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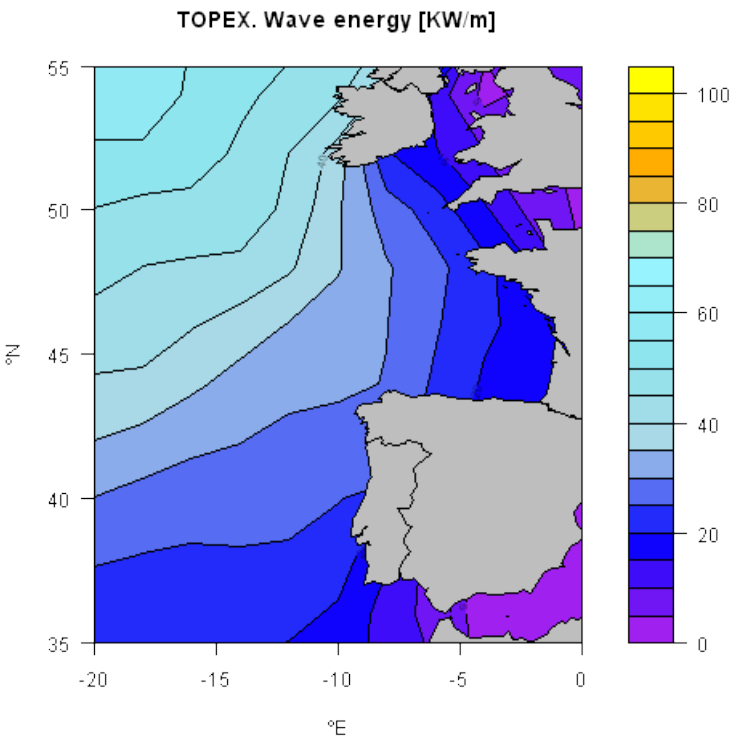
01. SCIENTIFIC PROFILE. (Sep. 2020)

I was awarded my Degree in Engineering at Bilbao´s ***Faculty of Engineering***. Five years later, in 1993, I obtained my PhD..

Currently, I work as a teacher and researcher at the ***Department of Energy Engineering*** in the ***University of the Basque Country*** and I also act as a coordinator of the activities of ***EOLO*** research group In the area of, generally speaking, ***geophysical fluids*** I have led several research projects in the fields of wind and wave energy, renewable energies, air pollution and climate change. I have also taken part in research projects on the fluid mechanics aspects of the biofiltration of waste gases.

In my research activities, I use ***SWAN*** to simulate ocean waves. In this ***video*** we have simulated the heavy storm of Feb 2014 in the Basque Coast. I typically use a variety of ***machine learning*** algorithms (mainly in the framework of ***R***) along with ***CFD*** (***SATURNE*** inside ***CAE Linux***) for fluid mechanics and geophysical fluids applications. In some of these areas, I have also conducted consultancy works for some public institutions. As a result of this work, I have published several research papers in peer-reviewed journals ***(section 03 below)*** and in 2013, along with other researchers from our University, we were granted a patent ***(section 04 below)***. In 2004 I became a fellow of the ***Wessex Institute of Technology*** (UK) as *"a recognition for his outstanding work".*



My research work involves the application of techniques like analogues, random forests and neural networks for classification, downscaling, long-term trend detection, climate analysis and short-term forecasting purposes. The target variables are two groups of ***geophysical fluids:***

i) Fluids associated with renewable energy like wind, and more specifically ocean ***wave energy flux***. This type of energy, like other renewable sources has the problem of intermittency which originates electricity-grid management problems. Being able to forecast with a reasonable accuracy the energy that waves will hold a few hours ahead, can contribute to address this problem.

ii) The variables involved in the atmospheric water cycle

Currently, I am working in two different time scales with both groups of variables. On the one hand, I have developed a set of ***random forests***-based models for short-term prediction of the wave energy flux in the Bay of Biscay. On the other hand, I am trying to learn from current day conditions, how wind power, ocean waves and water cycle variables, relate with long-term changes in climate. I am/have been (co)advisor of five PhD thesis in these research lines. Since 2011, I coordinate the activities of EOLO research group.

02. UNIVERSITY PROFILE

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UPV EHU

The ***University of the Basque Country*** **(EHU/UPV)** is the most important University in the Autonomous Region of the Basque Country, and the one with the widest range of educational offer, with almost one hundred qualifications. The thirty faculties and university colleges, located in campuses in Alava, Bizkaia and Gipuzkoa, cater for more than 60,000 students, 3,500 lecturers and a thousand professional staff.

Regarding the overall research challenges, in our website it can be read that *"We seek to extend our international influence working on a 'brain-gain' basis and establishing cross-border campuses. With a view to reinforce our services and boost technological platforms, our General Research Services Unit (SGIker) commands the acquisition and handling of all research-structures. The University of the Basque Country equally manages several advanced-groundwork centres: The Lucio Lascaray CIEA (Centre for Research and Advanced Studies in Vitoria-Gasteiz) is an innovative, energy efficient building hosting experimental and health sciences research groups; our D+D+I Korta Centre in Donostia-San Sebastián is the seat of the European Theoretical Spectroscopy Facility and the POLYMAT University Institute for Polymeric Materials. This campus also hosts the Material Physics Joint Centre, belonging to the University of the Basque Country and the CSIC; finally, our Scientific Park in the Campus of Biscay (under construction) will soon become the head office of intensive R+D groups, an enterprise incubator and other R+D+I activities support services"*

Bilbao's ***Faculty of Engineering*** is more than 100 years old, belongs to **EHU/UPV** and is located in Bilbao (Basque Country), in the heart of one of the most dynamic and wealthiest areas of Spain. Bilbao`s ***Faculty of Engineering*** is a unique institution particularly intended to bridge high-level education, research, industry and social leadership. Since its beginnings our School of Engineering has inspired and been closely ***linked*** to the economical development of the region, while providing local institutions with leaders that through history have shown their full commitment with this task.

03. PUBLICATIONS IN PEER-REVIEWED JOURNALS BELONGING TO THE JCR (Sep. 2020)

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8. R. Arias, A. Barona, G. Ibarra-Berastegi, I. Aranguiz and A. Elías. Assessment of metal contamination in dregded sediments using fractionation and Self-Organizing Maps. *Journal of Hazardous Materials*, 151, 78-85, 2008.

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13. A. Fernandez, J. Saenz, G. Ibarra-Berastegi. Comparison of the performance of different analogue-based bayesian probabilistic precipitation forecasts over Bilbao. *Monthly Weather Review,* 138, 3107-3119, 2010.

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Three additional papers with educational focus in two JCR journals [Sustainability Q2–DYNA -Q4]

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51. Alain Ulazia, G. Ibarra-berastegi. 2020. Problem-Based Learning in University Studies on Renewable Energies: Case of a Laboratory Windpump. Sustainability 2020, 12(6), 2495; https://doi.org/10.3390/su12062495 (***Special Issue: Approaches and Methods of Science Teaching and Sustainable Development)***

04. PATENT

November 2013. Patent PUBLICATION NUMBER WO 2012056081 (kind A1) and ES2386221 as issued by the Official Spanish Board of Patents.
TITLE: **Biofilter comprising compost-based filler and biofiltration-based method for the purification of a gas stream containing CS2 .**
AUTHORS: **Elias Saenz, Ana; Barona Fernandez, Astrid; Ibarra Berastegui, Gabriel; Gallastegui Ruiz de Gordoa, Gorka Javier; Rojo Azaceta, Naiara . Assignee: Universidad del Pais Vasco, Spain**

This biofilter is full of small pellets with microorganisms. Due to the action of these bacteria, a polluted air stream containing CS2 is depurated when moving across the biofilter.

My contribution was related to the Fluid Mechanics aspects of the gas flow, and more specifically, its Computational Fluid Dinamics (CFD) simulation. The final design as approved in the patent, is basically a cylinder that includes hundreds of small pellets inside.

To that end, I used the CFD code ***SATURNE*** developed at ***Electricité de France EDF R&D*** and currently incorporated into the ***CAE Linux*** suite (running on Linux). The advantage I found over other CFD codes is that its geometric module ***SALOME*** allows using ***a Python script*** to obtain in a straightforward and direct manner, a random distribution and incorporation -just like in real-life biofilters- of 500 pellets into the ***final geometry*** to be meshed.

Regarding the flow of polluted gas stream through the biofilter, ***the CFD simulation I ran*** using ***SATURNE*** correctly described the laminar flow and accurately represented the pressure and velocity fields inside as observed in the laboratory.