

## Resumen línea de investigación

El grupo de Hidrología Subterránea e Hidrogeoquímica estudia los procesos hidráulicos, químicos, térmicos y mecánicos que tienen lugar en medios porosos desde la escala de poro hasta la regional. El grupo emplea enfoques matemáticos y numéricos, así como experimentos y métodos de muestreo a escala de laboratorio y de campo (utilizando datos hidráulicos, hidrogeoquímicos e isotópicos ambientales muestreados directamente o mediante pruebas específicamente diseñadas). El grupo trabaja activamente en el desarrollo de modelos numéricos y matemáticos, técnicas de modelización de procesos complejos en medios porosos a través de escalas espaciales y temporales, experimentación a escala de laboratorio, de campo y muestreo y análisis de datos. Las aplicaciones incluyen la evaluación y gestión de recursos hídricos subterráneos, la remediación de aguas subterráneas y suelos, la gestión de acuíferos urbanos, el estudio de contaminantes emergentes en acuíferos urbanos e instalaciones de recarga artificial, el estudio de humedales, la intrusión de agua marina en acuíferos costeros, la gestión del agua en explotaciones mineras, obras civiles, almacenamiento de residuos y/o su valorización, metodologías de descontaminación de aguas, estudio de la zona no saturada, estudio de los procesos hidrotermomecánicos y químicos asociados a la inyección y extracción de fluidos a gran profundidad (almacenamiento de hidrógeno y CO<sub>2</sub>, almacenamiento de residuos nucleares, geotermia, gas de esquisto, sismicidad inducida).

## Resumen CV de los investigadores principales

**Juan J. Hidalgo** is a Ramón y Cajal researcher at the Institute of Environmental Assessment and Water Research of the Spanish National Research Council (IDAEA-CSIC, Barcelona, Spain). He did his Ph.D. at the School of Civil Engineering at the Technical University of Catalonia (UPC, Spain) and has a Bachelor in Physics (Universidad de Córdoba, Spain). He was a postdoctoral researcher at the Institut de Physique du Globe de Paris (IPGP, France) and at the Civil and Environmental Engineering Department of the Massachusetts Institute of Technology (MIT, USA) as a Marie Curie IOF fellow. His at IDAEA-CSIC focuses on transport processes at the pore and Darcy scales with special emphasis on unstable fluid flow and the upscaling of transport in heterogeneous media. He has contributed to the knowledge of the behavior of multi-phase flow in porous media and provided results with direct application to the CO<sub>2</sub> injection technologies. He also contributed to the fields of geothermal energy, parameter estimation, and stochastic modeling. He develops open source modelling tools for flow and transport in porous media (<https://github.com/jjhidalgo>). He has co-authored 39 publications (26 peer reviewed, 14 as first/corresponding author, h-index 13) with more than 430 citations in the last five years. He has over 60 contributions in national and international scientific meetings and was an invited speaker at the SIAM-Geosciences conference in 2013 and the Mixing Day (2018). He has participated in a total of 12 national and international projects, 6 of them as principal investigator of 6 (2 funded by the European Commission and 4 by the Spanish National Research Agency and the Ministry of Science and Innovation). He is the coordinator of the project HydroPore II on a coupled multiphase flow and transport processes in porous and fractured media funded by the Spanish Research Agency. He has co-directed the master thesis of K. Katimada presented at the Universität Hannover and the PhD thesis of L. Pérez (now associate professor at the Desert Research Institute, Reno, USA) presented at the UPC in 2019. He currently co-supervises 4 PhD students.

**Marco Dentz** is Professor (Profesor de Investigación) at the Institute of Environmental Assessment and Water Research (IDAEA) of the Spanish National Research Council (CSIC) in Barcelona, Spain. His research focuses on hydrodynamic flow and transport in porous media and the quantitative understanding of flow, mixing and reactive transport phenomena from the pore to the regional scale. His research combines theory, numerical simulation, and new data analysis strategies to shed light on the fundamental mechanisms of flow, transport and deformation in heterogeneous porous and fracture media, and to derive theories and models for process prediction at large spatial and temporal scales with diverse applications in the areas of energy and environment. He has authored and co-authored 5 book chapters and 180 articles in peer reviewed journals with 7500 citations (H-Index 50) according to Scopus. He has (co-) directed 12 PhD theses and mentored 11 postdocs, who have pursued careers in academia and industry. He has (co-)organized 5 workshops and a series of sessions and mini-symposia at international conferences (AGU Fall Meeting, EGU General Assembly, Computation Methods in Water Resources Conference, SIAM Geoscience Meeting), among them the 2020 Lorentz conference on Mixing in Porous Media as main organizer, the 2020 kick-off meeting and the 2021-2022 annual meetings of the Spanish InterPore Chapter. In the last 10 years, he has

delivered 20 invited talks and keynote lectures at international conferences, workshops and summer schools (Cargese Summer Schools on Flow in Porous and Fractured Media, 2018 Gordon Research Conference on Flow in Porous Media, 2020 SIAM Gesciences Conference). In the last 10 years he has participated in 19 competitive national and European research projects as PI (12) and contributing researcher (7). From 2014-2020 he led the consolidator project MHetScale on mixing in porous media funded by the European Research Council (ERC). He is the coordinating PI of the project HydroPore on the foundations of multiphase flow and transport in porous media funded by the Spanish Research Agency. In 2022 the consortium led by Marco Dentz was awarded the ERC Synergy Grant KARST on the prediction of flow and transport in complex karst systems. In 2021 he was awarded the InterPore medal for porous media research.

## Publicaciones de los investigadores principales

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