



MINISTERIO
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**SUBPROGRAMA RAMON Y CAJAL
CONVOCATORIA 2011**

Nombre: ALONSO VEGA, M. FLORA

Referencia: RYC-2011-07908

Area: Ciencias de la Tierra

Correo electrónico: florav@uvigo.es

Título:

Distribution and speciation of heavy metals in soil solid and solution phases

Resumen de la Memoria:

The distribution of sorbed heavy metals on soil solid phases and their speciation on solution will be investigated as the second stage of a research line focussed on sorption and desorption of heavy metals by soils. The fate of the soil pollutants depends on the processes mediating their distribution between solid and solution because of the well-known equilibrium between both phases. The ions are incorporated in the solid phase during sorption and the contribution of the different sorbents is mainly attributed by several analytical and/or statistical techniques. Nevertheless all of them have limitations due to the inherent complexity of the soil phases and/or because new artifacts are introduced in the soil causing speciation changes. Individual soil components and twenty whole soil samples that cover a wide range of contents and properties influencing the distribution of pollutants will be studied. The main relevant soil properties and the details of the methods are shown in previous works as well as their sorption-desorption capacities. Analytical techniques adapted to these microenvironments (TOF-SIMS and TEM-EDS) will be used to identify and to estimate the contribution of the different sorbents. The speciation technique DMT will be used to determine the free (bioavailable) concentrations in soil solution. TOF-SIMS is a powerful surface analytical technique that provides sensitivity for chemical analysis and spatial resolution. It will be used to investigate the elemental and molecular structure of the samples to a better understanding of the chemical composition, localization and relative quantity of the different species present at the soil surfaces. These results will be supplemented by TEM-EDS which allows a semiquantitative determination of local composition at the nanoscale level. It allows direct visualization (morphology, structure and chemical composition) of minerals and ultra-fine particles. All crystalline and amorphous phases of soil components as well as the assemblage and distribution of the heavy metals to soil particles will be characterized. Generally, the free metal ion is responsible for the toxic effects (bioavailable). The DMT is a speciation technique based on Donnan membrane equilibrium that has been successfully applied to measure cation speciation in soil solutions. Recently, during my stay in Wageningen University we developed and tested it for the determination of free anion concentration and the results are promising. DMT separates colloidal particles in the soil solution from true dissolved species. In addition, there is no dilution of the sample during the analysis, which makes it applicable to samples containing low concentrations of ions and there is no elution or other treatment of the solution sample that may lead to speciation changes. The information about the ion spatial distribution and their relationship with soil solid phases will be verified using both TOF-SIMS and TEM-EDS techniques. DMT will provide data about their speciation (bioavailability) in soil solution. Combining both solid distribution and solution speciation results in equilibrium, the bioavailability and toxicity of heavy metals will be modeled in terms of soil components sorption capacities.

Resumen del Curriculum Vitae:

Bachelor of Biology at the University of Vigo in July 2002, I presented my minor thesis in July 2003 entitled "Selectivity sequences of sorption and desorption of heavy metals by minesoils" obtaining the highest grade (sobresaliente). During 2002-2004 I took MA courses at the programme "Soil and Plant Resources" at the Department of Plant Biology and Soil Science. On March 12, 2008, I obtained my PhD Degree at the University of Vigo. My thesis, "Sorption capacity of Cd, Cu, and Pb by different soils" obtained the grade summa cum laude with distinction. It also received from the Spanish Soil Science Society the José María Albareda award as the best PhD thesis on soil science of Spain in 2008-2009. In 2008, I was hired through public call as Ángeles Alvariño post-doctoral researcher (Xunta de Galicia and University of Vigo). It was at this moment when I started my stay at the research group "Soil Quality and Soil Chemistry" at the University of Wageningen (Netherlands) for 26 months. During this period, I developed and tested the Donnan Membrane Technique for anion measurements. Since 2004, I participated in 14 projects funded by public calls (seven by national calls) and I presented 56 communications (short and proceedings) to different congresses (42 of them international congresses). I have co-directed a PhD thesis, a minor thesis, two MA research works, a graduate project and a master project. All of them obtained the best grade. From 2004 on, I published a chapter in a book and 44 papers among them, 39 were in refereed journals (ISI-JCR). 20 of these papers are within the 25% higher impact factor in its knowledge area at the year of publication and 11 are at the first place. These papers were cited 271 times and mi h-index is 10. Some of them have been cited more than 25 times. The most outstanding ones are: Vega, F.A., Covelo, E.F., Andrade, M.L. 2006. Competitive sorption and desorption of heavy metals in minesoils: influence of minesoil characteristics. *J. Colloid Interface Sci.* 298 (2): 582-592. Vega, F.A., Andrade, M.L., Covelo, E.F. 2010. Influence of soil properties on the sorption and retention of Cadmium, Copper and Lead, separately and together, by 20 soil horizons: comparison of linear regression and tree regression analyses. *J. Hazard. Mater.* 1-3 (1) 522-533. Vega, F.A., Weng, L., Temminghoff, E.J.M., Van Riemsdijk W.H. 2010. Donnan membrane technique (DMT) for anion measurement. *Anal. Chem.* 82 (7): 2932-2939.



Nombre: NOGUES BRAVO, DAVID

Referencia: RYC-2011-08962

Area: Ciencias de la Tierra

Correo electrónico: dnoques@bio.ku.dk

Título:

Assessing Global Change impacts on Late Quaternary environmental dynamics

Resumen de la Memoria:

Understanding future global changes impacts in terrestrial environments is a key scientific challenge nowadays. Unfortunately, forecasting environmental dynamics under global change still facing several problems. Maybe the trickiest ones is a lack of a better integration of concepts and methods belonging both to Earth and biological sciences from a paleo perspective. I aim at better understanding Late Quaternary environmental dynamics focusing specifically in the extinction process of mammal megafauna species, a classical paleontological question but from a novel perspective. Between 50,000 and 3,000 years before present (BP) 65% of mammal genera weighing over 44 kg went extinct, together with a lower proportion of small mammals. Since the end of the XIX century, researchers still debate on the causes behind Late Quaternary Extinctions, LQE, without reaching a consensus. Unfortunately, the debate about LQE has generally suffered from the search for a silver bullet to explain the extinctions and from the lack of integrative interdisciplinary approaches. Whatever the causes of the global LQE, testing hypotheses about LQE requires developing stringent models at large scales including concepts, methods and data coming from evolutionary biology, ecology, biogeography, climatology, paleontology and human anthropology. Progress in the LQE debate will also enhance our knowledge about future environmental crises when factors such as humans and climate change come together. Moreover, *¿travel to the past¿* allows validating and improving the ability of predictive techniques to forecast impacts of global change in the environment. My project will integrate paleoclimatic reconstructions, the mammal and the pollen fossil record, archaeological databases, ancient DNA and sedimentary ancient DNA for the northern hemisphere. I aim at 1) clarifying drivers of Late Quaternary extinctions and 2) and to validate and improve predictive approaches dealing with global change impacts in terrestrial environments. Integrating paleoclimatic and paleoenvironmental databases (i.e., paleoclimatic reconstructions based on Atmospheric Ocean-coupled General Circulation Models, AOGCMs, and the fossil record both for plant and animals) will ensure gaining novel insights on how environmental changes and human impacts controlled extinction processes. In a broader context, I expect to gain lessons from the past both in conceptual and analytical aspects to better forecast future impacts of global change, particularly for those issues placed in the interface between climate and environmental diversity. In summary, I pursue at integrating perspectives and methods both from Earth and biological sciences to better understand future impacts of global changes in terrestrial environments. I consider my dual background in Earth and biological sciences would ensure a success completion of those objectives. Moreover, my integration in the Spanish Earth Sciences community through a Ramon y Cajal may well enrich the significance and implications of my project on Late Quaternary environmental dynamics.

Resumen del Curriculum Vitae:

My interdisciplinary background allows me to work at the interface between the Earth and biological Sciences. My bachelor studies were on Geography (Departamento de Geografía y Ordenación del Territorio de la Universidad de Zaragoza), and then my PhD supervisor, at the Pyrenean Institute of Ecology, IPE, was a biologist (Martinez-Rica). After my PhD at the Pyrenean Institute of Ecology I moved to the School of Geography at Oxford University (2005). During my post-doctoral stay at the School of Geography I enriched my interdisciplinary background thanks to the exposure to biogeographers such as Robert Whittaker, climatologists such as Mark New or paleo-ecologists such as Katherine Willis. A year later I moved to the Department of Biology at University of Copenhagen (2006). I learnt there about ecological/evolutionary theories and simulation techniques to explain environmental dynamics. After these two years in Oxford and Copenhagen I moved back to Spain with an I3P post-doctoral grant at Museo Nacional Ciencias Naturales (2007-2009). In Madrid, and under the supervision of Miguel Araujo (physical geographer), I researched within the Biodiversity and Global Change Lab. During that period I developed my ideas on applying my dual background to understand environmental dynamics during the Late Quaternary. Nowadays I am leading research on integrating tools and concepts from ancient genetics, paleoclimatology, paleoecology and macroecology for clarifying 1) the causes of Late Quaternary extinctions (to be submitted to Nature soon), and 2) to assess trends in species climatic niches during the Late Quaternary using the pollen record of North America, Europe and paleo-climatic reconstructions based on AOGCMs (to be submitted to PNAS soon). I am based at the Center for Macroecology, Evolution and Climate (university of Copenhagen). Since my first SCI publication (October 2004), I have published 24 SCI papers, 12 in non-SCI peer-review journals and 3 book chapters. The H-impact factor of my publications is 10. Eighteen out of the 24 SCI papers (75%) are published in journals that are in the upper quartile in their respective impact ranks (Nature or Plos Biology among them). I am first author (or second author in the cases of papers with only two authors) in 13 papers. Three of them were selected by Faculty of 1000 Biology and four of them are cited sufficient number of times to pass the 1% citation threshold to qualify it as an ISI highly cited paper. ISI Web of Knowledge shows that my papers have been cited 298 times (242 after excluding self-citations). An 80% of the citations to my papers were within the last two years, which imply a fast and exponential increase in the number of times that my papers are cited. My papers have been cited in a wide range of journals as Nature, PNAS, Current Biology, Ecology Letters, Proceedings RS-B, Conservation Biology, Global Change Biology, Geophysical Research Letters, Progress in Physical Geography, Climate Research, Earth Science Reviews or Quaternary Science Reviews among many others, which highlight the impact of my studies across different scientific communities (papers published across 98 different ISI journals cite my papers). I am academic editor for two ISI journals: Ecography and Plos One. I am also the Spanish representative of the International Biogeographical Society (IBS).



Nombre: LUQUE ESTEPA, ALEJANDRO

Referencia: RYC-2011-07801

Area: Ciencias de la Tierra

Correo electrónico: luquex@gmail.com

Titulo:

Transient Luminous Events in the Upper Atmosphere: a Natural Probe for the Mesosphere

Resumen de la Memoria:

The activity of electric thunderstorms often induces high-altitude electric discharges in the Earth's mesosphere. Observed as Transient Luminous Events (TLEs), these discharges were first reported in the scientific literature in 1990. Today, two decades after their discovery, TLEs constitute a young and vibrant field in the geosciences, fueled by a multidisciplinary research community. The research line proposed here is an multidisciplinary approach to the study of TLEs with the following scientific objectives:(1) Use TLE observations as naturally occurring probes for the remote sensing of the mesosphere. This layer of the atmosphere has been called 'ignosphere', due to the scarcity of in-situ measurements. We can use TLEs to obtain snapshots of the temperature and spatial variations of the mesosphere, thus compensating for the present lack of observations.(2) Understand the influence of TLEs on the surrounding atmosphere. In particular, they may affect the balance of NO_x and other chemical species. They also play a role as part of the global electrical circuit.(3) Some TLEs are nonlinear phenomena that exhibit forms of complex behavior. Understanding them is valuable not only for the geosciences but also for areas of theoretical and applied physics (TLEs mimic artificial discharges with industrial uses). This important point gives this research line a highly multidisciplinary nature. -- I will pursue these objectives with a combination of the following three methodologies:(1) Satellite observations. A major upcoming event in the study of TLEs is the launch in 2013 of the Atmospheric Space Interactions Monitor (ASIM), an European Space Agency (ESA) mission to monitor TLEs from the International Space Station. Spain is one of the major financial and scientific contributors to ASIM. Part of the reason is the privileged location of Spain: most TLEs in Europe occur above the Spanish Mediterranean arc so it is natural that Spain should play a significant role in this research. Extracting the most from the ASIM investment requires a world-class supporting scientific team to interpret ASIM's observations.(2) Theoretical and numerical models. Use of electrodynamic and chemical (kinetic) codes. Development of large scale, parametrized models.(3) Ground- and balloon-based observations. Including optical, spectral and polarimetric ground observations. In order to reduce the atmospheric absorption, balloon-based, remote observations are also possible through my involvement with the French (CNES) COBRAT project.

Resumen del Curriculum Vitae:

From 1996 to 2001 I studied Physics at the University of Sevilla, Spain. I started my scientific career in 2001 when I joined the European Graduate School "Nonlinear Phenomena and Phase Transitions in Complex Systems" at the University of Bayreuth, Germany. There I studied nonlinear waves in the Earth's Magnetosphere and upper Ionosphere. During my PhD, I published 5 papers in ISI Science Citation Index (SCI) journals. --In my first postdoc I was part of the Marie Curie Research Training Network "Turbulent Boundary Layers in Geospace Plasmas." I spent six months at the Ruhr-University Bochum, Germany in the group of Prof. P. K. Shukla, a leading authority in Nonlinear Plasma Physics. In Bochum I published 4 papers in SCI journals. --My second postdoc was at the Dutch Center of Mathematics and Computer Science (CWI), in Amsterdam. I was part of the "Multiscale Modeling and Nonlinear Dynamics" cluster. I worked in the group of Prof. U. Ebert, on numerical modeling of electrical discharges. I was the first in this group to investigate high-altitude atmospheric discharges. My work there resulted in 10 papers in SCI journals. --Currently I am at the Instituto de Astrofísica de Andalucía (IAA), CSIC as a Jae-Doc researcher. I continue the work on modeling TLEs but I am involved also in the design and scientific exploitation of a polarimeter and high spectral resolution spectrograph to observe upper-atmospheric discharges. At IAA-CSIC I have published 7 articles in SCI journals. --In total, I have 59 months of post-doctoral experience in 3 prestigious centers, different from the center where I obtained my PhD. --PUBLICATIONS: Since I started my research career in late 2001, I have published 32 papers. From them, 26 are in SCI journals (77% in the top 25% of their area) and from these 26, I am the first author in more than half (14). My h-index is h=10 (h=8 if only papers as first author are included). My publications have received 283 citations and 5 of them have more than 25 citations (I am first author in 4 of these 5). I have published in some of the top journals in the Geosciences and in Physics, such as Nature Geoscience (ranked by ISI as the top journal in the Geosciences), Geophysical Research Letters, Physical Review Letters, Applied Physics Letters and Physics Reports (in all of them as first author). One publication has been featured as Research Highlight in Nature and another was an Editor's highlight in Geophysical Research Letters. I also wrote a review on Transient Luminous Events, aimed to non-specialists, in Europhysics News. -- PROJECTS: I have participated in 9 scientific projects, including European-level projects as well as Spanish, German, Dutch and French projects. --OTHER MERITS: I have taught 3 courses at the University of Bayreuth, Germany. Currently, I co-supervise the PhD thesis of one graduate student. I have acted as referee for 5 international journals. I have attended 19 scientific meetings, being invited to 3 major international conferences. My work was featured in a full page in the science section of the Dutch newspaper NRC Handelsblad. I maintain active collaborations with researchers in Belgium, France, Germany, The Netherlands, Czech Republic and USA. In 2010 I was selected as "Reserve Candidate" in the Ramón y Cajal Programme. --



Nombre: ANTON MARTINEZ, MANUEL

Referencia: RYC-2011-08345

Area: Ciencias de la Tierra

Correo electrónico: mananton@unex.es

Título:

Analysis of the extreme episodes of total ozone column over the Iberian Peninsula and its influence on the ultraviolet solar radiation

Resumen de la Memoria:

Spatio-temporal variations in the total ozone column (TOC) have received an increasing attention since the discovery of the springtime ozone hole over Antarctica. The origin of ozone changes at midlatitudes is not as clear as in the polar regions, since both photochemical and dynamical mechanisms can act together to produce notable TOC variations. For instance, TOC values often experiment strong reductions or significant enhancements that can exceed more than 50% of average values. These anomalous events are called ozone mini-holes (ozone mini-highs) and they are characterized by a rapid and small-scale decrease (increase) in TOC. In addition, it is well-known that short-term changes in total ozone produce an outstanding effect on ultraviolet (UV) solar radiation during cloud-free conditions. In this framework, the main research line proposed is focused on the study of extreme episodes of TOC values over the Iberian Peninsula and the analysis of the influence of these anomalous events on the ultraviolet (UV) solar radiation measured at Earth's surface. The specific goals are:(1) Characterization of the spatio-temporal variability of the total ozone column over the Iberian Peninsula using ground-based data provided by the Spanish Network of Brewer spectrophotometers which is managed by the Spanish Agency of Meteorology (AEMET). In addition, TOC data derived from several satellite instruments (TOMS, OMI, GOME, SCIAMACHY) will be also utilized.(2) Development of a procedure to obtain extreme ozone episodes (mini-holes and mini-highs). Quantification of these anomalous events.(3) Analysis of the photochemical and dynamical mechanisms that origin ozone mini-holes and mini-highs. (4) A study of the individual contribution of ozone to the short-term variability of UV solar radiation at ground level with respect to other modulation factors such as aerosols and cloudiness(5) Study the effect of extreme ozone episodes on the UV solar radiation recorded at Earth's surface using ground-based data and satellite observations. The results of this research line will enlarge our understanding of the origin of ozone changes at midlatitudes and the influence of these changes over the UV solar radiation measured at Earth's surface. This research line will allow to continue the collaboration of the applicant with a large number of scientists at universities and research institutes in Europe and USA.

Resumen del Curriculum Vitae:

Manuel Antón started his Ph.D. in 2002 at Universidad of Extremadura (UEx) with a FPU predoctoral fellowship. He performed two PhD. research stays in 2003 and 2004 at Joseph Fourier University (Grenoble, France). In September 2005, he obtained his M. Sc. in Meteorology from UEx. In November 2005, Manuel Antón moved to the Spanish Agency of Meteorology (AEMET) in Madrid as a Research Fellow, enjoying this grant until September 2006. Within this period, he enjoyed a Visiting Scientist Grant in the German Aerospace Center (DLR) (Wessling, Germany) during one week which was funded by the O3M-SAF from EUMETSAT. In October 2006, he took up the position of an assistant professor at UEx which he held until April 2007. In this date, Manuel Antón obtained his Ph.D. with the highest level (cum laude per unanimity), he received the European mention and he was also distinguished with the Extraordinary Award of the UEx. As a first post-doc position, he enjoyed a research contract at UEx (May 2007-November 2008). Manuel Antón participated as investigator in the ARENO 2007 inter-comparison campaign of broadband UV radiometer at El Arenosillo station supported by UE-COST Action 713. In December 2008, he was awarded a postdoctoral position at Geophysics Centre of Évora (CGE) from University of Évora (Portugal). He spent 1.5 years at this institution. In May 2010, he reached the current position at University of Granada with a ¿Juan de la Cierva¿ Research Fellow (funded by the Spanish Ministry of Science and Innovation). He accessed each of his three postdoctoral contracts after a competitive open process of applications, covering a total of 46 months of postdoctoral positions. Moreover, he has performed three postdoctoral stays in 2007, 2008 and 2010 in DLR. He has spent 11 months in all during these three research stays (one of them funded by a Jose Castillejo Research Fellowship). He has taken part in 6 research funded projects/contracts carried out at UEx and CGE, working actively in all them. In the course of his research career he has published 33 peer-reviewed articles included in the Journal Citation Reports (JCR) in top, international journals specialized in Geophysics Sciences: J. Geophys. Res., Geophys. Res. Lett., Atmos. Chem. Phys. Atmos. Environ., Rem. Sens. Environ., J. Climate, Tellus-B, IEEE Trans. Geosc. Rem. Sens. It should be highlighted that Manuel Antón is the first author in 24 of these JCR peer-reviewed articles (73% of all). As a measure of the work quality it would be noted that about 60% of all articles appears in the first quartile of their subject category (remaining are mainly in the second). All these papers were co-authored with 47 different scientists of 12 nationalities (all articles were collaborations of 5.5 authors in average). Despite that most of these articles have been published within the last 4 years, Manuel Antón has already achieved an h- factor of 6 (Scopus Database). Other outstanding publications are: four peer-reviewed articles not included in the JCR, one book as unique author and two books as co-author, one chapter of book, and more than 60 International/National conference abstracts with 18 oral presentations. He has also contributed as a peer-reviewer in the most prestigious journals in his field of research such as J. Geophys. Res., Atmos. Environ, Atmos. Res., Tellus-B, Int. J. Climatol..



Nombre: LARA MARTIN, PABLO ANTONIO

Referencia: RYC-2011-09008

Area: Ciencias de la Tierra

Correo electrónico: pablo.lara@uca.es

Título:

Caracterización del comportamiento ambiental y destino final de compuestos biocidas y antibióticos (ABCs)

Resumen de la Memoria:

La producción y consumo de compuestos orgánicos de síntesis ha experimentado un extraordinario auge en las últimas décadas, promoviendo una notable mejora en la calidad de vida. Como contrapartida, miles de sustancias son vertidas cada día al entorno y, en la mayoría de los casos, se desconoce su distribución y comportamiento ambiental, así como su impacto en los ecosistemas que alcanzan. El grupo de contaminantes orgánicos sobre los que se centra la línea de investigación del candidato lo comprenden aquellas sustancias que presentan carácter biocida o antibiótico (ABCs, Antimicrobial and Biocide Compounds). Una vez utilizados, una gran parte de los ABCs alcanzan los ecosistemas acuáticos, pudiendo ser encontrados a concentraciones del orden de ppb y/o ppt tanto en aguas superficiales como subterráneas, así como decenas de ppm en sedimentos en el caso de los más hidrófobos. Su presencia en el medio ambiente es motivo de alarma, ya que pueden causar perjuicios para la salud humana y los organismos acuáticos, así como favorecer la generación de resistencias microbianas. El objetivo principal de la investigación a desarrollar es la identificación y estudio de la distribución, comportamiento ambiental y destino final de los ABCs, lo cual a su vez permitirá determinar el riesgo medioambiental que suponen. Con este fin las líneas de investigación del candidato, multidisciplinarias y complementarias entre sí, son las siguientes: a) desarrollo de metodologías para la determinación de ABCs en matrices ambientales (empleo y optimización de las últimas técnicas de extracción, así como determinación mediante espectrometría de masas avanzada), b) estudios de campo para determinar su distribución y reactividad en sistemas acuáticos (incluyendo la validación de nuevos sistemas de muestreadores pasivos, así como la obtención de testigos datados de sedimento para estudiar el destino diagenético), y c) ensayos de laboratorio para caracterizar los procesos fisicoquímicos y biológicos (biodegradación aerobia y anaerobia, fotodegradación, adsorción y bioconcentración) que afectan a los ABCs en el medio.

Resumen del Curriculum Vitae:

El candidato es licenciado en Ciencias del Mar y en Ciencias Ambientales por la Universidad de Cádiz, obteniendo, entre otros galardones, dos veces el Primer Premio Nacional de Fin de Carrera. Realizó los cursos de doctorado bajo el programa Recursos Naturales y Medioambiente, presentando la Tesis Doctoral titulada ¿Comportamiento, distribución y destino final de tensioactivos sintéticos en sedimentos marinos y continentales¿ en el año 2007. El resultado fue una docena de publicaciones y la obtención del Premio Nacional de Doctorado otorgado por la Real Academia de Doctores de España. Además, durante su desarrollo se realizaron diversas estancias de 3 meses de duración en el Instituto de Investigaciones Químicas y Ambientales de Barcelona (IIQAB-CSIC) y en la Universidad de Stanford (Estados Unidos). Recientemente, el candidato ha finalizado su estancia posdoctoral en la School of Marine and Atmospheric Sciences (State University of New York), la cual comenzó en marzo de 2008, bajo el programa de becas posdoctorales del MEC/Fulbright y prosiguió mediante la obtención de una beca Marie Curie OIF. Actualmente ha empezado a trabajar como profesor en la Universidad de Cádiz durante el curso 2010-2011. Durante los últimos años ha diversificado su investigación hacia el estudio del comportamiento ambiental de contaminantes emergentes tanto en sistemas acuáticos marinos y estuáricos como en acuíferos. Particularmente se ha centrado en la identificación de nuevos contaminantes procedentes de productos de higiene personal y en el estudio de su persistencia y posibles efectos negativos sobre los ecosistemas. La mayoría de publicaciones del candidato pertenecen al área de conocimiento de Ciencias Ambientales (ej.: Environ. Sci. Technol.), si bien también desarrolla parte de su actividad en Química Analítica (ej.: J. Chromatogr. A) por cuanto es necesario el desarrollo de diversas metodologías analíticas para la determinación de diversos grupos de contaminantes en matrices ambientales. El núcleo de su investigación, sin embargo, lo compone el estudio de las fuentes, distribución y reactividad de tensioactivos y otros contaminantes de diverso tipo (productos de higiene personal y fármacos), así como la puesta a punto y desarrollo de procedimientos experimentales para cuantificar bajo condiciones controladas procesos de degradación, adsorción o bioconcentración. Entre los proyectos más importantes en los que ha colaborado el solicitante destacan varios subvencionados por la CICYT y la Unión Europea, donde ha participado en todos los aspectos (redacción, muestreos, análisis, difusión de resultados). Además el candidato es investigador principal de los proyectos más recientes del grupo de investigación, dirigiendo tanto Tesis de Master como Tesis Doctorales. En resumen su experiencia investigadora (10 años) queda recogida en 21 publicaciones (15 de ellas como primer autor, y la mayoría de ellas dentro del primer cuartil de sus áreas de conocimiento, con factor de impacto superior a 4), asistencia a más 30 de congresos internacionales, participación en 14 proyectos de investigación (los 2 últimos como investigador principal) y la obtención de una decena de premios, compaginando además la actividad investigadora con la docente en Ciencias Ambientales y Ciencias del Mar.



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**SUBPROGRAMA RAMON Y CAJAL
CONVOCATORIA 2011**

Nombre: RUIZ AGUDO, ENCARNACION MARIA

Referencia: RYC-2011-09007

Area: Ciencias de la Tierra

Correo electrónico: encaruiz@ugr.es

Título:

Mechanisms of element incorporation into carbonates and sulfates from aqueous solutions: towards an understanding of marine environmental proxies.

Resumen de la Memoria:

The process of ion incorporation into minerals is a key control on the reactivity and cycling of elements in biogeochemical systems, and therefore, it is critical in explaining and predicting numerous ocean and Earth surface processes. In particular, ions incorporated in marine carbonates and sulfates are widely used as proxies for changes in ocean chemistry and paleoclimate, as they reflect the temperature, salinity, nutrient abundance or pH of the water in which the organisms lived and thus biogenic marine carbonates are regarded as records of geochemical palaeoclimatic parameters. These proxies increase our understanding of past climate and its sensitivity to changes in environmental variables and enhance our ability to predict future climate change. Research in this topic face challenges as fundamental knowledge of the underlying mechanism of element partitioning at ambient temperatures is still lacking. This limits the reliability of the climatic information extracted from the concentration and isotopic composition of trace and minor elements in biogenic carbonates, as it can be strongly overprinted by secondary, non-climate related phenomena. Despite the proliferation of studies in recent years, there is no consensus as to whether low temperature partitioning is subject to crystal chemical control, or whether non-equilibrium effects predominate. If the latter holds, any change in the kinetics of the growth process may have an impact on the incorporation of ions into the growing mineral. Ion-assisted dehydration of trace and minor element ions could occur in biological systems thus affecting their incorporation and isotopic fractionation, providing interesting insights into the possible origin of anomalies found in systems used as proxies and the so-called 'vital effects'. This opens the possibility of a new understanding of very diverse phenomena in geochemistry and raises the fundamental question addressed in this proposal: ¿How do changes in the hydration of the incorporating ion (induced by the characteristic properties of the growth solution) affect its partition into minerals and how can we use this new knowledge to solve urgent environmental problems such as climate evolution prediction?¿ The proposed research is aimed at determining the influence of different non-equilibrium phenomena on ion partitioning, by combining computational studies with a systematic, micro-to-nanoscale experimental study of the incorporation process using flow-through and constant composition experiments and high resolution analysis and observations of natural samples and mineral surfaces during ion incorporation. The results of this research may be also critical for a wide range of natural and engineered processes, as trace element abundance and distribution in carbonates are used as tracers of petrogenetic and diagenetic histories, as sinks in geochemical cycles, and for predicting the effectiveness of contaminants sequestration

Resumen del Curriculum Vitae:

I completed the BEng in Chemical Engineering at the University of Granada (July 2003). Later on, I was awarded an Introductory Research Fellowship (2003-2004) at the Dept. of Chemical Engineering of the University of Granada. I carried out my PhD research at the Dept. of Mineralogy and Petrology of the University of Granada funded by the EU STREP Project SALTCONTROL (FP6) and by the University of Granada (Plan Propio program). I completed a further BEng (Industrial Engineering) at the University of Jaén (September 2006). I obtained the PhD degree (European Doctorate mention) in December 2007 with the highest grade. I carried out pre-doctoral research visits to the Institute für Mineralogie, University of Münster, Germany (October 2006-January 2007) and The Getty Conservation Institute, Los Angeles, USA (March-April 2007). Subsequently I performed a first postdoctoral research stay (2008) at the Institute für Mineralogie of the University of Münster. Then I was awarded a pos-doctoral fellowship from the Spanish Ministry of Science and Technology, as well as a two-year Marie Curie contract at this University. From 15.01.2009 to 14.01.2011, I worked there funded by the European Initial Training Network DELTAMIN (FP7). Then, I was awarded reintegration contract of the University of Granada, in the Department of Mineralogy and Petrology where I have worked since 01.02.2010. I have participated in 12 research projects, 3 of them supported by European funding. Since 2004, I have authored a total of 40 publications, being the first author of thirty of them (75%). 22 of these publications are included in journals listed in the JCR such as Crystal Growth and Design (3), Geochimica et Cosmochimica Acta (5), Chemical Geology (1), American Mineralogist (2), Langmuir (2), Journal of Physical Chemistry B (1), Atmospheric Environment (1), Inorganica Chimica Acta (1), Environmental Geology (4) and Scanning (1); 15 appear in refereed journals not included in the JCR; 2 contributions are book chapters and 1 is a book. Additionally, I have published 1 popular article in the journal Investigación y Ciencia, the Spanish edition of Scientific American (which is part of Nature Publishing Group). As well, 3 more publications are currently in revision in journals listed in the JCR. Including the publications currently in revision, my average number of publications per year is 6. Additionally, I have taken active part in several national and international conferences with a total of 37 contributions (28 of them presented in international conferences and 9 in national conferences). I act as a reviewer for international journals such as Geochimica et Cosmochimica Acta, Crystal Growth and Design and Thermochemica Acta and I am part of the Editorial Board of MACLA, the journal of the Spanish Society of Mineralogy. As well, I am currently co-supervising one PhD student (start date: 2009). I have also gained teaching experience as a lecturer at the Universities of Granada (subjects: Crystallography -BSc in Geology, BSc in Chemistry-) and Münster (MSc program). I obtained the positive evaluation by ANECA to be hired as "Profesor Ayudante Doctor" (March 2008), "Profesor Contratado Doctor" and "Profesor de Universidad Privada" (June 2009). Finally, my research has been awarded the Prize for Young Scientists of the Spanish Society of Mineralogy and the Prize of the European Geoscience Union for the Young Scientist Outstanding Poster Presentation.



Nombre: TOLEDANO OLMEDA, CARLOS

Referencia: RYC-2011-09357

Area: Ciencias de la Tierra

Correo electrónico: toledano76@gmail.com

Título:

Estudio de componentes atmosféricos, principalmente aerosoles, mediante métodos ópticos. Validación de procedimientos de inversión.

Resumen de la Memoria:

El estudio de los aerosoles ha adquirido gran importancia en las últimas décadas por su impacto en muy diversos aspectos del desarrollo de la vida en la Tierra, con repercusión directa sobre los ecosistemas y la salud humana, así como por su influencia sobre el sistema climático global. Es además el factor que más incertidumbre introduce en la evaluación del balance radiativo terrestre, y presenta gran variabilidad espacial y temporal. Un gran número de redes de medidas ópticas de detección remota, globales o nacionales, han sido establecidas en las últimas décadas con objeto de paliar este déficit de conocimiento sobre el efecto climático de los aerosoles y proporcionar medidas a nivel de suelo para la validación de las medidas desde satélite. Existen determinadas cuestiones clave todavía abiertas: la correcta determinación de la absorción, el efecto de la forma de las partículas y de las mezclas o los errores asociados a los procedimientos de inversión. En relación a los diversos tipos de medidas (ópticas, químicas, remotas, in situ, activas o pasivas) se requieren experimentos de cierre que relacionen de forma satisfactoria los resultados obtenidos por las distintas técnicas. Es necesario mejorar la identificación de tipos de aerosol, sus propiedades y las derivadas de las mezclas, sobre todo para la caracterización de zonas y su uso en algoritmos de satélite. También es necesario trabajar en la validación y mejora de los algoritmos de inversión que permiten obtener parámetros clave sobre los aerosoles a partir de medidas radiométricas pasivas y activas. Este trabajo implica, por una parte, la comparación entre diversos modelos y medidas, así como estudios de sensibilidad a los datos de entrada. Por otra parte, los algoritmos de inversión deben ser validados frente a otro tipo de datos, como medidas in situ, muestreo y composición química o flujos radiativos, lo que implica una estrecha colaboración con grupos de diversas disciplinas.

Resumen del Curriculum Vitae:

Licenciado en Física por la Universidad Complutense de Madrid y doctor en Ciencias por la Universidad de Valladolid (2005), donde disfruté de una beca FPI. Premio 2006 de la Fundación 3M de Investigación (VIII Edición), en la categoría de Medio Ambiente, con el trabajo *¿Intrusiones de aerosol sahariano en la Península Ibérica?*. Posteriormente fui investigador con una beca posdoctoral del MEC en el Instituto de Meteorología de la Universidad de Munich, nombrada en 2007 como la mejor Universidad de Alemania. Desde 2008 soy investigador Juan de la Cierva en la Universidad de Valladolid. En mi trabajo de investigación, siempre en torno al estudio de componentes atmosféricos, principalmente aerosoles, por métodos ópticos, podemos distinguir varias líneas de trabajo: el análisis de calidad de series de datos fotométricas; el estudio a nivel climatológico de los aerosoles, con especial énfasis en los aerosoles desérticos y árticos y el empleo de algoritmos de inversión; y el trabajo experimental en numerosas campañas de medidas. Destacan las 6 campañas llevadas a cabo en el Ártico noruego, financiadas por el programa ARI (Access to Research Infrastructures) de la UE y en 2006 enmarcadas dentro de los proyectos Polar-AOD y Polarcat del Año Polar Internacional. También destaca la campaña en Cabo Verde en enero de 2008 para la caracterización de los aerosoles desérticos dentro del proyecto SAMUM. He participado en 36 proyectos de investigación, uno de ellos como investigador principal, participado en 5 convenios y contratos de I+D, y realizado estancias en centros europeos de reconocido prestigio durante más de 39 meses (6 durante el periodo predoctoral y más de 33 en el posdoctoral). He trabajado en 3 grupos diferentes de investigación, en la Universidad de Valladolid en España, ALOMAR en Noruega y el Instituto de Meteorología de la Universidad de Munich en Alemania. Esto ha dado lugar a 34 publicaciones científicas (incluyendo 28 en revistas SCI y 2 capítulos de libro), más otras 9 actualmente en revisión, así como más de 100 contribuciones a congresos nacionales e internacionales, donde se ponen de manifiesto las numerosas colaboraciones y trabajos con grupos como el de la Universidad de Valladolid, Universidad de Munich, AEMET, GSFC-NASA, INTA, Universidad de Lille, ALOMAR, NILU, IFT Leipzig, CNR italiano, etc. Desde 2008 soy el coordinador de la gestión operativa de la red de fotómetros RIMA, federada a AERONET, responsable del centro de calibración y a cargo de más de 20 estaciones de medida. He sido miembro del comité organizador de dos congresos internacionales y actué como evaluador para revistas especializadas. Además he dirigido 1 tesis doctoral, más otras dos en curso, 2 trabajos de suficiencia investigadora en España y Alemania e impartí clases de Radiometría y Óptica en la Universidad de Valladolid.



Nombre: CURIEL YUSTE, JORGE

Referencia: RYC-2011-09615

Area: Ciencias de la Tierra

Correo electrónico: j.curriel@creaf.uab.es

Título:

UNDERSTANDING THE MECHANISMS BEHIND SOIL CARBON FLUXES AND STOCKS IN MEDITERRANEAN ECOSYSTEMS

Resumen de la Memoria:

Projections of climate models indicate increasing variability in rainfall and higher temperatures in the Mediterranean basin, with subsequent changes on the structure and functioning of terrestrial ecosystems in the region. However, there is little information on how these changes affect the ability of these systems to capture carbon (C), especially due to our limited mechanistic understanding of the processes driving soil C dynamics in terrestrial systems. Here I present a highly interdisciplinary research program designed to increase our understanding of the mechanisms and environmental controls of flows of carbon in Mediterranean soils. The idea will be to improve current predictions of soil C fluxes and soil C stocks in the Mediterranean basin. Using innovative molecular and isotopic techniques, combined with new experimental approaches, my research program will address two of the mechanisms that generate much of the uncertainty in predictions of C budgets in Mediterranean soils: Allocation of C to root, micorrhizal and soil microbial growth/metabolisms at different temporal scales and the role of soil microbial community structure and diversity in the decomposition and stabilization of the incoming soil organic matter (SOM). The results will be used as the basis to implement a new process-based model of soil C dynamics that will circumvent the shortcomings in current box-models (e.g. CENTURY and Roth) to predict soil C dynamics under climate-change scenarios. My research will, hence, focus on three main sections: 1. Space/time ecosystem-level study of belowground C allocation. Techniques to measure C fluxes into the soil (monitoring of phloem and xylem sapflows, fine root growth, litter production), will be combined with measurements of fine roots and litter decay (litter-bags) and continues measurements of soil metabolic activity (respiration) of different soil ecological compartments (root, micorrhizal and soil microbial community) using flux partition methodologies (roots exclusion with collars and/or $\delta^{13}\text{C}$ natural abundances); This activities will be carried in key ecosystems following a precipitation gradient (e.g. North-South). 2. Under controlled conditions (meso/microcosms) climate-change scenarios for Mediterranean basin (increase in drought and heat waves) will be simulated to study the role of taxonomic and functional diversity of soil microbial communities (pyrosequencing and PLFA) on patterns of SOM decomposition and patterns of physical (aggregation) and geochemical (adsorption) stabilization of SOM. Stabilization of SOM in aggregates and mineral matrix will be studied using stable isotope tracers (^{13}C labeled organic matter) combined with some of the most innovative techniques in the field, such as near red X-ray Absorption fine structure (NEFAXS) spectroscopy. Apart from the qualitative nature of the design, this experimental part will be designed to obtain some quantitative information of the rates of SOM stabilization and decomposition associated to a given soil and microbial community. 3. Modeling part. Results on the mechanistic bases of C allocation, C use and C stabilization will then be used to develop and feed a process-based model. The model could then be calibrated with existing soil fluxes databases (e.g. SRDB database; Bond-Lamberty and Thomson) and compared to box models outcomes.

Resumen del Curriculum Vitae:

EDUCATION 1998 Master degree in Biology, Universidad Autonoma de Madrid, Spain. 2004 Ph.D. from the University of Antwerp (UA), Department of Biology. Promotor: Reinhart Ceulemans, co-promotor: Ivan A. Janssens. MOST IMPORTANT PROFESSIONAL EXPERIENCE Jan 2010 Postdoctoral fellow in CREAM 2007-2009 Marie Curie IEF Fellow. Unit of Ecophysiology CSIC-CREAM, Barcelona (Spain). 2004-2007 Postdoctoral research in The Biomelab of UC Berkeley. MOST IMPORTANT PROJECTS National Projects. 2010-2013. (SECASOL). ζ Programa Nacional de ayudas de Proyectos de Investigación Fundamental no orientada ζ ; 2009-2013. MONTES. National Funding program ζ CONSOLIDER INGENIO 2010 ζ . Coordination Prof. Dr. Javier Retana.; GLOCHARID (Global Change in Arid zones). Founded by Consejería de Medio Ambiente de la Junta de Andalucía. European Projects. CARBOEUROPE cluster. Research staff; SIBAE (Stable Isotopes in Biospheric-Atmospheric Exchange) COST action; Management committee North-American Projects. KEARNEY research foundation Research staff; North American Carbon Program (NACP) Associated researcher. SOME IMPORTANT PUBLICATIONS in peer-reviewed journals o J. Curriel Yuste, I.A. Janssens, A. Carrara, L. Meiresonne and R. Ceulemans (2003). Tree Physiology, 23: 1263-1270. (48 citations) o C.W. Xiao, J. Curriel Yuste, I. A. Janssens, P. Roskams, L. Nachtergale, A. Carrara, B.Y. Sanchez and R. Ceulemans (2003). Tree Physiology, 23: 505-516. (33 citations) o Carrara, A.S. Kowalski, J. Neirynek, I.A. Janssens, J. Curriel Yuste and R. Ceulemans (2003). Agricultural & Forest Meteorology, 119 (3-4): 209-227. (69 citations) o J. Curriel Yuste, I.A. Janssens, A. Carrara and R. Ceulemans (2004). Global Change Biology, 10: 161-169. (70 citations) o J. Pumpanen, et al. (2004). Agricultural and Forest Meteorology, 123: 159-176. (81 citations) o J. Curriel Yuste, I.A. Janssens, A. Carrara and R. Ceulemans. (2005a). Tree physiology, 25: 513-523. (16 citations) o J. Curriel Yuste, B. Konopka, K. Coenen, C. W. Xiao, I.A. Janssens and R. Ceulemans. (2005b). Tree physiology, 25: 701-712. (14 citations) o J. Curriel Yuste, I.A. Janssens and R. Ceulemans. (2005c) Biogeochemistry, 73: 209-230 (8 citations) o D.A. Sampson, I. A. Janssens, J. Curriel Yuste and R. Ceulemans. Global Change Biology 13(9) 2008-2017. (14 citations) o Curriel Yuste J.*, Misson L., Wong S., Goldstein A., Baldocchi D. Global Change Biology. 13(9) 2018 ζ 2035. (22 citations) o Misson, L., et al. 2007. Partitioning forest carbon fluxes with overstory and understorey eddy-covariance measurements: A synthesis based on FLUXNET data. Agricultural and Forest Meteorology 144:14-31. (18 citations) o Chiti T, et al. Radiocarbon dating indicates differences in historical land use of two adjacent forest soils. Geoderma 149: 137-142. o Curriel Yuste J, Ma S., Baldocchi DD. P. (2009) Biogeochemistry. 98: 137-142 o M. Bahn, et al.. (2009) Biogeosciences, 6, 11501-11520, o Curriel Yuste J, et al. (2011) Global Change Biology. 17: 1475-1486 GRANTS AND AWARDS RECEIVED 2004 Awarded with a Marie Curie IEF in the Università Seconda di Napoli. Promotor: Prof Dr. Francesca Cotrufo 2006 Awarded with a M Marie Curie IEF in the Global Ecology Unit CSIC-CREAM, Barcelona (Spain). Promotor: Prof. Josep Peñuelas 2010 2 years ζ Beca Postdoctoral de la UAB ζ . Promotor: Francisco Lloret Maya



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**SUBPROGRAMA RAMON Y CAJAL
CONVOCATORIA 2011**

Nombre: PEREZ LOPEZ, RAFAEL

Referencia: RYC-2011-08086

Area: Ciencias de la Tierra

Correo electrónico: rafael.perez@dgeo.uhu.es

Título:

Synchrotron light source as a tool to assess mobility and fate of contaminants into the environment

Resumen de la Memoria:

Environmental pollution by heavy metals is a serious problem due to their low biodegradability and high ability to accumulate in the biota. The heavy metal concentration has increased considerably in aquatic ecosystems as a result of inputs from human activities. Hence, it is crucial a proper assessment of the factors controlling the release, mobility and fate of contaminants from their source area with the purpose of preserving natural resources. As a case study, the Estuary of Huelva (SW Spain) represents a clear example of metal-polluted aquatic ecosystem, despite some salt marsh zones are UNESCO Biosphere Reserve and RAMSAR-NATURA wetlands sites. The main wastes acting as a continuous source of pollution to the surrounding environment are those from abandoned mining districts of the Iberian Pyrite Belt (IPB) and the phosphogypsum stacks from the present fertilizer industry of the Huelva Industrial State. In mining and industrial wastes, decrypting mobility and fate of contaminants into the environment is difficult because are complex in composition and structure. With the advent of synchrotron light sources, which provides intensive techniques using X-rays and higher spatial and temporal resolution, it can be determined the forms and distributions of contaminants at an atomic scale in environmental samples. The main objective of the current research proposal is the understanding and quantitative analysis of processes controlling the release, transport and immobilization of contaminants using synchrotron light techniques: EXAFS, XANES, μ -XRD and μ -XRF. The combination of synchrotron-induced X-ray analysis and theoretical calculations (e.g. density functional theory and molecular dynamic) will reveal information about how contaminants could affect the nucleation, growth and stability of environmental minerals to incorporate them, if energetically possible, into their crystalline structures. This project aims to (1) study the location of contaminants in the crystalline structure of their bearing phases, which could represent an essential tool to assess their solubility, mobility, bioavailability and toxicity, (2) establish the potential risk of contamination for the environment and (3) design future and proper restoration plans (or improving existing ones) for both IPB mining environments and phosphogypsum stacks. Although the selected case study for this research proposal is the Estuary of Huelva, the methodological approach chosen could be applied to any other metal-polluted ecosystem worldwide. This research line could contribute to define the requirements of a specific beamline for Mineralogy-Geochemistry in the new synchrotron light facility ALBA (Barcelona).

Resumen del Curriculum Vitae:

The candidate Rafael Pérez López obtained a Degree in Geology (2001) and a PhD in Earth Science (2006) at the University of Huelva (Sobresaliente Cum Laude Unanimidad-European Doctorate). PRE-DOCTORAL STAYS: (1) two stays (3 months each) at the Instituto de Ciencias de la Tierra Jaume Almera-CSIC (Barcelona), (2) one stay (3 months) at the Institute for Research on the Environment and Sustainability (Newcastle, UK) and (3) one stay (2 months) at the Laboratoire de Géophysique Interne et Tectonophysique (LGIT) at the Joseph Fourier University (Grenoble, France). POSTDOCTORAL EXPERIENCE: (1) 8 months at the LGIT (Grenoble, France) under the supervision of Prof. Laurent Charlet, (2) 16 months at the Instituto Superior de Agronomia (ISA) of the Technical University of Lisbon (Portugal) under the supervision of Prof. Manuela Abreu, and (3) 24 months (and continues) at the Instituto de Diagnóstico Ambiental y Estudios del Agua (IDAEA) of the CSIC as a Postdoctoral researcher -Juan de la Cierva Subprogramme- under the supervision of Prof. Carlos Ayora. To date, the total duration of the post-doctoral stages is 48 months. RESEARCH ACTIVITY: The main research lines are focused on developing methods for assessing the potential risk caused by the release of contaminants from mining and industrial wastes to the environment, as well as treatment strategies. PARTICIPATION IN PROJECTS: 3 national projects from Ministerio de Ciencia, 3 regional projects from Junta de Andalucía, 4 INTERREG European projects, 1 European project from the 5th Framework Programme, 1 project from the Centre National de la Recherche Scientifique (CNRS)-France, 1 project from the European Science Foundation, 1 project from the AECID Spain-Argentina and 4 projects from the European Synchrotron Radiation Facility, in addition to 6 research contracts with companies. PUBLICATIONS: 46 publications, of which 21 are papers in SCI-JCR international journals (first-author of 15 and second-author of 3) with an average Impact Factor of 2.41 (h-index=8). Of the 21 papers in SCI-JCR journals, 12 papers are in journals from the first quartile of their area (Chemosphere, Geochim Cosmochim Acta, Am Mineral, J Hazard Mat, Sci Total Environ, Chem Geol, Mar Pollut Bull) and 7 papers in the second quartile. In addition, other 3 papers are under review in SCI-JCR journals. OTHER PUBLICATIONS: 11 national papers in non-SCI journals, 13 chapters of books (10 in international books and 3 in national books), 1 book, 20 presentations in international congresses and 12 in national congresses. In 65% of all publications, the candidate signs as the first author, and in 20% as the second author, which shows the high level of authorship and capacity for responsibility and leadership of research. PATENTS: 1 international patent available on World Intellectual Property Organization and European Patent Office; in addition to 5 Technology Transfer Offers published in the Enterprise Europe Network of the European Commission (2010). THESIS SUPERVISION: 4 Master Theses defended, and 3 Doctoral Theses in progress. OTHERS: (1) Referee in SCI-Journals: e.g. Environ Sci Technol, J Hazard Mat, Fuel, Sci Total Environ, J Environ Manage, Appl Geochem, Hydrol Process, Am Mineral; and (2) External expert of the FONCYT for evaluation of Research Projects, Ministry of Science, Technology and Productive Innovation, Argentina.



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**SUBPROGRAMA RAMON Y CAJAL
CONVOCATORIA 2011**

Nombre: ALVAREZ VALERO, ANTONIO MIGUEL

Referencia: RYC-2011-07584

Area: Ciencias de la Tierra

Correo electrónico: aav@mit.edu

Título:

Partial crustal melting: metamorphic processes and geodynamic implications

Resumen de la Memoria:

My scientific interests are in metamorphic geology and what it can tell us about broader problems in the Earth Sciences. I typically use the solid products from volcanic eruptions to understand processes that occur at depth in the Earth. In addition to the popularly known volcanic hazards for life, these natural crustal "drill cores" also provide information on the deep Earth. I utilize the metamorphic changes and chemistry of the solids (transferred to the surface by the lava) to investigate how partial crustal melting occurs at depth. I also study the links between metamorphic petrology, magmatism/volcanism and geodynamics that influence the Earth's crustal dynamics and evolution. Partially melted crustal rocks provide a complex story of melting, melt migration and subsequent solidification. Their study is aimed at understanding the rates and mechanisms of segregation of crustal-derived melts: an essential step towards a complete model of crustal evolution. In detail, this research line is concerned with the essential processes of metamorphic change, mainly under anatexis conditions, at all scales, from the mineral lattice to the Earth's crust, but with special emphasis on the connection between microstructures and the thermodynamic and kinetic controls on metamorphic reaction processes. This multidisciplinary research has implications not only for metamorphic petrologists and mineralogists, but also for other geologists. Understanding the rates of melting, crystallization, fluid dynamics and strain will assist in (i) understanding tectonic processes like anatexis at depth and further lithosphere/crust scale processes like exhumation; (ii) whether melting and/or crystallization processes were interrupted or continuously have implications for heat transport in the vicinity of reacting rocks; (iii) improving the knowledge of the wall-rock vs magma conduit interactions and fluid dynamics before eruption; (iv) whether most of the strain occurred early in the melting/crystallization history has implications for convergent tectonics; (v) the timing of chemical zoning changes has implications for data used in constraining pressure-temperature-time paths; (vi) the triggering and causes of eruptive-explosive potential in volcanic eruptions; (vii) tracking (and hence to constrain in time for paleoceanographic and paleoclimatologic reconstructions) drifted rock-samples that are currently separated by thousand of kms in e.g. Antarctica. Partial melting is a decisive process-link between metamorphism and magmatism, playing a key role in the development of xenoliths, migmatites, granulites and S-type granites during crustal evolution. Those world-places where partial crustal melting occurred (connect these rock-types and comprise the aim of my research-line) are: Betic Cordillera, Morocco, SE Sweden, Sri-Lanka, Argentina, Antarctica and Himalaya, in collaboration with the following international groups: Massachusetts Institute of Technology, LMTG of Toulouse, NCB Naturalis, and Universities of Oxford, Utrecht, Río Cuarto and Fez. The results of such a research line/project are of interest for international research programs like e.g. TOPO-MED, International Lithospheric Project (ILP)- Task Force "Medyna".

Resumen del Curriculum Vitae:

CURRENT POSITION: Postdoctoral researcher (JAE-Doc 2007) in the Instituto Andaluz de Ciencias de la Tierra (CSIC-UGr) working on a petrologic-geophysical-climate evolution project in Antarctica (Scotia Sea and South Shetland Islands). From May 2011: Postdoctoral associate in the Dept. of Earth, Atmospheric and Planetary Sciences (Massachusetts Institute of Technology - MIT). Research on (i) the dynamics of mantle-melt extraction systems throughout field and theoretical approaches, (ii) the role of the hydrosphere condition on the composition of the upper continental crust throughout experimental studies. **HIGHER EDUCATION:** Degree in Geological Sciences (1994-1999), Third Cycle Studies and DEA (1999-2001) in the University of Granada. Doctor of Philosophy (PhD) in Earth Sciences (2005) in the University of Padova (Italy). First European Doctorate of this University. PhD title: "Petrographic and Thermodynamic Study of the Partial Melting of Restitic Xenoliths from the Neogene Volcanic Province of SE Spain". Postdoctoral experience: Dept. Geology, University of Huelva, 2006-2007 (environmental geochemistry and mineralogy & pollution impact). Dept. of Earth Sciences, University of Oxford (academic visitor), 2007-2008 (thermodynamic modeling of partial crustal melting processes). **GRANTS:** PhD awarded by the University of Padova (01/2002-12/2004). 2 travel-lodging grants (2003, 2004) at the NCB-Naturalis of Leiden, The Netherlands. EU-FP6, Synthesis grant, (09/2006) in NCB-Naturalis, Leiden. Young researchers grants program "José Castillejo" (MEC) (2007-2008) in the Dept. of Earth Sciences, University of Oxford. JAE-Doc (CSIC) (2008-2011). Postdoctoral associate at MIT (EAPS) from May 2011. **STAYS IN INTERNATIONALLY RECOGNIZED CENTERS:** c. 44 months in foreign institutions: Univ. Padova (Italy), NCB-Naturalis, Leiden (The Netherlands), Univ. Oxford (UK). **PARTICIPATION IN RESEARCH PROJECTS:** active member of 11 research projects: Internationals (6, European Science Foundation, NSF, Interreg), Nationals (3, MCyT, MICINN), Regionals (3, Junta de Andalucía). **PUBLICATIONS:** 19 SCI papers. Research leader (i.e. first author) in most of them (60%). Within their categories, 10 of these papers are in Quartile 1 (5 as first author, 5 as second, in journals as e.g. Journal of Petrology, Lithos, Journal of Metamorphic Geology), 7 are Quartile 2 (in journals as e.g. American Mineralogist, Tectonophysics, Terra Nova, Applied Geochemistry). The ISI Web of knowledge shows my NH=8.15 international congress abstracts (9 as first author). **THESIS SUPERVISED:** Currently co-supervising 1 PhD candidate. **TEACHING EXPERIENCE:** At the University of Huelva within the Geological Sciences degree during the academic year 2006/2007: Teaching assistant: "Thermodynamics of the geological processes", 2nd year course; Teaching assistant: "Mineralogy of the silicates", 2nd year course; Teaching: "Metamorphic Petrogenesis", 4th year course.- Research Associate of NCB-Naturalis- External referee for funding research-projects of the National Council of Scientific and Technical Research, Argentina



Nombre: **BARRIOPEDRO CEPERO, DAVID**

Referencia: RYC-2011-09386

Area: Ciencias de la Tierra

Correo electrónico: dbarriopedro@fc.ul.pt

Título:

Extratropical weather systems and climate variability

Resumen de la Memoria:

Mi principal línea de investigación se centra en la climatología sinóptica y variabilidad climática extratropical, en particular bloqueos atmosféricos, DANAs (cut-off lows) y Sistemas Convectivos de Mesoescala, sus impactos y su relación con los principales modos de variabilidad extratropical. No obstante, he realizado trabajos en una variedad de temas que abarcan reconstrucción del clima a partir de fuentes documentales y registros dendrocronológicos, fenómenos de interacción tierra-atmósfera (cubierta de nieve del hemisferio norte), extremos (sequías, crecidas del nivel del mar, mini-agujeros de ozono), efectos del ciclo de 11 años de actividad solar en la troposfera extratropical, modelos de circulación general, etc. Mi actividad investigadora se ha desarrollado a partir de la interacción con una gran número de centros nacionales e internacionales, estancias pre y post doctorales, y participación en proyectos nacionales, extranjeros y Europeos. En la actualidad, gran parte de mi actividad científica se centra en evaluar episodios extremos en observaciones y simulaciones climáticas. Los modelos de circulación general (GCMs) representan una herramienta muy útil para entender el clima del pasado y presente y para estimar futuros escenarios de cambio. No obstante, existen incertidumbres a escala regional ya que las tendencias y proyecciones pueden ser amplificadas o reducidas por cambios en la circulación regional. Una posible alternativa para estimar cambios regionales consiste en la evaluación de cambios de aquellos sistemas meteorológicos más relevantes para la temperatura y precipitación regionales. Entre ellos, los bloqueos y ciclones ejercen una fuerte influencia en el clima de Europa, causando frecuentemente episodios extremos con gran repercusión socioeconómica como sequías, inundaciones, olas de frío y calor. Mi propuesta persigue evaluar el impacto de bloqueos y ciclones en la temperatura y precipitación de Europa a partir de observaciones y simulaciones del último milenio (modelo ECHO-G) y de escenarios futuros de cambio climático (ECHO-G y EC-EARTH). En particular, se pretende: 1.- Construir climatologías de ciclones y bloqueos para el nuevo reanálisis del siglo XX, el cual proporciona un periodo más amplio que los reanálisis tradicionales permitiendo contextualizar las tendencias observadas en el periodo 1950-2000; 2.- Analizar la estacionariedad de los impactos asociados a estos sistemas en temperatura y precipitación; 3.- Evaluar los cambios de estos sistemas en el pasado y futuro y cómo éstos afectan a los patrones de impactos; 4.- Estimar cambios de la relación de estos sistemas con extremos de temperatura y precipitación en Europa, prestando especial atención a periodos de especial relevancia como la pequeña edad de hielo y el periodo cálido medieval.

Resumen del Curriculum Vitae:

FORMACIÓN- Licenciado en Ciencias Físicas en el año 2002 por la Universidad Complutense de Madrid con las especialidades de Ciencias de la Atmósfera y de Geofísica. - Doctorado con Mención Europea en Ciencias Físicas por la Universidad Complutense de Madrid (programa de Astrofísica y Ciencias de la Atmósfera) en el año 2007 con la tesis titulada "Variabilidad climática de bloqueos atmosféricos en el hemisferio norte", dirigida por Ricardo García-Herrera, con la máxima calificación (Sobresaliente cum laude). - Premio Extraordinario de Doctorado 2006-2007 por la Universidad Complutense de Madrid. - Puesto actual: Contrato Investigador en el Centro de Geofísica da Universidade de Lisboa, Lisboa, Portugal desde el 1 de marzo de 2008. - Línea de investigación principal: Variabilidad climática e impactos asociados a sistemas de circulación en latitudes extratropicales. - Otras líneas de investigación: episodios extremos, cambio climático y modelos de circulación general, reconstrucción del clima, variabilidad solar (ciclo 11 años). ESTANCIAS- Estancias pre-doctorales: 1) University of Missouri-Columbia (EEUU, 3 meses, 2004); 2) University of Fribourg (Suiza, 3 meses, 2005), 3) National Center for Atmospheric Research (NCAR) (EEUU, 3 meses, 2006). - Estancias post-doctorales: 1) Universidad de Extremadura (España, 3 meses, 2007-2008); 2) Centro de Geofísica da Universidade de Lisboa (3 años, 2008-2011). PRODUCCIÓN- Proyectos y programas de investigación: 9 (3 Portugueses; 2 Españoles; 1 acción integrada; 1 acción complementaria; 1 programa europeo; 1 privado). - Artículos publicados en revistas SCI: 24 (4 Meteorol. Atm. Phys.; 3 J. Clim.; 3 JGR; 3 Atmos. Res.; 2 Clim. Dyn.; 2 GRL; 2 BAMS; 1 Int. J. Clim.; 1 J. Hydrom.; 1 Geograf. Ann.; 1 Agric. Forest Meteor.; 1 Rem. Sen. Environ.). - Artículos enviados: 2 (1 BAMS; 1 Science). - Capítulos de libro: 2 (1 en preparación). - Presentaciones en congresos: 37 (18 presentaciones orales). - Seminarios invitados: 4. DOCENCIA, GESTIÓN- Co-dirección de trabajos de investigación: 1 tesis doctoral (desde 2009). - Organizador Workshop "Medieval Warm Period Redux - When and where was it warm?". 22-24 Septiembre. Lisboa. Participación: Raymond Bradley, Malcolm Hughes, Michael Mann, Phil Jones, Henry Diaz, Jurg Luterbacher, etc. - Revisor: 15 artículos de revistas SCI y 1 propuesta para la European Science Foundation. - Docencia (integrada en el espacio europeo de enseñanza superior): 1) ¿Variabilidad y Cambio Climático? (Máster en Ciencias Geofísicas. Universidade de Lisboa); 2) Sistemas en el Mediterráneo (Máster en Ciencias del Clima. Universidad de Vigo. Campus de Ourense. 20 horas).



MINISTERIO
DE CIENCIA
E INNOVACIÓN

**SUBPROGRAMA RAMON Y CAJAL
CONVOCATORIA 2011**

Nombre: PAZO BUENO, DIEGO

Referencia: RYC-2011-08188

Area: Ciencias de la Tierra

Correo electrónico: pazo@ifca.unican.es

Título:

Constructing optimal ensembles: from chaotic dynamical systems to meteorological models

Resumen de la Memoria:

I plan to develop a body of mathematical tools to be applied by the practitioner of forecasting, with special emphasis on weather and climate systems. This will include a transfer of knowledge from theory to applications. Far from being an academic question, predicting the future state of high-dimensional systems from the present state has a paramount importance in practical applications including weather forecasting, hydrodynamics, turbulence, and oceanic flows. The economic impact of prediction systems is huge and can only be possibly tackled within the context of multidisciplinary approaches. Operative meteorological models have nowadays a good degree of reliability and the use of dynamical-systems theory is fully justified. Indeed, operative ensemble forecasting (used in both, European and American Weather Services) relies on perturbations selected in the spirit of stability analysis from dynamical-systems theory. Nevertheless the development of these techniques has relied mostly on empirical observations, lacking of a firm basis that justifies the optimality of a certain ensemble. When scientists from weather forecast services and non-linear dynamicists are brought together, like in several workshops I have attended, it becomes clear that a gap remains (and needs) to be filled allowing a better transfer of knowledge from fundamentals to operative models. This is a promising field with important outcomes from a practical point of view. I have taken a leading role in developing an innovative approach that borrows tools from statistical physics. A few years ago I started transferring the results in spatio-temporal chaos to simple models of the atmosphere. It is encouraging that the same phenomenology is observed in extended systems of very different nature and the fact that simple models of the atmosphere are able to reproduce in qualitative terms the behavior of high-resolution models. My goal is to exploit concepts and algorithms that can be developed in simple dynamical models, and implemented in more sophisticated models, with emphasis in weather systems. The main problem to be investigated is the construction of optimal ensembles, and its relation with assimilation techniques.

Resumen del Curriculum Vitae:

Me licencié CC. Físicas por la Universidad Autónoma de Madrid en 1998. En 2003, terminé mi doctorado en Física por la Universidad de Santiago de Compostela. A continuación, realicé mi primer postdoc, de un año de duración, en el Instituto no Lineal de Niza (Francia). Seguidamente comencé un postdoc de dos años en el Instituto Max Planck para la Física de los Sistemas Complejos (Dresde, Alemania). En 2006 ingresé en el Instituto de Física de Cantabria (CSIC-UC) como postdoc dentro del programa Juan de la Cierva. Desde 2008 soy postdoc (contrato JAE-Doc) en el mismo Instituto. Mi línea actual de investigación se centra en el análisis y preparación de perturbaciones adecuadas para su uso en la predicción por conjuntos (ensemble forecasting). En particular en transferir el conocimiento adquirido en sistemas caóticos extendidos a modelos meteorológicos sencillos. He publicado 29 artículos en revistas con revisión (18 como primer autor), y 26 de ellos están dentro del primer cuartil de sus áreas respectivas. Tengo además dos artículos en fase de revisión (en J. Atmos. Sci. y Tellus A). Mi índice de Hirsch es $h=9$. Tengo 16 comunicaciones a congresos internacionales (2 como invitado), y 7 contribuciones a congresos nacionales. Tengo la acreditación de profesor contratado doctor y soy revisor de seis revistas internacionales.



Nombre: GARCIA COMAS, MAIA LEIRE

Referencia: RYC-2011-08269

Area: Ciencias de la Tierra

Correo electrónico: maya@iaa.es

Título:

Impacto del Cambio Climático sobre la Composición y la Dinámica de la Atmósfera Media y Alta

Resumen de la Memoria:

My general research line is the study of the chemistry and physics of the middle and upper atmosphere and the impact of the climate change on its thermal structure and its composition. In this context, my interests are: 1) to better understand the changes the stratosphere, mesosphere and lower thermosphere is suffering; 2) to discern between those of anthropogenic and those of natural origin; and 3) to determine how these changes propagate to lower regions in our atmosphere. The most relevant aspects that I investigate within this general research line are: 1) Short- and middle-term variations of carbon dioxide concentration and its infrared emissions, main responsible of the radiative cooling in the mesosphere, and of temperature, including studies on sporadic events occurred in the last years and their correlation with the climate change; 2) The global distributions of water vapour (with emphasis on the vertical distributions in the polar summer and around polar mesospheric clouds) and of carbon monoxide, and their potential changes related with enhancements in methane in the stratosphere; 3) The Sun-Earth interaction, in particular, the impact on the abundance of atmospheric species involved in the ozone catalytic destruction after precipitation of energetic particles in our atmosphere; 4) Non-Local Thermodynamic Equilibrium, important in these atmospheric regions in order to accurately derive the atmospheric composition from infrared emission measurements and to assess the energy balance; and 5) The lower ζ middle - upper atmosphere interaction, with particular interest on the chemical-dynamical connexion between the upper troposphere and the lower stratosphere regarding the injection of contaminant agents in the stratosphere, and the response of the middle-upper atmosphere to dynamical processes originated in the lower atmosphere. These aspects can be studied through the analysis of infrared atmospheric emissions measurements performed globally and continuously for an extended period of time by instrumentation onboard satellites orbiting the Earth.

Resumen del Curriculum Vitae:

Me licencié en CC. Físicas en la UGR en 1999. En 2000, me incorporé al Grupo de Atmósferas Planetarias Terrestres (GAPT-IAA, CSIC), inicialmente mediante una beca pre-doctoral del IAA-CSIC y, en 2001, mediante una beca pre-doctoral FPI del PAI-JA, con las que realicé mi tesis doctoral (director: Prof. Dr. López-Puertas; tutor: Prof. Dr. Alados Arboledas). Realicé los cursos de Tercer Ciclo y Doctorado, obteniendo el DEA en 2001 con calificación de Sobresaliente. En 2002, obtuve una Ayuda a la Investigación del PAI, que financió mi estancia de 3 meses en NASA-LaRC (EE.UU.). La investigación de mi tesis, que defendí en 2004 obteniendo calificación de Sobresaliente cum Laude, se centró en el estudio de la temperatura y CO₂ de la media y alta atmósfera terrestre mediante la interpretación de medidas en el IR de SABER. De 2005 a 2007, trabajé en el MPS de la Max-Planck-Society en el estudio de las emisiones marcianas IR del CO₂, las propiedades de los aerosoles y las distribuciones de H₂O. En 2007, me reincorporé con un contrato con cargo a proyecto (obtenido competitivamente) al GAPT-IAA, grupo de reconocida experiencia en la media y alta atmósfera, con el que he trabajado desde entonces en el estudio de la distribución global de temperatura y composición atmosféricas y sus tendencias. Desde 2009, mi contrato post-doctoral se financia con un proyecto de la ESA, del que soy investigadora principal, uno de los 11 seleccionados bajo el programa Changing Earth Science Network (CESN). Formo parte del equipo científico de los instrumentos MIPAS-ESA y SABER-NASA, a bordo de los satélites EnviSat y TIMED, respectivamente, dedicados a la observación de la atmósfera terrestre. He realizado estancias en el extranjero durante 29 meses. En mi etapa pre-doctoral, estuve en el NASA-LaRC durante 3 meses, colaborando con el Dr. Mlynczak (co-investigador asociado del instrumento SABER) en la inversión de la temperatura en la atmósfera media y alta. Durante mi etapa post-doctoral, estuve 25 meses en el MPS-MPG, trabajando con el Dr. Keller. Fui entonces investigadora asociada de HRSC-MeX. Fruto de esa estancia son 8 publicaciones y 9 contribuciones a congresos. También he realizado dos estancias cortas (1 semana) en mi etapa post-doctoral en la Universidad de Hampton, trabajando con el Prof. Dr. J. Russell III, investigador principal de SABER. He participado en 12 proyectos de investigación (7 de financiación española y 5 internacional), de los que soy IP en 1. En el marco de estos proyectos, he colaborado con grupos de investigación de gran prestigio de NASA-LaRC, NASA-Goddard, IMK-UK, ACD-NCAR, MPS-MPG y HU. Mi investigación se plasma en 52 publicaciones de las que 26 son artículos en el ζ Citation Index ζ (la mayoría en revistas de alto índice de impacto), 5 artículos más enviados o en preparación, 4 capítulos de libros, 4 reviews de la ESA, 12 proceedings en libros internacionales y el conjunto de 3 apéndices de un libro (como única autora). Soy co-autora de 72 contribuciones a congresos internacionales (de los que 4 son charlas invitadas). He sido árbitro de la revista J. Geophys. Res. He pertenecido a comités organizadores de 3 workshops y 3 congresos internacionales y he participado en más de 20 reuniones de los equipos científicos de los instrumentos MIPAS, SATI, HRSC, OMEGA, NOMAD y SABER, para los que he escrito numerosos informes internos.