José Javier Muñoz-Criollo

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Experience

Research Associate
Jan 2015 – Jan 2018

Part of the INSPIRE (*In-Situ Processes in Resource Extraction from Waste Repositories*) project financed by NERC (Natural Environment Research Council). Main responsibilities involve the development of numerical and analytical models to describe heterogeneous flow processes and resource mobilisation and transport, in particular the biological dynamics of growth and decay of soil bacteria and its impact in the hydraulic properties of soils. The post involves close collaboration within a highly multidisciplinary team that brings together specialists in soil science, geochemistry, microbiology, numerical analysis, environmental engineering and social science across three universities, and with the project partners and to support the supervision of several research students.

Experimental work
2015-2017

I am involved in a research project that studies the impact of variable conductivity layers and freezing on the performance of Seasonal Thermal Energy Storage (STES) in soils. This involves the development of mathematical models and numerical evaluations to advice the design of the experimental system. Experimental observations are used in turn to validate the mathematical models and to propose improvements to the experimental setup. Furthermore, during my PhD I performed site soil sampling and laboratory tests for basic soil physical properties. This made me familiar with soil laboratory safety procedures that could similarly be used in other laboratory facilities.

Teaching
2013 – 2017

I have served as a teaching assistant on environmental engineering courses with focus on modelling software tools such as Modflow for aquifer modelling. I have experience as computer laboratory demonstrator for numerical methods and programming courses on C++ and Matlab. I have also occasionally had the opportunity to act as a lecturer substitute in a graduate level course on environmental modelling and risk assessment.

Supervisory skills
Jan 2015 – Jan 2018

I have experience supporting and advising graduate students working on numerical and experimental projects related with: geothermal engineering (2 PhD students), methane generation from landfills (MSc student) and fate and transport of contaminants in soils (MSc student).

Representative for international outreach
February 2017

Mexican university ITESM as part of a Global Faculty Program invited faculty members from international partner universities to develop and strengthen international research collaborations. In this context I was invited to be part of a committee representing Cardiff University School of Engineering and to present the current research areas of interest in our groups.

Software development
2011-2018

During the course of my PhD I specialized in C++ coding for the development of numerical models exploiting HPC capabilities. For this I chose a open source finite element library DEAL.II where through the interaction with the developers I became proficient in the process of collaborative software development. Currently I actively participate in the community submitting bug reports and the creation of patches. Additionally, as a side project I'm developing a library with C++ codes with known solutions of analytical equations for the heat transfer equation under different conditions (source codes publicly available at my GitHub account).

Education

Cardiff University   Cardiff, Wales, UK

Ph. D. in Engineering
2011 – 2015

Thesis title: *An investigation of inter-seasonal near-surface ground heat transfer and storage.*
Topic: Numerical analysis of a ground-based inter-seasonal thermal storage system. Special focus is given to the energy interactions between the soil's surface and the atmosphere and its influence on the shallow soil thermal profile and corresponding impact on the performance of heat exchangers. The research involves the use of the Finite Element Method applied to solve the time dependent heat diffusion equation in 1D, 2D and 3D with different materials and heat generation; boundary conditions of the 2nd and 3rd kind at the soil surface; development of analytical equations for benchmark and initial conditions; use of adaptive mesh refinement techniques; use of open source software for mesh generation, solution of FEM equations in parallel and visualization of results.

Universidad Nacional Autónoma de México, Instituto de Energías Renovables Cuernavaca, México

M. Sc. in Renewable Energy
2008 – 2010

Thesis title: *Radiative cooling of buildings (Enfriamiento Radiativo en Edificaciones).*

Topic: Numerical simulation of an experimental heat exchanger for water cooling using infrared radiation interactions with the night sky and evaluation of its possible application to reduce the cooling energy demand of buildings. The research involves the use of the Finite Difference Method to solve the transient mass and heat flow in the heat exchanger and water storage tank; and the mathematical description of the radiative heat transfer in the infrared region (atmospheric window) between the heat exchanger and the sky.

Universidad Autónoma de Yucatán Yucatán, México

B.S Engineering Physics
2001 – 2008

Thesis title: *Use of infrared spectroscopy techniques to analyse the quality of 5 natural wells in Yucatan (Aplicación de la técnica de espectroscopía infrarroja al análisis de la calidad del agua en 5 cenotes de Yucatán)* bf Topic: Experimental study of the quality of groundwater in the Yucatán peninsula using infrared spectroscopy to determine the presence of chemical indicators. Special focus was given to: development of skills for sampling and laboratory analysis, analysis of environmental impact of certain chemical compounds in ground water.

Awards and recognitions

Scholarships

Ph. D.
2011 – 2014

Full scholarship from the National Council for Science and Technology of México (CONACYT) to study the PhD program at Cardiff University School of Engineering.

Bursary
2014

£3000 bursary from the Mexican Secretariat for Public Education (SEP)

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M. Sc.
2008 – 2010

Full scholarship from the National Council for Science and Technology of México (CONACYT) to study the M. Sc. program at the Institute for Renewable Energies of the National Autonomous University of México (IER-UNAM).

Skills

Technical specialties: I am an expert in C++, proficient in C and Bash and conversant in Phyton and Matlab. I can perform highly efficient work in both Linux and Windows operative systems. I have solid knowledge of document preparation using Latex, Windows Office and Libre Office. I have vast experience with data visualization using Paraview/Visit/Gmsh/Gnuplot.