests to the users, including the identification of climate variables, thresholds and models. The co-production

of this customized system allows fire-risk outlooks to be translated into usable information for fire management. This fire forecasting ability plays a crucial role in developing proactive fire management practices such as long-term fuel assessment and other fire-risk planning, thus minimising the impact of adverse climate conditions on summer burned area.

<https://doi.org/10.1016/j.scitotenv.2019.04.296>

Casellas, E., Latron, J., Cayuela, C., Bech, J., Udina, M., Sola, Y., Lee, K.O. Llorens, P. Moisture origin and characteristics of the isotopic signature of rainfall in a Mediterranean mountain catchment (Vallcebre, eastern Pyrenees). *J. Hydrolog.*, 575, 767-779, 2019.

This study investigates moisture origin, characteristics and intra-event scale variability of the isotopic signature of rainfall in a Mediterranean mountain area, based on data from the Vallcebre Research Catchments, NE Spain. Weekly data and samples were used to analyse the general dynamics of the isotopic composition of precipitation and its relationship with meteorological variables at the sampling site. Then, based on the data and samples available at the intra-event scale, the variability of the isotopic signature during rainfall events was characterised and an explanation of what caused the observed variability was attempted. Results at the weekly time scale show that the maximum relative deviation of the heavy isotopic content with respect to Standard Mean Ocean Water ( $\delta O-18$ ) of the precipitation signature occurred during summer months and, in contrast, the minimum during winter months. The intra-annual trend of rainfall  $\delta O-18$  roughly followed the mean monthly air temperature. Using intra-event information, three main types of  $\delta O-18$  isotopic trends were found during rainfall events: most of the events had a V-shaped isotopic trend, followed by L-shaped and constant trend

events. Changes in moisture sources 'diagnosed using a Lagrangian approach and a previously existing contribution algorithm' were one of the causes of the isotopic variability and changes at the intra-event scale, but these may also have been influenced by sub-cloud processes that modified the isotopic signature. Moisture sources for analysed events showed the main influence of the Mediterranean area, but also an important influence of the Atlantic Basin.

<https://doi.org/10.1016/j.jhydrol.2019.05.060>

Gil-Guirado, S., Perez-Morales, A., Lopez-Martinez, F. SMC-Flood database: a high-resolution press database on flood cases for the Spanish Mediterranean coast (1960-2015). *Nat. Hazards Earth Syst. Sci.*, 19, 9, 1955-1971, 2019.

Flood databases of high spatio-temporal resolution are a necessary tool for proper spatial planning, especially in areas with high levels of exposure and danger to floods. This study presents the preliminary results of the Spanish Mediterranean Coastal Flood (SMC-Flood) database covering the municipalities in this region. This database collects information on flood cases that occurred between 1960 and 2015 by systematically consulting the digital archives of the main newspapers in the study area. The search for flood information was conducted by means of using links between municipality names and seven keywords that correspond to the most common ways of referring to a situation that is likely to describe a flood in Spain. This methodology has enabled the reconstruction of 3008 flood cases at a municipal scale with daily resolution while gathering information on the types of damage, intensity, severity and area affected. The spatio-temporal analysis of the data reveals hotspots where flood cases are especially intense and damaging when compared to highly developed areas where the frequency of flood cases is very high. This situation is especially worrying insofar

as we have detected a growing trend in the frequency and area affected by flood cases. However, one positive aspect is that the intensity and severity of flood cases follows a falling trend. The main novelty lies in the fact that the high-resolution spatial analysis has made it possible to detect a clear latitudinal gradient of growing intensity and severity in a north-south direction. This pattern calls for new actions by the coastal municipal authorities of southern Spain for adaptation to a more complex flood scenario.

<https://doi.org/10.5194/nhess-19-1955-2019>

Lemus-Canovas, M., Lopez-Bustins, J.A., Trapero, L., Martin-Vide, J. Combining circulation weather types and daily precipitation modelling to derive climatic precipitation regions in the Pyrenees. *Atmos. Res.*, 220, 181-193, 2019.

The Pyrenees is a mountain range that presents a very broad range of climatic diversity, as well as a multitude of geographical factors conditioning precipitation in this region. In-depth knowledge of this precipitation, specifically of its association with atmospheric circulation types in mountain regions, is of great importance for the management of natural hazards such as avalanches or floods. Thus, the present research combines the synoptic scale with the local scale. We employed the regional scale of the Pyrenees to interpolate, by means of the General Linear Models (GLM), General Additive Models (GAM) and Regression Kriging (RK) methods, mean daily precipitation (MDP) based upon a classification of weather types at the synoptic scale; this procedure reflects the most frequent atmospheric patterns in the study area during the 1961-2010 period. This combination of scales makes it possible to perform a spatial precipitation regionalization of the Pyrenees by means of the work flow proposed in the present research. The result is a compendium of 20 atmospheric circulation types. For each of these circulation types, we obtained MDP

maps for each of the aforementioned interpolation methods. The most satisfactory fit of the models was provided by the GAM and the RK methods, with an average R-2 of all models of 0.58 and 0.61, respectively. These models provided a precipitation regionalization of the Pyrenees involving eight differentiated regions, two of which reveal a statistically significant annual tendency towards a decrease in precipitation.

<https://doi.org/10.1016/j.atmosres.2019.01.018>

Miglietta, M.M., Rotunno, R. Development mechanisms for Mediterranean tropical-like cyclones (medicane). *Q. J. R. Meteorol. Soc.*, 145, 721, 1444-1460, 2019.

Midlatitude cyclones with characteristics similar to tropical cyclones (also known as Tropical-Like Cyclones, TLCs, or medicanes) are sometimes observed in the Mediterranean region. The Wind Induced Surface Heat Exchange (WISHE) mechanism has been considered responsible for their development, in analogy with tropical-cyclone theory. However, some recent papers have proposed a different explanation, suggesting that the deep warm core in the TLC is mainly an effect of the seclusion of warm air in the cyclone core. To investigate the latter hypothesis, two case-studies of Mediterranean TLCs are analysed here by means of high-resolution numerical experiments. The evolution of the near-surface equivalent potential temperature is followed along back-trajectories around the cyclone centre, showing for both cases a strong heating when the parcel moves from the outer part of the cyclone to its inner, warmer core. Sensitivity experiments clarify the mechanism of cyclone intensification and the way the warm-core structure is generated, showing that sea-surface fluxes and/or condensation latent heating are fundamental to explain the intensification of the cyclones. However, the importance of air-sea interaction processes is case

dependent. For the first cyclone, the intense sea-surface fluxes, associated with tramontane and cierzo winds over the western Mediterranean Sea, transfer a large amount of energy from the ocean to the atmosphere in the area where the cyclone developed, so that the vortex is able to sustain itself in a barotropic environment and reach a tropical-like structure at a later stage in its lifetime. For the second cyclone, the cyclone never develops a fully tropical-like structure, evolving in the baroclinic environment associated with the potential vorticity streamer in which the cyclone formed. Based on the distinction emerging in this and other articles, a classification of medicanes in three different categories is proposed.

<https://doi.org/10.1002/qj.3503>