

Jean-Christophe Maréchal

Hydrogeologist, PhD, HDR — Fractured and Karst Aquifers

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PROFILE

Civil engineer and hydrogeologist with over 25 years of experience in the hydrogeology of fractured (crystalline) and karst aquifers. My work combines field observation (pumping tests, tracers, geophysics, long-term observatories), mathematical modelling (MODFLOW, FEFLOW, Matlab/Simulink) and socio-economic analysis to support the sustainable management of groundwater resources — from managed aquifer recharge and climate-change adaptation to saltwater intrusion in Mediterranean and tropical semi-arid environments (France, India, Africa, Pacific atolls).

CURRENT POSITIONS

- **Since 2021** — Deputy Director of UMR G-eau (Water Management, Actors, Uses), joint research unit INRAE, IRD, CIRAD, BRGM, APT, IA, UM, Montpellier, France.
- **Since 2011** — Head of the New Water Resources & Economy Unit, later Karst Aquifers and Socio-Economics Research Unit (UR AKS), BRGM, Montpellier, France (team of 30 staff).

CAREER

Since 2011 Head of Research Unit (NRE, then AKS)

BRGM, Montpellier, France

2009–2011 Leader of the framework programme “Responses to Water Resource Tensions”

BRGM, Montpellier, France

2006–2009 Researcher, Tropical Experimental Watersheds (BVET)

IRD, Indian Institute of Science, Bangalore, India

2003–2006 Senior hydrogeologist – Project Leader

BRGM Water Division, Montpellier, France

2000–2003 Co-Director, Indo-French Centre for Groundwater Research (CEFIRES)

BRGM & NGRI, Hyderabad, India

1998–2000 Research Engineer, Laboratory of Engineering Geology, Hydrogeology and Geophysics (LGIH)

University of Liège, Belgium

1995–1998 Assistant Engineer, GEOLEP

Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland

EDUCATION

2024 HDR (Habilitation to Supervise Research) — “Fractured and karst aquifers: from observation to modelling”

University of Montpellier, France

1998 PhD in Hydrogeology — “Water circulation in alpine crystalline massifs and its interaction with underground structures”

EPFL, Switzerland

1994 Postgraduate degree (MSc) in Hydrogeology — “Hydraulics and transport in karst conduits”

University of Neuchâtel, Switzerland

1992 Civil Engineer in Geology

University of Liège, Belgium

RESEARCH THEMES

- **Crystalline rock aquifer hydrogeology:** multidisciplinary methods for groundwater resource assessment in crystalline and metamorphic basement aquifers, natural recharge estimation, watershed-scale aquifer balance in semi-arid areas.
- **Karst systems:** characterisation and functioning of Mediterranean karst aquifers, groundwater contribution to flash floods, active management of karst groundwater resources.
- **Pumping tests:** interpretation and modelling of long-duration pumping tests in fractured and karst environments, diagnostic derivative plots, analytical solutions.
- **Managed aquifer recharge:** technical and economic feasibility, multi-criteria mapping, real-time monitoring and control (MAR).
- **Saltwater intrusion:** monitoring and modelling in complex coastal aquifers, including submarine karst springs.
- **Modelling:** reservoir models coupled with geochemistry, heat transport, water inflows in tunnels, applications to global-change impact assessment.

SELECTED PROJECTS

- **SentinelSprings (2025–2028):** springs as sentinels of climate change and sustainability of aquatic ecosystems (contributor).
- **SMART-Control (2018–2022):** smart framework for real-time monitoring and control of managed aquifer recharge (France, Germany, Cyprus, Brazil) — BRGM project leader.
- **GeoERA RESOURCE (2018–2021):** European typology of karst aquifers with 14 geological surveys — leader of the karst work package (CHAKA).
- **Managed aquifer recharge in the Rhône-Mediterranean-Corsica basin (2016–2018):** technical and economic feasibility of artificial recharge — project leader.
- **Plateau de Sault (2014–2018):** karst groundwater resources, 3D geological and hydrogeological models, vulnerability mapping — project leader.
- **Lez multi-use management (2009–2014):** optimising the Montpellier drinking-water karst aquifer while reducing downstream flood risk — coordinator.
- **CEFIRES (2000–2003):** establishment of the Indo-French Centre for Groundwater Research in Hyderabad, India; instrumented Maheshwaram watershed; supervised 2 PhDs.

TEACHING & SUPERVISION

Lectures at Master level (University of Montpellier, AgroParisTech/ENGREF): practical hydrogeology, hard-rock and karst aquifer hydrogeology, pumping-test interpretation. BRGM certified trainer since 2004 (“Introduction to practical hydrogeology”, “Interpretation and use of pumping test data” — course designer).

Supervised or co-supervised 9 PhD theses (Liège, Rennes, Toulouse, Normandy, Tübingen, Bangalore...) and one postdoc; supervised about 20 Master internships.

PUBLICATIONS & EDITORIAL ACTIVITY

~114 peer-reviewed journal articles (Hydrogeology Journal, Journal of Hydrology, Water Resources Research, Engineering Geology...), 7 book chapters and ~50 conference papers. Associate Editor of Hydrogeology Journal. Member of the French Committee of Hydrogeologists (CFH). **Bibliometrics:** Web of Science h-index 31 (114 papers, 3,218 citations); Google Scholar h-index 41 (337 publications, ~6,006 citations).

LANGUAGES & SKILLS

French (native) · English (fluent, working language).

Project and team management (30-staff research unit), scientific strategy, fund raising, research evaluation (FNRS, Water4All, Aqua-Valley). Long-term international cooperation (India, Cameroon, Switzerland).