

Part A. PERSONAL INFORMATION		CV date	02/04/2024
First and Family name	María Patrocinio González Dugo		
Researcher numbers	Researcher ID	J-4157-2012	
	Orcid code	0000-0003-0423-8246	

A.1. Current position

Name of University/Institution	Instituto de Investigación y Formación Agraria y Pesquera de Andalucía. IFAPA (Junta de Andalucía)		
Department	Centro IFAPA Alameda del Obispo		
Address and Country	Avd. Menéndez Pidal s/n 14080 Córdoba		
Phone number	671 532 700	E-mail	mariap.gonzalez.d@juntadeandalucia.es
Current position	Research Scientist	From	11/07/2009
Espec. cód. UNESCO	250815, 250813, 332401, 220990, 250916, 310205, 310601		
Keywords	Remote Sensing, Surface energy and water balance, Biomass, Evapotranspiration, Drought, Irrigation, Mediterranean oak savanna, Dehesa		

A.2. Education

PhD	University	Year
PhD in Agricultural Engineering	University of Cordoba	2002

A.3. JCR articles, h Index, thesis supervised.

JRC articles: 31; Articles in Q1 journals = 27
 Total citations: 1741 (Web of Science), 2702 (Google Scholar, GS)
 h Index (Web of Science) = 19; h Index (GS) = 23
 Thesis supervised in the last 10 years: 4

Part B. CV SUMMARY (max. 3500 characters, including spaces)

María Pat González Dugo is a research scientist at the Agri-Food Engineering and Technology Area of the Institute of Agricultural and Fisheries Research and Training (IFAPA), which is part of the Department of Agriculture and Rural Development of Andalucía. Her work seeks to improve knowledge and monitoring of water, energy, and carbon exchanges in the soil-plant-atmosphere system through a combination of remote sensing, models, and measurements. This line of work is applied to agroforestry systems at a local and regional scale, broadly focusing on applications that support management decisions and paying special attention to water resources and the impact of current and future changes in their availability. She specifically focuses on the use of remote sensors in complex ecosystems such as the Mediterranean oak savanna.

She has coordinated a large number of research and technology transfer projects funded by national or international (mainly EU) institutions (in the last 10 years: 14 as PI, 9 of which have been obtained in European and national competitive calls) and in collaboration with an extensive network of national and international researchers, technical staff of government agencies involved in agricultural and natural resources management and private sector organisations. The results are disseminated through scientific publications (50 works indexed on the Web of Science), training and information material, and participation in national and international forums. She has supervised many degree projects for Agricultural and Forest Engineers, 6 master's theses, and 4 PhD theses in cooperation with the University of Cordoba, where she is part of the Master and doctorate program. Is consulted as an expert at the national and European level in the area of specialisation of Agriculture and Remote Sensing (e.g. evaluating projects for ANEP and AEI Coordination and Evaluation Subdivision, participating in the advisory group of the Spanish space mission SEOSAT-INGENIO, evaluating calls and monitoring projects for Horizon Europe, H2020, the Belgian Science Policy Office, the National Fund for Scientific and Technological Research of Chile, or as part of the *Copernicus Expert*

Group). She is also a member of the International Scientific Committee of the SOERE-ACBB Observatory of INRA (France) and vice-president of the Spanish Society for Remote Sensing.

She has international experience, with several research stays in reference centres: 2015/2016, 36 weeks at ITC Faculty of Geo-Information Science and Earth Observation. Dept. of Water Resources (Netherlands); 2010, 12 weeks and 2006, 12 weeks, at the Hydrology and Remote Sensing Laboratory (HRSL ARS-USDA) Beltsville (MD, USA); 1999, 12 weeks at the Water Conservation Laboratory (WCL ARS-USDA) at Tucson (AZ, USA).

Part C. RELEVANT MERITS

C.1. Selected publications (five years)

- (1) Fernández-Habas, J., Carriere Cañada, M., García Moreno, A.M., Leal-Murillo, J.R., **González-Dugo, M.P.**, Abellanas Oar, B., Gómez-Giráldez, P.J., Fernández-Rebollo, P. 2022. Estimating pasture quality of Mediterranean grasslands using hyperspectral narrow bands from field spectroscopy by Random Forest and PLS regressions. *Computers and Electronics in Agriculture*, 192: 106614. <https://doi.org/10.1016/j.compag.2021.106614>
- (2) **González-Dugo, M. P.**, Chen, X., Andreu, A., Carpintero, E., Gómez-Giraldez, P. J. (2021). Long-term water stress and drought monitoring of Mediterranean oak savanna vegetation using thermal remote sensing. *Hydrol. Earth Syst. Sci.*, 25, 755–768, 2021 <https://doi.org/10.5194/hess-25-755-2021>
- (3) Johnston, M.R., Andreu, A., Verfaillie, J., Baldocchi, D., **González-Dugo, M.P.**, Moorcroft, P.R. 2021. Measuring surface temperatures in a woodland savanna: Opportunities and challenges of thermal imaging in an open-canopy ecosystem. 2021. *Agricultural and Forest Meteorology*, 310: 108484. <https://doi.org/10.1016/j.agrformet.2021.108484>
- (4) Carpintero, E., Anderson, M.C., Andreu, A., Hain, C., Gao, F., Kustas, W.P., **González-Dugo, M.P.** (2021). Estimating Evapotranspiration of Mediterranean Oak Savanna at Multiple Temporal and Spatial Resolutions. Implications for Water Resources Management. *Remote Sensing*, 13(18): 3701.. <https://doi.org/10.3390/rs13183701>
- (5) Castellví F., **González-Dugo M.P.** (2021). A one – source model to estimate sensible heat flux in agricultural landscapes. *Agricultural and Forest Meteorology*, 310: 108628.. <https://doi.org/10.1016/j.agrformet.2021.108628>
- (6) Neale, CMU., **Gonzalez-Dugo, M.P.**, Serrano-Perez, A., Campos, I., Mateos, L. 2021. Cotton Canopy Reflectance under Variable Solar Zenith Angles: Implications of Use in Evapotranspiration Models. *Hydrological Processes*, 35(6): e14162. <https://doi.org/10.1002/hyp.14162>
- (7) Carpintero, E., Andreu, A., Gómez-Giráldez, P. J., Blázquez, Á., **González-Dugo, M. P.** (2021). *Remote-Sensing-Based Water Balance for Monitoring of Evapotranspiration and Water Stress of a Mediterranean Oak – Grass Savanna*. *Water*, 12, 1418; [doi:10.3390/w12051418](https://doi.org/10.3390/w12051418)
- (8) Gómez-Giráldez, P. J., Pérez-Palazón, M. J., Polo, M. J., **González-Dugo, M. P.** (2020). *Monitoring grass phenology and hydrological dynamics of an oak-grass savanna ecosystem using sentinel-2 and terrestrial photography*. *Remote Sensing*, 12(4), 1–23. <https://doi.org/10.3390/rs12040600>
- (9) Carpintero, E., Mateos, L., Andreu, A., **González-Dugo, M. P.** (2020). *Effect of the differences in spectral response of Mediterranean tree canopies on the estimation of evapotranspiration using vegetation index-based crop coefficients*. *Agricultural Water Management*, 238(April), 106201. <https://doi.org/10.1016/j.agwat.2020.106201>
- (10) Busquier, M., Lopez-Sanchez, J. M., Mestre, A., Navarro, E., **González-Dugo M.P.**, Mateos, L. (2020). *Exploring TanDEM-X Interferometric Products for Crop-Type Mapping*. *Remote Sens.* 2020, 12, 1701; [doi:10.3390/rs12111701](https://doi.org/10.3390/rs12111701)
- (11) Román-Cascón, C., Lothon, M., Lohou, F., Ojha, N., Merlin, O., Aragonés, D., **González-Dugo, M. P.**, Andreu, A., Pellarin, T., Brut, A. Soriguer, R.C. Díaz-Delgado, R., Yagüe, C. (2020). *Can We Use Satellite-Based Soil-Moisture Products at High Resolution to Investigate Land-Use Differences and Land – Atmosphere Interactions? A Case Study in the Savanna*. *Remote Sens.* 2020, 12, 1701; <https://doi.org/10.3390/rs12111701>
- (12) Gómez-Giráldez, P.J., Aguilar, C., Caño, A.B., García-Moreno, A., **González-Dugo, M.P.**, (2019). *Remote sensing estimation of net primary production as monitoring indicator*

- of holm oak savanna management. Ecological Indicators* 106, 105526. <https://doi.org/10.1016/j.ecolind.2019.105526>
- (13) Andreu, A, T. Dube, H. Nieto, A. E. Mudau, **M. P. González-Dugo**, R. Guzinski, S. Hülsmann. 2019. *Remote sensing of water use and water stress in the African savanna ecosystem at local scale – Development and validation of a monitoring tool*, Physics and Chemistry of the Earth. <https://doi.org/10.1016/j.pce.2019.02.004>.
- (14) Klosterhalfen, A., Graf, A., Brüggemann, N., Drüe, C., Esser, O., **González-Dugo, M. P.**, et al., (2019). Source partitioning of H₂O and CO₂ fluxes based on high-frequency eddy covariance data: a comparison between study sites, Biogeosciences, 16, 1111-1132, <https://doi.org/10.5194/bg-16-1111-2019>.
- (15) Blöschl, G., Bierkens, M.F.P., Chambel, A., Cudennec, C., Destouni, G., Fiori, A., Kirchner, J.W., McDonnell, J.J., Savenije, H.H.G., Sivapalan, M., Stump, C., Toth, E., Volpi, E., Carr, G., Lupton, C., Salinas, J., Széles, B., Viglione, A., ..., A., **González-Dugo, M.P.**, et al., (2019). Twenty-three unsolved problems in hydrology (UPH) – a community perspective. Hydrological Sciences Journal 64, 1141–1158. <https://doi.org/10.1080/02626667.2019.1620507>
- (16) Jódar J., E. Carpintero, S. Martos-Rosillo, A. Ruiz-Constán, C. Marín-Lechado, J.A. Cabrera-Arrabal, E. Navarrete-Mazariegos, A. González-Ramón, L.J. Lambán, C. Herrera, **M.P. González-Dugo**. (2018). Combination of lumped hydrological and remote-sensing models to evaluate water resources in a semi-arid high-altitude ungauged watershed of Sierra Nevada (Southern Spain). Science of the Total Environment, 625, 285-300 <https://doi.org/10.1016/j.scitotenv.2017.12.300>
- (17) Andreu A, William P. Kustas, M. Jose Polo, A. Carrara and **M. P. González-Dugo**. (2018). *Modeling Surface Energy Fluxes over a Dehesa (Oak Savanna) Ecosystem Using a Thermal Based Two-Source Energy Balance Model (TSEB) I. Integration of Medium and Low Spatial Resolution Satellite Images*. Remote Sensing. 10, 567; <https://doi.org/10.3390/rs10040567>
- (18) Andreu A, William P. Kustas, M. J. Polo, A. Carrara and **M. P. González-Dugo**. (2018). *Modeling Surface Energy Fluxes over a Dehesa (Oak Savanna) Ecosystem Using a Thermal Based Two Source Energy Balance Model (TSEB) II—Integration of Remote Sensing Medium and Low Spatial Resolution Satellite Images* Remote Sensing. 10, 558; <https://doi.org/10.3390/rs10040558>

C.2. Principal Investigator of Research projects and grants (10 years)

- (1) 2023-2026 Upscaling (real-time) sensor data for EU-wide monitoring of production and agri-environmental conditions (ScaleAgData - 101086355) EU Horizon Europe Framework Programme (HORIZON).
- (2) 2023-2026. Avances en la investigación e innovación tecnológica de la dehesa para una gestión adaptada al calentamiento global (IN-DE. PR.AVA23.INV202301.030). Convocatoria de Líneas Estratégicas de IFAPA.
- (3) 2020-2023. Results-based payments for ecosystems services: Remote-sensing based tools to support agri-environment and climate policy (PAGOSER-SAT. PID2019-107693RR-C22). Spanish National Plan for Scientific and Technical Research and Innovation. Retos-2019. Retos2019.
- (4) 2018-2021. Savanna water and carbon fluxes modelling integrating Earth Observation data — SWATC. 703978 — European Commission H2020-Marie Skłodowska-Curie actions-IF-2015 Entidades participantes: IFAPA, UC Berkeley.
- (5) 2017-2020. Collective management of crops at the service of environmental programs related to the use and quality of water (LIFE16 ENV/ES/000287) AGROGESTOR.
- (6) 2015-2018. RTA2014-00063-C04- 02. La Seca de la encina y el alcornoque en la dehesa. Seguimiento temporal de su impacto y alternativas de control: biofumigantes, enmiendas y búsqueda de resistencias. Plan Estatal I+D+i 2013-2016. Plan Nac- RTA-INIA.
- (7) 2012-2016. LIFE sigAGROasesor: Customized advanced GIS advisory tools for the sustainable management of extensive crops (LIFE+11/ENV/ES/641).
- (8) 2012-2018. LIFE Biodehesa. Dehesa ecosystems: Development of policies and tools for biodiversity conservation and management. LIFE+ Biodiversity. LIFE11 BIO/ES/726.

- (9) 2012-2014. Integración del balance de energía y el balance de agua en la superficie terrestre usando datos remotos para la estimación de la evapotranspiración, humedad del suelo y estrés hídrico (CERESS, AGL2011-30498-C02-02). Plan Nacional de I+D+i.

C.3. Contratos dirigidos (10 años)

- (1) CAICAD23-121TELEDET Estudio y asesoramiento en la aplicación de nuevos productos derivados de teledetección para su implementación en la gestión de cultivos extensivos en regadío modernizado. Contrato con la empresa Tragsatec. 2023-2025
- (2) PP.PEI.IDF2019.004. *Uso de Copernicus para el seguimiento de la PAC en Andalucía.* Proyecto con financiación FEDER para atender una demanda de la Secretaría General de Fondos Europeos al Desarrollo Rural Sostenible de la CAGPyDS de la Junta de Andalucía.
- (3) CAICEM2019-33. Determinación de la evapotranspiración de los regadíos de la cuenca del Guadalquivir en la campaña 2018. Contrato con la empresa Tragsatec para la Confederación Hidrográfica del Guadalquivir.
- (4) PR.PP.PEI.IDF201601.16. Evaluación de la producción de pasto y bellota en la dehesa mediante sensores próximos y remotos. Aplicaciones a la ganadería de precisión. Proyecto con financiación FEDER
- (5) 010/2016. Determinación de la evapotranspiración de los regadíos de la cuenca del Guadalquivir en el año 2015 mediante teledetección. Contrato con la empresa Tragsatec para la Confederación Hidrográfica del Guadalquivir.
- (6) PR.PEI.IDF201401.9. D.G. de Planificación y Gestión del Dominio Público Hidráulico (Consejería de medio Ambiente y Ordenación del Territorio). Estudio de las cubiertas vegetales de la cabecera de los ríos Grande de Bérchules y Mecina aplicando técnicas de teledetección.

C.4. PhD Supervision

1. Integración multiescala de los balances de agua y energía usando sensores remotos para mejorar la estimación espaciotemporal continua de la evapotranspiración
DOCTORANDO: Elisabet Carpintero García. Becaria FPU.
UNIVERSIDAD: Universidad de Córdoba FACULTAD/ESCUELA: ETSIAM
FECHA: November 2021 CALIFICACIÓN: Sobresaliente Cum Laude
2. *Seguimiento de la producción primaria de un ecosistema de dehesa a escala regional usando sensores remotos y evaluando el efecto del estrés hídrico sobre el sistema.*
DOCTORANDO: Pedro Jesús Gómez Giráldez.
UNIVERSIDAD: Universidad de Córdoba FACULTAD/ESCUELA: ETSIAM
FECHA: March 2020 CALIFICACIÓN: Sobresaliente Cum Laude
2. *Water monitoring in vegetation covers through multiscale energy balance modelling using time series of remotely sensed data.*
DOCTORANDO: Ana Andreu Méndez.
UNIVERSIDAD: Universidad de Córdoba FACULTAD/ESCUELA: ETSIAM
FECHA: December 2014 CALIFICACIÓN: Sobresaliente Cum Laude
3. *Integración de datos remotos en modelos de crecimiento y estimación de cosecha de cultivos herbáceos. Aplicación a escala local sobre trigo y maíz.*
DOCTORANDO: Francisco L. Muñoz Padilla
UNIVERSIDAD: Universidad de Córdoba FACULTAD/ESCUELA: ETSIAM
FECHA: September 2011 CALIFICACIÓN: Sobresaliente Cum Laude

C.5, C.6, C.7 OTHER (e. g., Institutional responsibilities, memberships of scientific...)

- Vicepresident of the Spanish Society of Remote Sensing (AET)
- Teaching responsibilities: Oficial inter-university Postgraduate Program "Dinámica de flujos ambientales y sus aplicaciones", Quality certification MCD 2006-00361. "Máster Oficial Interuniversitario en Hidráulica Ambiental".
- Member of scientific societies: Asociación Española de Teledetección, AET, European Geosciences Union (EGU), International Association of Hydrological Sciences (IAHS).