MINISTERIO
DE ECONOMÍA, INDUSTRIA
Y COMPETITIVIDAD

AGENCIA ESTATAL DE INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL

MEMORIA DE LA TRAYECTORIA INVESTIGADORA Y LA LÍNEA DE INVESTIGACIÓN PRINCIPAL QUE HA DESARROLLADO (*SUMMARY OF THE RESEARCH CAREER OF THE CANDIDATE AND THE MAIN RESEARCH LINE THAT SHE/HE HAS CARRIED OUT*)

Esta memoria debe rellenarse preferiblemente en inglés - *Summary to be completed preferably in English*

INVESTIGADOR SOLICITANTE / *RESEARCHER APPLICANT*: Martin MÉNÉGOZ

IDENTIFICADORES DEL INVESTIGADOR / RESEARCHERS NUMBERS: **RESEARCHER ID:**
ORCID CODE: orcid.org/0000-0001-7098-9270

PALABRAS CLAVE / *KEY WORDS: Climate variability, decadal forecasts, aerosols, volcanic eruptions, cryosphere*

RESUMEN (aprox. 300 palabras) / SUMARY (approx. 300 words):

I am currently **leading the research line devoted to stratosphere-troposphere coupling processes** at the Earth Sciences Department of the Barcelona Supercomputing Center (BSC, Barcelona). With a double graduation from the National High School of Hydraulics and Mechanics and the Master Ocean, Atmosphere and Hydrology (Grenoble University, France), I started my research activities in 2004 with two four-month contracts with the French Institute for the Development (IRD) to investigate the water resource availability related to glacier evolution in the tropical Andes. Then, I worked one year in a private company to design hydraulics network and flood protection structures. I got a PhD in 2009 after 3 years in Météo-France (Toulouse, France), studying **atmosphere-aerosols interactions**. Then, I have been associate researcher with three French climate institutes (2010-2014): the Laboratory of Glaciology and Geophysics of Environment (LGGE, Grenoble), the Laboratory of Climate and Environmental Sciences (LSCE, Paris) and the Laboratory of Dynamical Meteorology (LMD, Paris). During this period, I organized a collaborative platform grouping different global and regional climate models to merge the efforts of these institutes in terms of cryosphere and climate modelling. I pursued a set of investigations related to **climate variability in mountainous regions, cryosphere sensitivity to particle pollution and climate change, focusing on concrete applications related to water resources and sea level change**. A part of this work is based on meteorological and glaciological observations that I collected in the Andes, the Alps and the Himalaya, benefiting from my experience as high-mountain guide (diploma get in 2012). I am currently involved in the development of the EC-Earth European model, in particular in terms of **aerosol parameterisations**. I am applying this model in initialised simulations to make **quasi-operational forecasts at seasonal-to-decadal timescales**. I am investigating in particular the possibility to predict the **climate response to large volcanic eruptions** with such forecast systems. I also take part in a collaborative development of a statistical tool to assess the performance of forecast systems. I developed **collaborations with 13 research institutes**. My researches have been organized trough projects: one international (NSF and Europe funds), 5 European and 4 national, including one MINECO project that I am coordinating (VOLCADEC, 168Keuros). I have an **H-index of 9** (Google Scholar), with **17 articles in peer-review journals** (6 as first author), **one highlight in *Nature Climate Change***, 1 article submitted and **460 citations**. I regularly review articles for 4 international journals. I have presented my results trough 36 conferences and international project meetings. My scientific background and my skill in both modelling and observational approaches coupled to my large international network of collaborations are the stakes of the future research activities that I could pursue with a Ramon y Cajal Grant.

DESTACAR HASTA UN MÁXIMO DE LAS CINCO APORTACIONES MÁS RELEVANTES ENTRE LAS RECOGIDAS EN EL CURRÍCULUM VITAE

Highlights a maximun of 5 relevant achievements from the ones includes in the cv

The following sections describe the five main relevant achievements of my professional career.

1/ Large sets of publications in atmospheric and aerosol science

During my PhD at Meteo-France (2006-2009, Toulouse, France), I developed an atmospheric-chemistry model to simulate the atmospheric concentration of the main aerosol species well known to impact the climate system: natural dust and anthropogenic sulfate and Black Carbon (BC). I carried out a thorough validation of aerosol simulations, in particular by using observations from industrialized area and remote lands of the Northern hemisphere, to provide an estimation of the aerosol load at the global scale (Ménégoz, 2009), in Europe (Ménégoz et al., 2009) and in the Arctic (Ménégoz et al, 2012). Figure 1 shows for example the strong levels of air pollution in the Arctic, in particular during the spring and the summer. By using these estimations of atmospheric aerosol concentration in global climate simulations, I investigated the impact of air pollution on the frequency and the persistence of weather regimes in the North-Atlantic Europe region (Ménégoz et al., 2010). During my PhD, I get a strong expertise in model development, in terms of both atmospheric dynamics and physical parameterisations, very useful for my current researches in the Spanish network.

I disseminated my investigations in aerosol sciences through publications and also communications at the European Geosciences Union Assembly (EGU) and trough my implication in the GEAI (Global Emissions Inventory Activities, http://www.geiacenter.org/) and the IGAC activities (International Global Atmospheric Chemistry, http://www.igacproject.org/).

My expertise in atmospheric chemistry allowed me to teach air quality from 2010 to 2012 (10 hours per year, master students, University Joseph Fourier, Grenoble, France), an asset to become a group leader.

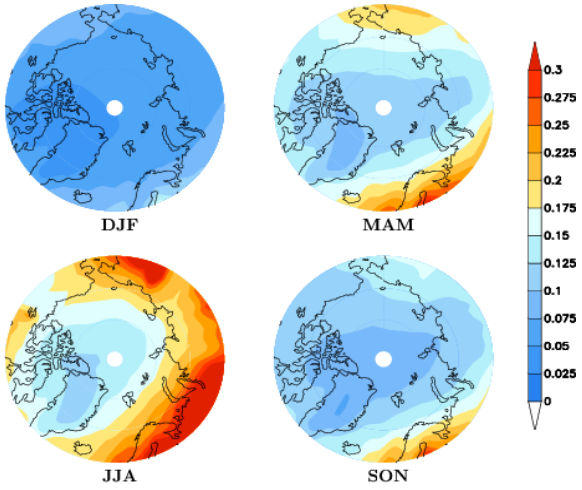

Figure 1 : BC load (mg.m-2, 2000-2005 mean) simulated between 60°N and 90°N (Ménégoz et al., 2012).

2/ Strong expertise in cryosphere sensitivity to particle pollution and climate change

From 2010 to 2014, trough contracts with the Laboratory of Glaciology and Geophysics of Environment (LGGE, CNRS, Grenoble, France), the Laboratory of Climate and Environmental Sciences (LSCE, CEA, Paris, France) and the Laboratory of Dynamical Meteorology (LMD, CNRS, Paris, France), I became an expert of the cryosphere-climate interactions, by developing snow schemes in climate model and using them for many different applications. Involved in the European project SNOWCARBO (Life+, http://snowcarbo.fmi.fi/), I developed in collaboration with French colleagues a full scheme of heat fluxes in the soil layers, to estimate the possible carbon emissions in the atmosphere related to snow cover changes affecting the permafrost (Gouttevin et al., 2012). I included a detailed parameterization of snow cover albedo in a global climate model to estimate the snow cover duration changes related to current BC deposition (Figure 2). I used this model to investigate the future snow cover changes associated to the potential increase of aerosol emissions in the Arctic related to ship traffic and biomass burning (Ménégoz et al., 2013a). With a fine resolution adapted for snow cover simulations in mountainous areas, I applied this tool to diagnose the impact of the strong aerosol pollution on the Himalayan snow, validating the model with ice core observations (Ménégoz et al., 2014, ***research highlight in Nature Climate Change, 2014***).

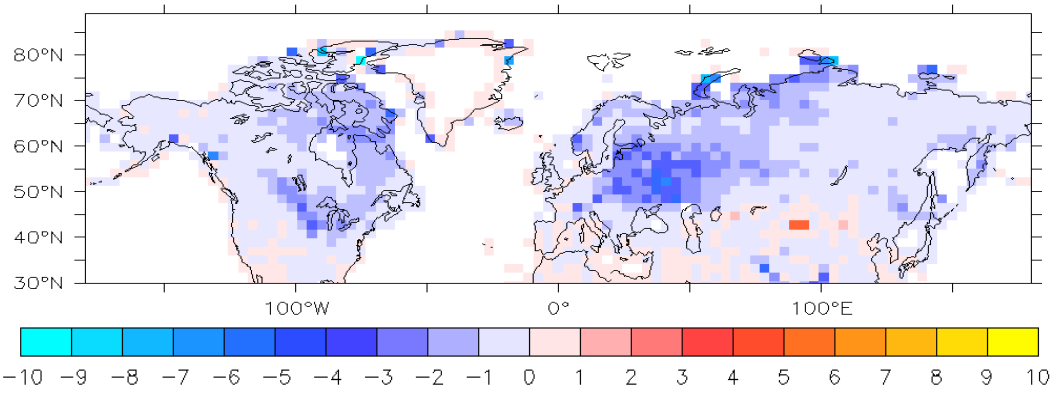

Figure 2: Snow cover duration change induced by BC deposition simulated on average over 1998-2008. From Ménégoz et al., 2014.

DESTACAR HASTA UN MÁXIMO DE LAS CINCO APORTACIONES MÁS RELEVANTES ENTRE LAS RECOGIDAS EN EL CURRÍCULUM VITAE

Highlights a maximun of 5 relevant achievements from the ones includes in the cv

To accurately estimate the local BC radiative forcing in the Himalayan snow, I have tested different parameterizations of aerosol deposition in an atmospheric chemistry model (Yasunari et al., 2013), and I have included a detailed snow albedo scheme in the operational snow model of Meteo-France (Jacobi et al., 2015). To investigate the climate variability in snow-covered and glaciarized areas, I use to apply both regional (Ménégoz et al., 2013b) and global models (Krinner et al., 2014). I have also investigated the ability of CMIP5 models to simulate the snow cover response to climate change in a study that served as a base for the chapter 12 of the IPCC devoted to climate projections (Brutel-Vuilmet et al., 2013). I conducted these investigations in the framework of national and international projects devoted to the estimation of the cryosphere sensitivity to anthropogenic pressure in mountainous areas, a particularly concerning topic, since more than a half of the rivers flow is coming from altitude higher than 1000 meters. I hope to pursue my investigations in climate variability, especially in Europe and Spain, where we need to anticipate the future evolution of water resources related to climate change.

3/ Developing new approaches to improve and evaluate climate forecast systems

Currently working at the Barcelona Supercomputing Center (BSC), I am leading the research line devoted to stratosphere-troposphere coupling processes (https://www.bsc.es/research-development/research-areas/climate-prediction/troposphere-stratosphere-coupling). Largely involved in the SPECS project (Seasonal to Decadal climate Predictions for the improvement of the European Climate Services, http://www.specs-fp7.eu/, coordinated by the BSC) and the APPLICATE H2020 project, a significant part of my researches aim at looking the sources of climate predictability at seasonal-to-decadal timescales. I also participate into the MORDICUS French project (Mechanisms for climate Oscillations and Retroactions at Decadal tImesCale: Uncertainties and Sensitivity, http://www.agence-nationale-recherche.fr/en/anr-funded-project/?tx_lwmsuivibilan_pi2[CODE]=ANR-13-SENV-0002), with the objective to understand the main modes of climate variability, their evolution under natural and anthropogenic forcings, and the ability of current climate models to reproduce them. I have co-supervised a master thesis in 2016 focusing on the impact of sea-ice and snow cover on the atmospheric variability at mid-latitudes (Santolaria et al., in prep). I also take part on the development of the European model EC-Earth (http://www.ec-earth.org/) that we use to produce quasi-operational seasonal-to-decadal forecasts (http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-multimodel). I also contribute to the development of a statistical package to assess the performance of climate forecast systems (https://cran.r-project.org/web/packages/s2dverification/index.html), and develop original approaches to evaluate the skill of forecast systems in reproducing the observations (Siegert et al., 2016). I am currently evaluating the ability of models to reproduce the surface temperature response to volcanic eruptions. This work is done under VOLCADEC, a project that I am coordinating at BSC. This initiative already led to a review paper of the volcanic imprints on the climate system (Swingedouw et al., *in press*) and to pioneering results concerning the North Atlantic Oscillation response to volcanic eruptions (Ménégoz et al., *submitted*). We also design protocols to simulate the climate response to the next volcanic eruption (Ménégoz et al., *in prep*). Figure 3 illustrate this work, by comparing the surface temperature anomalies: (a) in the observations; (b) in a simulation including the observed volcanic forcing; and (c) in a forecast run with an idealized volcanic forcing that could be used in a real-time forecast.

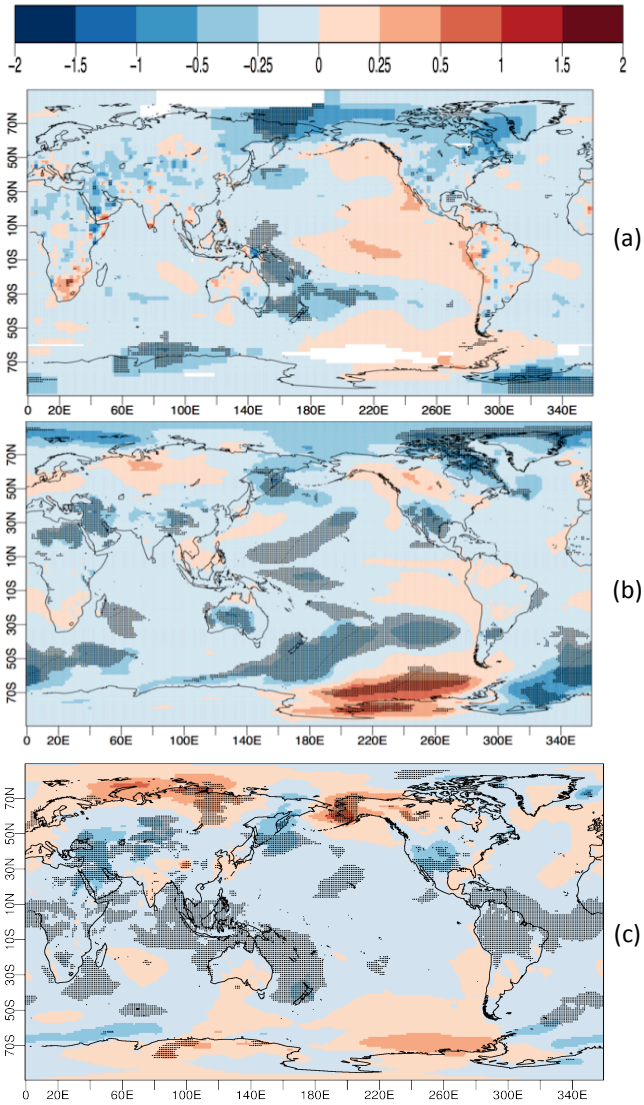

Figure 3: Surface temperature anomalies (°C) on average over three years following the last three major eruptions (Agung (1963), El Chichon (1982), Pinatubo (1991): (a) Observations; (b) simulation including the observed volcanic forcing; (c) forecast including an idealized volcanic forcing designed for real-time forecasts. Shaded areas show significant anomalies according to a bootstrap resampling (applied to 5 members for simulations).

DESTACAR HASTA UN MÁXIMO DE LAS CINCO APORTACIONES MÁS RELEVANTES ENTRE LAS RECOGIDAS EN EL CURRÍCULUM VITAE

Highlights a maximun of 5 relevant achievements from the ones includes in the cv

4/ Observing the glaciers evolution around the world

Over the last ten years, I focused a large part of my research activities on the observation of the cryosphere to understand its links with the climate variability, with the aims of predicting the water resources availability in mountainous areas, and to investigate the challenging issue of estimating the contribution of glacier melting to sea level rise. For these purposes, and benefiting from my expertise as a high-mountain guide (French national diploma get in 2012), I have collected meteorological and glaciological observations in the Andes (2003 and 2004), in the Himalaya (2012) and in the Alps (2010-2014). In addition to the objective to increase the number of data required for the validation of climate models in these remote regions, these field campaigns were devoted to: (1) the measurement of glaciers mass balance by setting up a network of ablation stakes; (2) the observation of temperature, wind, heat fluxes and precipitation to estimate the surface energy balance in order to understand the links between glacier evolutions and climate variability; (3) the setting up of hydrological stations to establish the links between the melting and the hydrological discharge under the glaciers. I used these data to understand the physical drivers of the glaciers retreat in the Andes (Ménégoz, 2003, 2004; Rabatel et al., 2013), in the Himalaya (Wagnon et al., 2013) and in the Kerguelen archipelago (Verfaillie et al., 2015, Favier et al., 2016). My research activities in climate predictions both in terms of seasonal to decadal forecasts and of projections at larger timescales will help to predict the future evolution of water resources.

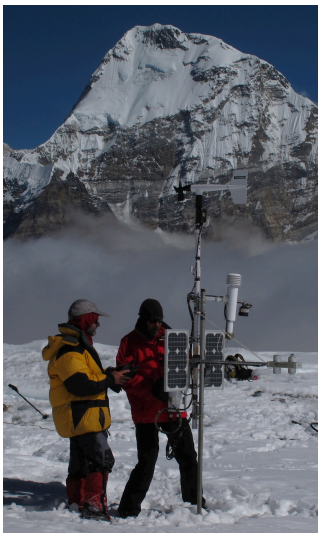

Figure 4: Meteorological station set up on Mera Peak (Nepal, 6400 m asl), 2012.

5/ International activities

Most of my research activity is tightly connected to a wide national and international network: As described in Table 1, I am or have been involved in 1 international project funded by the National Science Foundation (NSF, USA) and European partners, 5 projects funded by the European Commission (2 under the framework of the FP7 program, one under the framework of the LIFE program, and two under the H2020 objective). I have also been involved in 3 projects funded by the French Ministry of Sciences. Based in Spain since two years, I am coordinating a MINECO project (VOLCADEC, 168 K€) to improve forecast systems and their ability to simulate the climate response to volcanic eruptions. I will pursue my implication in national and international initiatives in the future, in particular by submitting new projects.

Name of the project	Description	Involvement	Dates
NEEM, international (NSF and Europe), http://neem.dk/	Ice core drilling in Greenland with paleoclimate applications	1 month	2007-2011
SNOWCARBO, European, LIFE, http://snowcarbo.fmi.fi/	Snow cover and carbon pool in the permafrost	24 months	2009-2012
PAPRIKA, French, ANR	Anthropogenic pressures on the cryosphere and the hydrosphere in the Himalaya	24 months	2010-2013
CLIMSLIP, French, ANR	Atmospheric pollution in the Arctic region	Co-author	2011-2013
HIMICE, French, ANR	Aerosols and cryosphere in the Himalayan region	Co-author	Rejected
ICE2SEA, European, FP7, http://www.ice2sea.eu/	Estimating the contribution of glacier wastage to sea level change	10 months	2009-2013
SPECS, European, FP7, http://www.specs-fp7.eu/	Seasonal to decadal climate predictions for the improvement of the European climate services	18 months	2013-2016
MORDICUS, French, ANR	Mechanisms for climate oscillations and retroactions at decadal timescale: uncertainties and sensitivity	Involved since September, 2014	2014-2017
PRIMAVERA, European H2020, https://www.primavera-h2020.eu/	Process-based climate simulation: advances in high-resolution modelling and European climate	Involved since January 2016	2015-2018
APPLICATE, European, H2020	Advanced prediction in polar regions and beyond: modelling, observing system design and linkages associated with a changing Arctic climate	Involved since January 2017	2017-2020
VOLCADEC, Spanish, MINECO	Volcanic eruptions in seasonal to decadal forecasts	**Principal Investigator**	2016-2018

Table 1: National and international projects involving Martin Ménégoz since 2007.

DESARROLLAR LA TRAYECTORIA INVESTIGADORA ASÍ COMO LA LÍNEA DE INVESTIGACIÓN PRINCIPAL QUE HA DESARROLLADO.

Extended detail of the research career of the candidate and the main research line that he/she has carried out.

(El tamaño máximo del fichero será de 4 Mb / The maximun file size will be 4 MB)

Graduated from the National Engineering School of Hydraulics and Mechanics (National Polytechnic Institute of Grenoble, France), I began my research activities during two training periods with the French Institute for the Development (IRD) and the Ecuadorian institute for Meteorology and Hydrology (INHAMI, Quito, Ecuador) to investigate the **water resource availability related to glacier evolution** in the tropical Andes. This work was based on two 3-month periods in Ecuador, to organise and supervise field campaigns in the Antizana glacier area (Ecuador). By designing innovative observational approaches to measure the surface energy balance over glaciers, I provided new approaches to generate accurate projections of their evolution over the next century and their socio-economical consequences. This successful training period allowed me to get a **Master in atmospheric sciences with distinctions in 2004**. Before beginning my PhD, I worked one year in 2005 in **a private company as an expert in hydraulics and hydrology**, to design **hydraulics networks and flood protection structures**, and to supervise their construction in the Hautes-Alpes, a French department. Trough this experience, I realized the potential socio-economical consequences of climate change in mountainous areas, especially in terms of societal adaptation when facing changes of water resources availability and increase of flood intensity and frequency. I received my PhD from the "Centre National de Recherches Météorologiques" (CNRM, Météo France, Toulouse) in 2009, where I studied the **interactions between the atmosphere and natural and anthropogenic aerosols**. During my PhD, I **developed both climate and atmospheric chemistry models**, and produced **3 publications as a first author related to air pollution and climate sensitivity to atmospheric particles**. Aerosol forcing is one of the major scientific uncertainties in terms of anthropogenic pressure on climate. For my current and future investigations, I benefit from my strong expertise in aerosol and atmospheric sciences to design climate forecast systems able to predict the climate of Europe, a region where aerosol forcing plays a major role in terms of climate variability.

As a post-doctoral researcher in different French institutes from 2010 to 2014, I developed strong collaborations with the Laboratory of Glaciology and Geophysics of Environment (LGGE, Grenoble, France), the Laboratory of Climate and Environmental Sciences (LSCE, Paris, France) and the Laboratory of Dynamical Meteorology (LMD, Paris, France). During this period, I organized a **collaborative platform grouping different global and regional climate models to merge the efforts of these three institutions in terms of cryosphere and climate modelling**. The platform has been designed to investigate the **interactions between the cryosphere and the climate**, offering in particular the possibility to model the impact of aerosol deposition on snow cover and glaciers. This work has been organized trough **two French projects** devoted to the impact of aerosols on the cryosphere and the atmospheric circulation (PAPRIKA, CLIMSLIP). I was also involved in **two European projects**, one devoted to the impact of cryosphere melting on sea level rise (ICE2SEA), and another one for which I was the French corresponding contact (SNOWCARBO) devoted to the carbon stocked in the permafrost and its link with the snow cover. My investment in these projects allows me to open strong **collaborations with the Finish Meteorological Institute** (FMI, Helsinki, Finland), the **EVK2-CNR Italian Institute**, and the **International Centre for Integrated Mountain Development** (ICIMOD, Kathmandu, Nepal). Benefiting from my diploma of high-mountain guide, I could supervise several **field campaigns** in the Himalaya (5 weeks in 2012) and in the Alps (several campaigns), devoted to the **observation of glacier mass balance and its links with climate variability**. During these contracts, I have published 12 articles in peer-review international journals (till 2016), devoted to investigations related to cryosphere, aerosols and climate (see details in the 5 achievements described previously), participated in 20 conferences or international meetings. I have also participated in popularisation activities trough several articles and posters and one movie explaining the future evolution of glaciers in the French Alps (http://www.ledoigtdedieu.fr/index.php).

Currently working at the **Barcelona Supercomputing Center** (BSC), I am leading the research line devoted to stratosphere-troposphere coupling processes. I am largely involved in the development of the **EC-Earth model**, participating in annual meetings and developing aerosol parameterisations. With my colleagues of the climate prediction group, we perform **quasi-operational seasonal-to-decadal predictions** by initializing this model with observations and we design tools to **assess the skill of forecast systems**. Under the VOLCADEC project (Ministerio de Competitividad y Economía, MINECO) that I am coordinating at BSC, I am managing a small team to design a forecast system that could be used **to predict the climate response to the next large volcanic eruption**. I am involved in **three European projects**, in particular in the SPECS FP7 project (Seasonal to decadal climate predictions for the improvement of the European climate services, coordinated by the BSC), highly active in the work package devoted to **stratospheric processes in seasonal to decadal forecasts**, with a particular focus on the stratospheric particles associated to large volcanic eruptions. I am also contributing to the PRIMAVERA H2020 initiative (Process-based climate simulation: advances in high-resolution modelling and European climate risk assessment), as an **expert in aerosol science**. Involved in the APPLICATE H2020 initiative, I investigate the **links between the polar changes and the climate of the mid-latitudes**. I am also taking part in the **French national project** MORDICUS (Mechanisms for climate oscillations and retroactions at decadal timescale: uncertainties and sensitivity), by investigating the **main modes of climate variability and their response to both natural and anthropogenic forcings**. These recent activities opened me collaborations at the European level, with the **ECMWF** (UK), the **MPI** (Germany), the **SMHI** (Sweden), the **MetOffice** (UK) and the **CERFACS** (France). The work that I do at BSC have been presented during around 15 communications and is valorized trough publications (2 published in 2016, one under review and several in preparation). These publications are related to the climate response to volcanic eruptions, the predictability of the climate of the mid-latitudes and the evaluation of forecast systems.

DESARROLLAR LA TRAYECTORIA INVESTIGADORA ASÍ COMO LA LÍNEA DE INVESTIGACIÓN PRINCIPAL QUE HA DESARROLLADO.

Extended detail of the research career of the candidate and the main research line that he/she has carried out.

(El tamaño máximo del fichero será de 4 Mb / The maximun file size will be 4 MB)

My scientific production is summarized in Table 2. My scientific background and my skill in both modelling and observational approaches coupled to my large international network of collaborations are the stakes of the future research activities that I could pursue with a Ramon y Cajal Grant.

H-index (Google Scholar, January 2017)	**9**
Articles in international peer-review journals (rank A)	**17 (6 as first author)**
Averaged impact factor of journals publishing my articles	**4.4**
Highlight in high-ranked journals	**1 in Nature Climate Change**
Number of citations (Google Scholar)	**460**
Number of submitted publications	**1**
Number of communications and oral presentations during international project meetings.	**36**
Journal reviews	**7** **(2 for *The Cryosphere*, 2 for *Environmental Research Letter*, 2 for *Atmospheric Environment and 1 for International Journal of Climatology*)**

Table 2: Scientific production from Martin Ménégoz

Publications:

Submitted:

- **Ménégoz, M.**, Cassou, C., Swingedouw, D., Doblas-Reyes, F., Bretonnière, P.A., Modulation of the climate response to a Pinatubo eruption by the Atlantic Multi-decadal Variability, *submitted to Climate Dynamics*.

Peer-reviewed publication in international journal (rank A):

17. Swingedouw, D., Ortega, P., Mignot, J., **Ménégoz, M.**, Khodri, M., Cassou, C., Impact of explosive volcanic eruptions on the main climate variability modes, review for *Global and Planetary Changes*, *in press*.
16. Siegert, S., Bellprat, O., **Ménégoz, M.**, Stephenson, D. B. & Doblas-Reyes, F. J., 2016: Detecting improvements in forecast correlation skill: Statistical testing and power analysis. *Monthly Weather Review*, doi: http://dx.doi.org/10.1175/MWR-D-16-0037.1, **Impact Factor: 3.2**.
15. Favier, V., Verfaillie, D., Berthier, E., **Ménégoz, M.**, Jomelli, V., Kay, J.E., Ducret, L., Malbéteau, Y., Brunstein, D., Gallée, H., Park, Y.H., Rinterknecht, V., 2016: Atmospheric drying as the main driver of dramatic glacier wastage in the southern Indian Ocean, Scientific Reports 6, 32396, doi:10.1038/srep32396. http://www.nature.com/articles/srep32396, **Impact Factor: 5.5**.
14. Jacobi, H.-W., Lim, S., Ménégoz, M., Ginot, P., Laj, P., Bonasoni, P., Stocchi, P., Marinoni, A., and Arnaud, Y., 2015: Black carbon in snow in the upper Himalayan Khumbu Valley, Nepal: observations and modeling of the impact on snow albedo, melting, and radiative forcing, The Cryosphere, 9, 1685-1699, doi:10.5194/tc-9-1685-2015, 2015, http://www.the-cryosphere.net/9/1685/2015/tc-9-1685-2015.html. **Impact Factor: 5.5**.
13. Verfaillie, D, Favier, V., Dumont, M., Jomelli, V., Gilbert, A., Brunstein, D., Gallée, H., Rinterknecht, V., Ménégoz, M., Frenot, Y., 2015: Recent glacier decline in the Kerguelen Islands (49°S, 69°E) derived from modeling, field observations and satellite data, Journal of Geophysical Research, doi: 10.1002/2014JF003329, http://onlinelibrary.wiley.com/doi/10.1002/2014JF003329/abstract. **Impact Factor: 3.4**
12. Ménégoz, M., Krinner, G., Balkanski, Y., Boucher, O., Cozic, A., Lim, S., Ginot, P., Laj, P., Gallée, H., Wagnon, P., Marinoni, A. and Jacobi, H.W., 2014: Snow cover sensitivity to black carbon deposition in the Himalaya : from atmospheric and ice core measurements to regional climate simulations, Atmos. Chem. Phys., 14, 4237-4249, doi:10.5194/acp-14-4237-2014, http://www.atmos-chem-phys.net/14/4237/2014/acp-14-4237-2014.html; **Impact Factor: 5.0; *Research highlight in Nature climate change*:** http://www.nature.com/nclimate/journal/v4/n6/full/nclimate2262.html. **Impact Factor: 14.5.**

DESARROLLAR LA TRAYECTORIA INVESTIGADORA ASÍ COMO LA LÍNEA DE INVESTIGACIÓN PRINCIPAL QUE HA DESARROLLADO.

Extended detail of the research career of the candidate and the main research line that he/she has carried out.

(El tamaño máximo del fichero será de 4 Mb / The maximun file size will be 4 MB)

11. Krinner, G., Largeron, C., Ménégoz, M., Agosta, C., Parouty, C. and Brutel-Vuilmet, C., 2014: Oceanic forcing of Antarctic climate change : A study using a stretched-grid atmospheric general circulation model, J. Climate, 27, 5786–5800. doi: http://dx.doi.org/10.1175/JCLI-D-13-00367.1, http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-13-00367.1. **Impact Factor: 4.4**

10. Wagnon, P., Vincent, C., Arnaud, Y., Berthier, E., Vuillermoz, E., Gruber, S., Ménégoz, M., Gilbert, A., Dumont, M., Shea, J. M., Stumm, D., and Pokhrel, B. K., 2013: Seasonal and annual mass balances of Mera and Pokalde glaciers (Nepal Himalaya) since 2007, The Cryosphere, 7, 1769-1786, doi:10.5194/tc-7-1769-2013, http://www.the-cryosphere.net/7/1769/2013/tc-7-1769-2013.html. **Impact Factor: 5.5.**

9. Ménégoz, M., Gallée, H., and Jacobi, H. W., 2013b: Precipitation and snow cover in the Himalaya : from reanalysis to regional climate simulations, Hydrol. Earth Syst. Sci., 17, 3921-3936, doi:10.5194/hess-17-3921-2013, http://www.hydrol-earth-syst-sci.net/17/3921/2013/hess-17-3921-2013.html. **Impact Factor: 3.5.**

8. Ménégoz, M., Krinner, G., Balkanski, Y., Cozic, A., Boucher, O., and Ciais, P., 2013a: Boreal and temperate snow cover variations induced by black carbon emissions in the middle of the 21st century, The Cryosphere, 7, 537-554, http://www.the-cryosphere.net/7/537/2013/tc-7-537-2013.html. **Impact Factor: 5.5.**

7. Rabatel, A., Francou, B., Soruco, A., Gomez, J., Cáceres, B., Ceballos, J. L., Basantes, R., Vuille, M., Sicart, J.-E., Huggel, C., Scheel, M., Lejeune, Y., Arnaud, Y., Collet, M., Condom, T., Consoli, G., Favier, V., Jomelli, V., Galarraga, R., Ginot, P., Maisincho, L., Mendoza, J., Ménégoz, M., Ramirez, E., Ribstein, P., Suarez, W., Villacis, M., and Wagnon, P., 2013 : Current state of glaciers in the tropical Andes : a multi-century perspective on glacier evolution and climate change, The Cryosphere, 7, 81-102, http://www.the-cryosphere.net/7/81/2013/tc-7-81-2013.html. **Impact Factor: 5.5.**

6. Brutel-Vuilmet, C., Ménégoz, M., and Krinner, G., 2013 : An analysis of present and future seasonal Northern Hemisphere land snow cover simulated by CMIP5 coupled climate models, The Cryosphere, 7, 67-80, http://www.the-cryosphere.net/7/67/2013/tc-7-67-2013.html. **Impact Factor: 5.5**

5. Yasunari, T.J., Tan, Q., Lau, K.-M., Bonasoni, P. Marinoni, A., Laj, P., Ménégoz, M., et al., 2013 : What are the true range of black carbon dry deposition and the related snow albedo reduction over Himalayan glaciers during pre-monsoon periods ?, Atmosph. Env., doi:10.1016/j.atmosenv.2012.03.031, http://www.sciencedirect.com/science/article/pii/S1352231012002725. **Impact Factor: 3.2**

4. Gouttevin, I., Ménégoz, M., Dominé, F., Krinner, G., Koven, C., Ciais, P., Tarnocai, C. and Boike, J., 2012 : How the insulating properties of snow affect soil carbon distribution in the continental pan-Arctic area ?, J. Geophys. Res., 117, G02020, doi:10.1029/2011JG001916, résumé : http://www.agu.org/pubs/crossref/pip/2011JG001916.shtml. **Impact Factor: 3.4**

3. Ménégoz, M., Voldoire, A., Teyssèdre, H., Salas y Mélia, D.S., Peuch, V.H. and Gouttevin, I., 2012 : How does the atmospheric variability drive the aerosol residence time in the Arctic region ?, Tellus B, 64, 11596, doi : 10.3402, http://www.tellusb.net/index.php/tellusb/article/view/11596/html. **Impact Factor: 3.3.**

2. Ménégoz, M., Guemas, V., Salas y Melia, D. and Voldoire, A, 2010 : Winter interactions between aerosols and weather regimes in the North-Atlantic European region, J. Geophys. Res., 115, D09201, doi:10.1029/2009JD012480, http://onlinelibrary.wiley.com/doi/10.1029/2009JD012480/abstract. **Impact Factor: 3.4.**

1. Ménégoz, M., Salas y Melia, D., Legrand, M., Teyssèdre, H., Michou, M., Peuch, V.H., Martet, M., Josse, B. and Dombrowski-Etchevers, I., 2009 : Equilibrium of sinks and sources of sulphates over Europe : Comparison between a six-year numerical simulation and EMEP observations, Atmos. Chem. Phys., 9, 4505-4519, http://www.atmos-chem-phys.net/9/4505/2009/acp-9-4505-2009.html. **Impact Factor: 5.0**

Other publications:

5. Ménégoz, M., 2013 : Simulations avec LMDZ de la sensibilité du couvert neigeux au dépôt d'aérosols. Edited in the journal of the LMD, 2013, http://lmdz.lmd.jussieu.fr/communication/lmdzinfo/lmdzinfo9.pdf/view.

4. Bisiaux, M., Ménégoz, M., 2013: Noir sur blanc – l'effet de la pollution sur la fonte des neige en Himalaya, http://www.anena.org/6333-neige-et-avalanches-n-142.htm.

3. Ménégoz, M, 2009: Modélisation globale des interactions atmosphère-aérosols, manuscrit de thèse, 198 p., http://thesesups.ups-tlse.fr/700/.

2. Ménégoz, M, 2004 : Étude de la couche limite atmosphérique sur le glacier de l'Antizana (Équateur), et estimation des flux turbulents, rapport de stage de Master, 50 pp.

1. Ménégoz, M., "Estimation des hauteurs de rugosité et des flux turbulents de chaleur sur un glacier", Rapport de stage, 50 p., 2003.