RESUMÉ

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Date of birth 10/06/1974 | Nationality Spain

PROFESSION

Dr. sc. techn., Civil Engineer and Hydrogeologist

WORK EXPERIENCE

February 2018-	Geo-Energie Suisse AG (Zürich). Head of Divison Modelling.
June 2017-	HydroGeoModels AG (Winterthur). Founder and CEO.
August 2014 - June 2017	TK Consult AG (Zürich). Head of Division Groundwater.
May 2011 - August 2014	Geo-Energie Suisse AG (Zürich). Project manager.
May 2009 - May 2011	TK Consult AG (Zürich). Project manager.
September 2006 - May 2009	Centre for Hydrogeology and Geothermal Neuchâtel (CHYN). Senior Researcher.
Sept. 1997 - Sept. 2006	Technical University of Catalonia (UPC); Geosciences. Research Assistant / Associate Professor.
Sept. 1996 - Sept. 1997	Technical University of Catalonia (UPC); Applied Mathematics. Research Assistant.

PUBLICATIONS/OTHERS

Peer review journals	28; 4 in preparation/submitted.
Books/book chapters	10; 1 in preparation
Conference Proceedings	83
Education	2006: Ph. D. in Hydrology and Civil Engineering (UPC) 2001: M. Sc. Hydrology (UPC) 1999: Civil Engineer (UPC)
Honours and awards	AGU Outstanding Student Award 2006
Languages	English, German, Spanish (mother tongue); French and Italian (basic)

AUTOBIOGRAPHY

I was born in Barcelona (Spain) in June 10, 1974. I studied civil engineering from 1992 to 1999. My main topics of interest are numerical modelling for ground water, contaminant transport, soil physics, geomechanics and seismology, with emphasis on induced seismicity following fluid injection. I started to work at the Department of Applied Mathematics of the Technical University of Catalonia (UPC) in 1996, as research assistant. I moved to the Department of Geotechnical Engineering of the UPC in 1997 and obtained the specialization in Geotechnical Engineering with two Master Thesis related to (1) optimization and numerical methods for ground water and (2) design of active and passive geochemical barriers for aquifer remediation. In 2000, I followed an international postgraduate course, on groundwater hydrology and soil physics. In 1999, I started my Ph.D., with main focus on geostatistical methods and their applications to earth and environmental sciences, particularly to the characterization of strongly heterogeneous aquifers. In 2006, I received the AGU "Outstanding Student Paper Award" and defended my Ph. D. Dissertation, entitled "Regularized Pilot Points method for the characterization of heterogeneity", obtaining the maximum mark of Magna Cum Laude. In September 2006, I moved to Switzerland and worked as Senior Researcher at the CHYN (Centre for Hydrogeology and Geothermy of Neuchâtel, Switzerland). In 2009, I joined the world of industry and became senior Hydrologist and Project Manager with TK Consult AG, in Zürich. Between 2011 and 2014, I worked as project manager with Geo-Energie Suisse AG. In August 2014, I moved back to TK Consult AG, as Head of the Division for Groundwater Resources. In June 2017, I founded HydroGeoModels AG. HydroGeoModels AG focuses on solving challenging problems related to the management and protection of water resources (either surface or groundwater bodies), to the protection against natural risks (e.g., flood events, aquifer contamination, rockslides, etc.) and other environmental issues. HydroGeoModels AG counts on the experience gained in more than 100 projects worldwide to bring reliable, plausible, creative and cost-balanced solutions satisfying clients' needs. In parallel, and since February 2018, I act again as project manager for Geo-Energie Suisse AG.

From the professional point of view, I have been Researcher and Assistant Professor in Switzerland and Spain from 1997, covering topics from the undergraduate to doctorate levels, related to geostatistics, ground water, model calibration, advanced numerical methods and programming. The results of this research have been published in several international peer-reviewed journals and books and have been disseminated in more than fifty scientific congresses. I have participated in numerous projects regarding numerical modelling, software design, optimization methods, design of geochemical barriers, urban hydrology and geochemistry, amongst other topics, and have assessed many private projects. I have cooperated in public projects coordinated by NAGRA, ENRESA, NATO, UNESCO, ANDRA and the European Commission, amongst others.

Outside academia since May 2009, I have been the main developer and/or leader of different projects, including the flood modelling of the Zürich floodplain and the design of the corresponding correction measures. During the last ten years, I have been an active member of the NAGRA's task force devoted to the selection of the Swiss nuclear waste repository. In this framework, I have developed accurate geological / geostatistical models at different siting areas in Switzerland. These models lay over meshes accounting for tens of millions of elements. Recently, I have modelled the hydraulic behaviour of the Excavation Damaged Zone around the galleries of a waste disposal on an Opalinus clay geological set-up. With Geo-Energie Suisse AG, part of my day to day duties were/are on the modelling of seismicity, productivity and life-time of geothermal systems, interaction with ground-water bodies of drilling and geothermal production activities and economic viability of projects, amongst others. I also modelled the seismic hazard associated with a deep geothermal project in Switzerland. Other side-activities were on the coordination of sub-contracted projects and on the writing of European proposals and other legal specifications.

From the management point of view, I started coordinating a project for Veolia Waters, a desalination plant in Oman. This project summarizes well my main skills, ranging from the instrumentation of pumping wells (pumps and probes), data gathering and interpretation, inverse modelling for aquifer characterization, design of optimal solutions and analysis of their economic and technical feasibility. With Geo-Energie Suisse AG, I have coordinated more than 50 projects, including both the technical and the economic sides. With TK Consult AG, as Head of Division, I carried out marketing campaigns at both Swiss and international levels and established a dense network of clients and partners. With

HydroGeoModels AG, and since 2018, I coordinate the Task Force devoted to the modelling of the FE experiment in Mont Terri. The FE is Nagra's flagship experiment in the context of the phenomenological evaluation of heating processes associated with storage of nuclear waste in the underground. With Geo-Energie Suisse, I coordinate the Division on Modelling of deep Enhanced Geothermal Systems since 2018.

EDUCATIONAL HISTORY

November 2021 – December 2021: Course on Project management in Geothermal Energy Projects

November 2017 – December 2017: Postgraduate Course on Shallow Geothermal Energy installations. Heat pumps and piles.

September 1999 – July 2006: Ph. D. in Hydrology and Civil Engineering by the Technical University of Catalonia (UPC), School of Civil Engineering. Dissertation title: "*Regularized Pilot Points Method for the Characterization of Heterogeneity*". Magna Cum Laude.

January 2001 – June 2001: Post-graduate course in Hydrology and Management by the *FCIHS* (International Centre for Ground Water, Barcelona, Spain). Diploma: "*International course on Groundwater Hydrology*".

September 1992 – September 1999: Civil Engineer by the Technical University of Catalonia, School of Civil Engineering. Specialty in Soil Engineering and Rock Mechanics.

September, 2008: Post Graduate CUSO Course "Model Calibration and Quantification of Predictive Uncertainty Using PEST (Parameter ESTimation)", by Professor J. Doherty. Neuchâtel, 42 hours.

September, 2007: Post Graduate CUSO Course "Inverse Problems", by Professor A. Tarantola. Neuchâtel, 42 hours.

November, 2000: Post Graduate Course "On the use of information resources". Barcelona (Spain), 8 hours.

March, 2000: Ph. D. Course "Deep borehole drilling techniques". Jaen (Spain), 30 hours.

August, 1999: Ph.D. Course "Parameter Identification in Groundwater Modelling", by Professors J. Carrera and A. Medina. Kopenhagen (Denmark), 80 hours.

September, 1998: Advanced Study Course on "Palaeohydrogeological methods in ground water and waste management", Nottingham (UK), 90 hours.

March, 1998: Ph. D. Course "Blasting in Civil Engineering", Barcelona (Spain), 45 hours.

September, 1997: International Workshop on Mathematical Methods in Earth Sciences. Barcelona (Spain), 48 hours.

WORK EXPERIENCE

February 2018–nowadays

Geo-Energie Suisse AG, Zürich, Switzerland. Position: Senior hydrologist / Project Manager / Head of Division Modelling / Member of Cadre.

June 2017–nowadays

HydroGeoModels AG, Winterthur, Switzerland. Founder and CEO.

August 2014 – June 2017

TK Consult AG, Zürich, Switzerland. Head of Groundwater Division. Main responsibilities:

- In house formation.

- Modelling:
    1. Ground water: model setup and transient calibration of the regional scale aquifer Wasseramt (Solothurn, Switzerland) and watershed management. Software used: Spring, TRANSDENS, BASEMENT, own toolbox.
    2. Surface water: transient water level fluctuations at Emme and Rhein rivers (Switzerland), including regulated weirs/gates. Software: BASEMENT/BASECHAIN, own toolbox.
    3. Contaminant transport modelling: several works for the NAGRA. Development of workflows and applications exclusive for NAGRA.
    4. Geothermal modelling: current state and forecast of the geothermal potential of Canton Graubunden, Chur city, Schwyz city (all in Switzerland). Development of local models for the heat use of groundwater (Ikea, Manor and others). Software: Spring, Basement, own toolbox.
    5. THM modelling: technical assessment to Geo-Energie Suisse AG and Nagra. Software: own toolbox.
    6. Web master and community manager: new web page for TK Consult AG and storefronts in Facebook and LinkedIn.
    7. Staff coordination
    8. Marketing, Strategy & Finances

- Software development:
    1. EDZ_Ups: upscaling of complex discrete fracture networks to simple equivalent shell models. Developed for NAGRA.
    2. MPS: multiple-point statistical toolbox. Own development.
    3. GT-40S: calibration of a handheld spectrometer and reconstruction of borehole logs from logs long core segments. Developed for NAGRA.
    4. Rooflo: design of correction measures to avoid flooding of roofs using graphs theory. Developed for the Nuclear Power Plant Gösgen in Switzerland.
    5. Rech_Sol: calibrating of soil parameters using rainfall and piezometric data. Own development.

May 2011 – August 2014

Geo-Energie Suisse AG, Zürich, Switzerland. Position: Senior hydrologist / Project Manager. Main responsibilities:

- Modelling:
    1. Economic viability of geothermal projects. Software: Structure, own toolbox.

2. Evaluation of seismic hazard associated with the stimulation of Enhanced Geothermal Systems. Software: own toolbox.
3. Thermo-Hydro-Mechanical modelling of the stimulation of Enhanced Geothermal Systems and of the production of geothermal systems. Development of hybrid semi-analytical models and analytical solutions for the heat exchange between injected fluid and surrounding rock. Software: TRANSDENS, own toolbox.

- Project management:
  1. Thermo-Hydro-Mechanical models: survey, budget (and deadlines) and quality control of projects developed by Q-Con, Geomecon, Geowatt, Itasca, TK Consult, CHYN, UPC, etc.
  2. Economic management: project by GTC Kappelmayer.
  3. Seismic risk and Hazard: project GEOSIM, carried out by Geo-Energie Suisse AG and the Swiss Seismological Survey (SED).

- Software development:
  1. Schemes: design of casing schemes of geothermal wells, involving the drilling costs and thermal production of a geothermal dipole.
  2. PISHA: probabilistic analysis of hazards associated with the stimulation of Enhanced Geothermal Systems.
  3. DIFT. Software for the modelling of the connectivity between a geothermal borehole and the formation, including both openhole, cemented and plug-and-perf completion schemes.
  4. DIPOLE. Software for the thermo-hydro-mechanical modelling of geothermal dipoles.
  5. ECO. Software for the economic evaluations of geothermal projects.

- Work developed for the Nagra (October 2012-August 2014). Hydraulic modelling of the Excavation Damaged Zone around the galleries of a target waste disposal.

May 2009 – May 2011

TK Consult AG, Zürich, Switzerland. Position: Senior hydrologist / Project Manager. Main responsibilities:

- In house formation courses in Lima (Peru). Topic taught: Advanced Ground Water Inverse modelling.

- Ground water modelling:
  1. Development of several geostatistical models for the characterization of siting regions candidates to host the Swiss nuclear repository. Strata modelled: Opalinus Clay, Effingen Member, Brauner Dogger at several areas in Switzerland and Southern Germany. Client: NAGRA.
  2. Design of an optimum pumping network for a desalination plant in Oman: instrumentation of wells, data gathering, aquifer characterization by numerical inverse modelling, design of the optimum pumping configuration and calculation of the economic feasibility of the solution. Client: Veolia Water Solutions and Technologies.

- Surface water modelling:
  1. Development of break-and-flood models of the dams at Sihlsee. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich).
  2. Development of the routing (1D and 2D) flood models of Zürich city and surroundings (from Sihlsee to Baden). Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich).
  3. Design of the correction measures at Sihl and Limmat rivers to prevent floods in Zürich. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich).
  4. Design of a tunnel-routed system to prevent floods in Zürich. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich).

- Ground water – surface water interactions:
  1. Flood risk analysis of parking and basements in Zürich caused by floods of Sihl and Limmat. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich).

- Software development (see section *Software Developed* for further details):
    1. Mesh_Rivers: a tool for the automatic generation of finite elements / volumes meshes representing stream / river courses from available cross sections and digital elevation models. This software allows the automatic generation of sophisticated geometries such as U-turns over small distances.
    2. Mesh_Deform: a tool for the automatic generation of meshes warped according to a given surfaces. This software allows a fast generation of finite elements / volumes meshes including tens of millions of elements.
    3. Sitra_Aniso: a modification of an old code to include 3D anisotropy in the hydraulic conductivity tensor and accelerations in the mathematical solver.

- Web design and implementation of TK Consult AG homepage: www.tkconsult.ch

September 2006 – May 2009

Centre d'Hydrogéologie et de Géothermie de Neuchâtel (CHYN). Position: Post Doc / Assistant professor. Main responsibilities:

- Technical assessment to Veolia Water Solutions and Technologies.

- Professor of the Post Graduate CUSO Course “Inverse Problems”, together with Professors A. Tarantola and Ph. Renard. September 2007.

- Professor of the Post Graduate CUSO Course “Model Calibration and Quantification of Predictive Uncertainty Using PEST (Parameter ESTimation)”, together with Professors J. Doherty and Ph. Renard. September 2008.

- Professor in the students’ field trip. Topics: Instrumentation of wells, data gathering and in-situ interpretation of hydraulic and tracer tests.

- Professor in charge of the topic: Applied Geostatistics.

- Technical assessment to students (all levels, from the undergraduate to Ph. D.)

- Software development (see section *Software Developed* for further details):
    1. GIM (Groundwater Integrated Modelling). Objected Oriented FORTRAN Software aimed at scientific software intercommunication.
    2. RPPM-MP. A tool aimed at conditioning aquifer characterizations to different kinds of data using the Regularized Pilot Points Method (own Thesis’ method) and Multiple Point statistics.
    3. INME. A FORTRAN code for the solution of the INverse Moment Equations for the characterization of highly heterogeneous fields.

September 1997 – September 2006

Department of Geotechnical Engineering and Geosciences. Hydrogeology Group of the Technical University of Catalonia (UPC, Spain). Positions: Researcher and Assistant Professor. Main responsibilities:

- Professor of the Ph. D. Program of the Technical University of Catalonia. Topics taught: Numerical methods, Geostatistics.

- Professor of the Postgraduate course “*International course on Groundwater Hydrology*”. Editions 2002-2007. Topics taught: Geostatistics, Pumping Test Set-Up and Analysis, Numerical Methods.

- Professor of the Master Program in Hydrogeology, Technical University of Catalonia. September 1999 – September 2006. Topics taught: Basic and Advanced Hydrogeology, Hydrogeological Exploration, Numerical Methods.

- Professor of the Ph.D. Course “Parameter Identification in Groundwater Modelling”, together with Professors J. Carrera and A. Medina. Kopenhagen (Denmark).
- Professor of the Post Graduate Course “Interpretation of pumping tests with EPHEBO”. Barcelona and Madrid (Spain).

- Technical assessment to students (all levels, from the undergraduate to Ph. D.)

- Technical assessment to the following public and private entities: ENVIROS (Barcelona, Spain), ENRESA (Spanish company for management of radioactive waste), IGME (Spanish Geological Survey), BGS (British Geological Survey), UNESCO, INITEC (Madrid, Spain), Entidad Metropolitana, S.A (Barcelona, Spain), AENA (Spanish airports and air navigation company), Barcelona city council, Badalona city council.

- Software development (see section *Software Developed* for further details):
    1. TRANSIN (Transin Inversion). A Finite Elements Fortran code for the transient inversion of fields characterizing aquifer properties.
    2. Cooperation in the development of RETRASO (REactive TRAnsport SOlver), a FORTRAN code for the simulation of transport processes (advection, dispersion and diffusion) and chemical reactions (acid-base reactions, redox, complexation, adsorption, cation exchange, precipitation and dissolution of minerals).
    3. Seminal cooperation in the development of CODEBRIGHT (BRIne, Gas, Heat and Temperature), a FORTRAN code for the modelling of coupled mechanical, hydraulic and thermal.
    4. EPHEBO. This software allows estimating hydraulic parameters by the interpretation of pumping tests.
    5. VisualGUM. Visual pre and post-process interface to RETRASO, CODEBRIGHT, TRANSIN and EPHEBO.
    6. PERCOL. A FORTRAN code for the solution of the stochastic percolation problem.

September 1996 – September 1997

Department of Applied Mathematics of Technical University of Catalonia. Position: Professor’s assistant. Main responsibilities:

- Professor of Applied Statistics.

- Professor at the Workshop: “GEOEAS, a geostatistical toolbox”.

- Technical assessment to students at the undergraduate level.

September 1993 – September 1997

Academia Sol. Position: Teacher. Topics taught: Soil Mechanics, Numerical methods in geotechnical engineering, Quantitative Physics, Soil Statics and Dynamics, Descriptive geometry, Algebra, Calculus, Functional Analysis, Satellite mechanics.

June 1996 – June1999

Fomento de Construcciones y Contratas, Soil Engineering Department, Barcelona. Position: External Consultant. Main responsibilities:

- Project Feasibility Analysis.

- Evaluation of external projects and reports.

- In situ surveillance of the dewatering system of the FORUM of Nations facilities, Barcelona.

PUBLICATIONS

Publications in peer reviewed journals

(32) Alcolea A., Firat-Luthi B., Garitte B., Gens A., Kolditz O., Laloui L., Madaschi A., Marschall P., Nagel T., Olivella S., Damians I. P., Reinicke A., Shao H., Wojnarowicz M., Wang W., Zhasmin M.. 3D modelling of THM repository induced effects in the Mont Terri FE experiment. A code and calculation-verification exercise. In preparation.

(31) Alcolea A., Hidalgo J., Meier P. Semi-analytical solution for the modelling of heat fluxes in Engineered Geothermal Systems. In preparation.

(30) Alcolea A., Renard Ph., Carrera J. The RPPM-MP: Multiple point geostatistics and pilot points method for the joint characterization of non-Gaussian facies' geometries and facies spatial variability at the intra-facies. In preparation.

(29) Madaschi A., Crisci E., Ferrari A., Alcolea A., Marschall P., Laloui L. Mechanical anisotropy of layered geomaterials: a multiscale approach. In preparation.

(28) Alcolea A., Meier M. Vilarrasa V. Olivella S. Carrera J. (2024). Hydromechanical modeling of the hydraulic stimulations in borehole PX2 (Pohang, South Korea). Geothermics 120 (2024) 103009

(27) Gischig V., Rinaldi A., Alcolea. et al. (2024). Updating induced seismic hazard assessments during hydraulic stimulation experiments in underground laboratories: workflow and limitations. Submitted to International Journal of Rock Mechanics & Mining Sciences.

(26) Sánchez-Vázquez A, Sánchez-Vázquez B, Solís-Calderón I, Bujons-Tur A, Alcolea-Rodríguez A, Badell-Serra I. (2024). Enuresi: un repàs històric des del ritual màgic fins als tractaments actuals. Pediatr Catalana. 2023;83(4)

(25) Alcaraz A., Polo M.J., Hornero J. Jimenez-Martinez J. Alcolea A., Manzano M. (2024). Computing the spatial-temporal evolution of groundwater recharge to the Quaternary aquifer of Campo de Cartagena (SE Spain) from 1970 to 2022. Ingeniería del Agua 28.3.2024. e ISSN: 1886-4996 ISSN: 1134-2196.

(24) Vaezi I., Alcolea A., Meier P., Parisio F., Carrera J., Vilarrasa V. Numerical modeling of hydraulic stimulation of fractured crystalline rock at the Bedretto Underground Laboratory for Geosciences and Geoenergies. International Journal of Rock Mechanics & Mining Sciences 176 (2024) 105689.

(23) Vaezi I., Parisio F., Yoshioka K., Alcolea A., Meier P., Carrera J., Olivella O., Vilarrasa V. (2024). Implicit hydromechanical representation of fractures using continuum approach. International Journal of Rock Mechanics & Mining Sciences 183 (2024) 105916.

(22) Markale I., Velasquez-Parra A., Alcolea A., Jimenez-Martınez J. (2022). Mixing Controlled Adsorption at the Liquid-Solid Interfaces in Unsaturated Porous Media. Transport in Porous Media. https://doi.org/10.1007/s11242-022-01747-x

(21) Dahrabou A., Valley B., Meier P., Brunner Ph., Alcolea A. (2021) A systematic methodology to calibrate wellbore failure models, estimate the in-situ stress tensor and evaluate wellbore cross-sectional geometry. International Journal of Rock Mechanics & Mining Sciences 149 (2022) 104935. https://doi.org/10.1016/j.ijrmms.2021.104935.

(20) Jiménez-Martínez J.J., Alcolea A., Straubhaar J. A., Renard Ph. Impact of phases distribution on mixing and reactions in unsaturated porous media. Advances in Water Resources 144 (2020) 103697.

(19) Alcolea A., Contreras S., Hunink J., García-Aróstegui J.L., Jiménez-Martínez J.J. Hydrogeological modelling for the watershed management of the Mar Menor coastal lagoon (Spain). Science of the Total Environment 663 (2019) 901–914.

(18) Alcolea A., Kuhlmann U., Marschall P. 3D modelling of the Excavation Damaged Zone around HLW/ILW tunnels and shafts using a Marked Point Process technique. Geomechanics for Energy and the Environment 17 (2019) 29–46.

(17) Alcolea A., Becker J.K., Marschall P. An automated procedure for the detailed analysis of geophysical well-logs. In: NORRIS, S., NEEFT, M. & VAN GEET, M. (eds) Multiple Roles of Clays in Radioactive Waste Confinement. Geological Society, London, Special Publications, 482, https://doi.org/10.1144/SP482.9.

(16) Marschall P., Giger S., de La Vaissière R., Shao H., Leung H., Nussbaum Ch., Trick Th., Lanyon G.W., Senger R., Lisjak A., Alcolea A. (2016). Hydro-mechanical evolution of the EDZ as transport path for radionuclides and gas: insights from a dedicated experimental programme in the Mont Terri URL. Swiss Journal of Geosciences – Springer. doi: 10.1007/s00015-016-0246-z

(15) Alcolea A., Kuhlmann U., Marschall P., Lisjak A., Grasselli G., Mahabadi O., de La Vaissière R., Leung H., Shao H. (2016). A pragmatic approach to abstract the EDZ around tunnels of a geological radioactive waste repository. Application to the HG-A experiment in Mont Terri. In: Norris, S., Bruno, J., Van Geet, M. & Verhoef, E. (eds) Radioactive Waste Confinement: Clays in Natural and Engineered Barriers. Geological Society, London, Special Publications, 443, http://doi.org/10.1144/SP443.8.

(14) Pool M., Carrera J., Alcolea A. (2015). A comparison of deterministic and stochastic approaches for regional scale inverse modelling on the Mar del Plata aquifer. Journal of Hydrology, http://dx.doi.org/10.1016/j.jhydrol.2015.09.064.

(13) Gischig V., Wiemer S., Alcolea A. (2014). Balancing reservoir creation and seismic hazard in enhanced geothermal systems. Geophys. J. Int. 198, 1585–1598.

(12) De Simone S., Vilarrasa V., Carrera J., Alcolea A., Meier P. (2013). Thermal coupling may control mechanical stability of geothermal reservoirs during cold water injection. Physics and Chemistry of the Earth, Parts A/B/C, 64(1), pp. 117-126.

(11) Riva M., Guadagnini A., De Gaspari F., Alcolea A. (2010), Exact sensitivity matrix and influence of the number of pilot points in the geostatistical inversion of moment equations of groundwater flow, *Water Resour. Res.,* 46, W11513, DOI:10.1029/2009WR008476.

(10) Alcolea A., Renard Ph. (2010), Blocking Moving Window algorithm: Conditioning multiple-point simulations to hydrogeological data, Water Resour. Res., 46, W08511, doi:10.1029/2009WR007943.

(9) Silva O., Carrera J., Kumar S., Dentz M., Alcolea A., Willmann M. (2009): A general real-time formulation for multi-rate mass transfer problems, *Hydrol. Earth Syst. Sci.*, 13, 1399-1411.

(8) Hendricks Franssen H.J., Alcolea A., Riva M., Bakr M., van der Wiel N., Stauffer F., Guadagnini A. (2009), A comparison of seven methods for the inverse modelling of groundwater flow. Application to the characterisation of well catchments, *Advances in Water Resources*, doi:10.1016 /j.advwatres.2009.02.011.

(7) Alcolea A., Renard Ph., Mariethoz G., Bertone F. (2009). "Reducing the impact of a desalination plant using stochastic modeling and optimization." Journal of Hydrology, 365(3-4): 275-288.

(6) Alcolea A., Carrera J., Medina A. (2008). Regularized pilot points method for reproducing the effect of small scale variability. Application to simulations of contaminant transport. Journal of Hydrology, 355(1-4): 76-90.

(5) Alcolea A., Castro E., Barbieri M., Carrera J., Bea S. A. (2007). "Inverse Modeling of Coastal Aquifers Using Tidal Response and Hydraulic Tests." Ground Water 45(6): 711–722.

(4) Alcolea A., Carrera J., Medina A. (2006). "Inversion of heterogeneous parabolic-type equations using the pilot points method." International Journal for Numerical Methods in Fluids 51(9-10): 963-980.

(3) Alcolea A., Carrera J., Medina A. (2006). "Pilot points method incorporating prior information for solving the groundwater flow inverse problem." Advances in Water Resources 29: 1678–1689.

(2) Carrera J., Alcolea A., Medina A., Hidalgo J., Slooten, L. J. (2005). "Inverse problem in hydrogeology." Hydrogeology Journal 13: 206-222.

(1) Carrera J., Medina A., Vives L., Alcolea A., Marcuello A., Jodar J., Benet I., Saaltink M., Vazquez-Suñe E., Sanchez-Vila X., Sendros D., Ramajo H. (2001). "Modelació del flux i transport de soluts en medis porosos." TERAFLOP, Journal of CESCA, Special Centre for Super Computation of Catalonia 61: 29-30.

Books / chapters in books

(10) Alcolea A. The finite element method. In *Hydrogeological modelling.* IGME. In preparation.

(9) Renard Ph., Alcolea A., Ginsbourger D. (2013) Stochastic versus deterministic approaches. In *Environmental models: finding simplicity in complexity.* DOI: 10.1002/9781118351475.ch8

(8) Carrera J., Pool M., Abarca E., Hidalgo J.J., Slooten L.J., Vazquez-Suñe E., Sanz E., Gámez D., Alcolea A. (2011). Principios y conceptos básicos sobre intrusion marina y gestión de acuíferos costeros. In *Cuatro décadas de investigaciñón y formación en aguas subterráneas. Libro Homenaje al Profesor Emilio Custodio.* ISBN: 978-84-938046-1-9.

(7) Vazquez-Suñe E., Casamitjana A., Sanchez-Vila X., Melcion C., Alcolea A., Sanz E. (2005). Hidrogeología de Badalona. Ed. Badalona city council, 83 pages, ISBN: 84-606-3771-9.

(6) Alcolea A., A. Medina (2003). Groundwater flow in porous media. In *Encyclopedia of life support systems (EOLSS)*, Unesco Series, number 20, 19 pages. eBook publication.

(5) Alcolea A., Ayora C., Bernet O., Bolzicco J., Carrera J., Cortina J. L., Coscera G., de Pablo J., Domenech C., Galache J., Gibert O., Knudby C., Mantecon R., Manzano M., Saaltink M., Silgado A. (2001). Barrera geoquimica. In *Boletin Geologico y Minero(Special edition "Las aguas y los suelos tras el accidente de Aznalcollar"*): 229-257.

(4) Medina A., Galarza G., Carrera J., Alcolea A. (2001). "El problema inverso en Hidrologia Subterranea." In *Boletin Geologico y Minero* 112: 93-106.

(3) Alcolea A. (1999). Proteccion de la subunidad acuifera Almonte-Marismas. Ed. Technical University of Catalonia, 560 pages. In Spanish.

(2) Alcolea A. (1999) A hybrid Marquardt Simulated Annealing method for solving the groundwater inverse problem. Ed. Technical University of Catalonia, 73 pages.

(1) Alcolea A., Font D. (1996). Osmosis inversa: solución a la sequía en el futuro. In *Environment,* Ed. Technical University of Catalonia, pp. 145-150.

Conference proceedings (*: presenter)

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(82) Meier P. M.*, Zingg O., Alcolea A., Bethmann F., Dyer B. C., Karvounis D., Ollinger D., Fiori R., Serbeto F. (2024). Learning curve of seismic risk mitigation for EGS from the perspective of a project developer. From Basel 2006 to Utah FORGE 2024. GRC Transactions, Vol. 48, 2024. Geothermal Rising Conference 2024. Waikoloa (USA), October 2024.

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(15) Aktennotiz AN11-409: TU-GSA-HRM: Baseline Model of the Opalinus Clay in the Siting Area Nordlich Lägern (NL-OPA/HAA, SMA & Codisposal) . Client: NAGRA, 2011.

(14) Update of the numerical model of Sur aquifer. New optimum design of the pumping network to feed the Sharquiya desalination plant. Client: Veolia Waters, 2011.

(13) Aktennotiz AN10-512: TU-GSA-HRM: Baseline Models of the Effingen Member in the Siting Area Jura Südfuss / Part I – Facies Model. Client: NAGRA, 2011.

(12) Aktennotiz AN10-399: TU-GG-EWG: Geostatistical models of porosity and hydraulic conductivity distributions derived from variogram analysis of geophysical well-logs. Methodology. Client: Nagra, 2010.

(11) Design of a tunnel-routed system to prevent floods in Zürich. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich), 2010.

(10) Design of the correction measures at Sihl and Limmat rivers to prevent floods in Zürich. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich), 2010.

(9) 1D/2D routing flood models of Zürich city and surroundings (from Sihlsee to Baden). Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich), 2009-2010.

(8) Break-and-flood models of the dams at Sihlsee. Client: AWEL (Amt fur Abfall, Wasser, Energie und Luft, Zürich), 2009.

(7) Alcolea A., Renard Ph., Mariethoz G. Numerical characterization of an aquifer in Oman. Client: Veolia Waters, 2008.

(6) Alcolea A, Carrera J, Castro E., Barbieri M, Bea S.A. Hydrogeological modelling of the SROA geological unit. Client: ENRESA, 2005.

(5) Alcolea A., Sanz E., Vázquez-Suñé E., Sánchez-Vila X., Carrera J. Aprovechamiento de las aguas freáticas del municipio de Badalona. Client: Badalona City Council, Publication 31/LGE-3/00, 2001.

(4) Alcolea A., Carrera J. On matrix diffusion. Integral-differential formulation. ENRESA, Publication C03493, 2000.

(3) Alcolea A., Martínez-Landa L., Carrera J. Study of numerical instabilities in three-dimensional simulations of radionuclide transport. The DGS (deep geological storage) model. ENRESA, Publication C03492, 2000.

(2) Alcolea A., Bolzicco J., Carrera J. Proyecto de Ejecución de una barrera geoquímica experimental en el río Agrio (Aznalcóllar). IGME. Publication 1FD97-0765, 1998.

(1) Alcolea A., Carrera J. Modelo regional de flujo subterráneo del sistema acuífero Almonte-Marismas y su entorno. IGME. Publication 280/98, 1998.

SKILLS

Languages

Mother tongues: Spanish and Catalan.

Notation: *Common European Framework of Reference for Languages*

	Understanding				Speaking				Writing	
	Listening		Reading		Spoken interaction		Spoken production			
English	C2	Proficient	C2	Proficient	C2	Proficient	C2	Proficient	C2	Proficient
German	B1	Independent	B1	Independent	B1	Independent	B1	Independent	B1	Independent
French	B1	Independent	B1	Independent	B1	Independent	B1	Independent	B1	Independent
Italian	A1	Basic	A1	Basic	A1	Basic	A1	Basic	A1	Basic

Programming Languages and Software

1. Expert programmer in MATLAB, FORTRAN77, FORTRAN90, FORTRAN95.
2. Proficient in Object Oriented Programming.
3. Proficient developer of php and Java protocols for dynamic web design.
4. Independent programmer in Visual Basic and Unix scripting.
5. Basic programmer in C++.
6. Proficient user of modelling software (e.g., Feflow, Spring, TRANSIN, PEST, CODEBRIGHT, etc.; beginning with iTOUGH2).
7. Proficient user of visualization software (e.g., Tecplot360, Paraview, AutoCad).

Awards and External Funding:

1. Fellowship from the Swiss National Science Foundation. 2006-2009.
2. Award: Outstanding Student Paper Award, AGU. 2006.
3. Award: Excellency in Teaching. Technical University of Catalonia. 2006.
4. Fellowship from the Swiss National Research Foundation. 2006.
5. Fellowship from the Spanish Ministry for Education and Sciences. 1999-2003.
6. Fellowship from the NATO Science Program. 2002.
7. Fellowship from the FCHIS, Fundación Centro Internacional de Hidrología Subterránea. 2001.
8. Fellowship from the CESCA (Centre for super computers in Catalonia). 1999.
9. Fellowship from the Technical University of Denmark. 1999.

10. Fellowship from the Technical University of Catalonia. 1998.
11. Fellowship from the Environment and Climate Program of the European Commission. 1998.
12. Fellowship from the IAMG (International Association for Mathematical Geology). 1997.

Memberships

American Geophysical Union.
International Association of Hydrogeologists.
International Association of Hydrogeologists, Spanish chapter.
EAGE.
SASEG.
The Water Network (external expert and coordinator).

Organizing and Scientific Committees

1. Scientific committee of the IARH Groundwater Symposium, Valencia, September, 2010.
2. Organizing and scientific committee of the *GEOENV* congress, Valencia, September, 2010.
3. Member of NAGRA's task-force. Since 2009.
4. Organizer of the Post Graduate CUSO Course "*Inverse Problems*", together with Professor Ph. Renard. September 2007.
5. Organizer of the Post Graduate CUSO Course "*Model Calibration and Quantification of Predictive Uncertainty Using PEST (Parameter ESTimation)*", together with Professor Ph. Renard. September 2008.
6. Member of the evaluation committee of the *Fonds National de la Recherche de Luxembourg*. Since 2006.
7. Organizing and scientific committee of the congress: "*Las caras del agua subterránea*", Barcelona, 2001.
8. Organizer of the Post Graduate Course "Interpretation of Pumping Tests with EPHEBO", together with Professor Jesus Carrera. Barcelona and Madrid, 2000.
9. Organizing committee of the Workshop: "*Mathematical Methods in Earth Sciences*". Barcelona, 1997.
10. Organizing committee of the "*IAMG 1997. Annual conference of the International Association for Mathematical Geology*". Barcelona, 1997.
11. Reviewer of journals: Water Resources Research, Journal of Hydrology, Hydrogeology Journal, Ground Water and Advances in Water Resources, amongst others.
12. Member of the Evaluation Committee of three Ph. D. Dissertations at UPC (Technical University of Catalonia, Spain).

Teaching experience

Undergraduate level

Date	***Topic***	***Diploma***	***Hours/week***	***# students***
2003-06	Hydrology and hydraulics	Technical Engineering	2	~25
2003-06	Advanced Hydrogeology	Civil Engineering	3	~100
2003-06	Advanced Hydrogeology	Geological Engineering	5	~25
2003-06	Quantitative Hydrogeology	Civil Engineering	3	~200
2003-06	Quantitative Hydrogeology	Geological Engineering	4	~40
2003-06	Quantitative Hydrogeology	Technical Engineering	2	~40
2002-06	Numerical methods in Groundwater Hydrology	Civil Engineering	3	~10
2002-06	Numerical methods in Groundwater Hydrology	Geological Engineering	3	~20
1996	Statistics	Civil Engineering	2	~250

Graduate level

Date	***Topic***	***Diploma***	***Hours/week***	***# students***
2002-06	Flow and transport models in porous media	---	4	~25
2001-06	Geostatistics	---	2	~20
2001-06	Advanced Geostatistics	---	2	~20

Courses taught outside the Technical University of Catalonia

Date	***Topic***	***Organizer***	***Hours/week***	***# students***
2009-	Inverse modelling	Camiper Lima	20	~40
2007	Inverse Problem	University of Neuchâtel	20	~25
2002-06	International course on Groundwater Hydrology	Fundacion Curso Internacional de Hidrología Subterránea	6	~30
1999	Parameter identification in Groundwater Modelling	Technical University of Denmark	25	~20

1998	Aquifer rehabilitation	ICT (Catalan Institute for technology)	2	~20

PUBLICALLY AVAILABLE SOFTWARE DEVELOPED

1) **TRANSIN** (TRANSient INversion of the coupled groundwater flow and contaminant transport equations). Main capabilities of the code include:

- Simulation (i.e., standard direct solution of the aforementioned equations, linear or non-linear).
- Parameter estimation. It is the primary use of the code. It makes use of analytical derivatives (as opposed to numerical) for the sensitivity analysis.
- Error analysis. That is, evaluation of uncertainty on model parameters
- Sensitivity analysis. Evaluation of how state variables will change in response to changes in model parameters
- Model selection. That is, identification of the best among a set of alternative conceptual models.
- Experiment design: selection of the most informative experiment among a set of alternatives.
- 1D, 2D, 3D, 4D, multi-D finite elements of different types
- Dual porosity models
- Geostatistical interpretation through the Regularized Pilot Points Method
- Density-driven formulation.

2) **CODE_BRIGHT** (BRIne, Gas, Heat and Temperature). This software solves the fully coupled thermo-hydro-mechanic problem, including solute and gas transport media. The computer code, originally, was developed on the basis of a new general theory for saline media. Then the program has been generalized for modelling thermo-hydro-mechanical (THM) processes in a coupled way in geological media. Basically, the code couples mechanical, hydraulic and thermal problems in geological media. The theoretical approach consists in a set of governing equations, a set of constitutive laws and a special computational approach. The code is written in FORTRAN and it is composed by several subroutines. The program does not use external libraries. CODE_BRIGHT uses GiD system for preprocessing and post-processing. GiD is developed by the International Center for Numerical Methods in Engineering (CIMNE). GiD is an interactive graphical user interface that is used for the definition, preparation and visualization of all the data related to numerical simulations. This data includes the definition of the geometry, materials, conditions, solution information and other parameters. The program can also generate the finite element mesh and write the information for a numerical simulation program in its adequate format for CODE_BRIGHT. It is also possible to run the numerical simulation directly from the system and to visualize the resulting information without transfer of files.

3) **EPHEBO** (Estimación de Parámetros Hidráulicos en Ensayos de BOmbeo). This software allows estimating hydraulic parameters in pumping tests by automatic calibration, was developed for VAX/VMS environments and it is provided with a text-mode interface which makes it quite difficult to understand and manage. In order to solve all these problems and include new graphic functions, when transferring it to this platform, it was decided to stop developing the text-mode interface and create a new interface for Microsoft Windows, that is, EPHEBO. The new program also allows interpreting graphically (Diagnostic Plot, Theis Superposition, Hantush Superposition, Cooper-Jacob Solution, Neuman Solution), as well as generating charts and data with the results obtained. MariaJ code is only used for automatic methods, the rest of interpretation methods are all new.

4) **RETRASO (REactive TRAnsport SOlver).** RETRASO simulates transport processes (advection, dispersion and diffusion) and chemical reactions (acid-base reactions, redox, complexation, adsorption, cation exchange, precipitation and dissolution of minerals). Chemical reactions can be assumed to follow either an equilibrium or a kinetic approach. The numerical solution is carried out using the global implicit or direct substitution approach. That means that all equations are solved simultaneously by applying Newton-Raphson

5) **VisualGUM.** Visual pre and post-process interface to RETRASO, TRANSIN and EPHEBO and CODEBRIGHT.

6) **GIM. (Groundwater Integrated Modelling)**

GIM (Groundwater Integrated Modelling) integrates existing scientific software packages in an overall fully-parallel object-oriented FORTRAN 95 structure. Thus, the capabilities of GIM are numerous (different solvers of direct and inverse problem, of groundwater flow, contaminant (conservative or not) or heat transport, etc.) as it takes profit of those of the codes embedded in its structure.