Agència de Gestió d'Ajuts Universitaris i de Recerca

AGAUR

ANNEX DE LA SOL·LICITUD D'AJUTS BP 2016

Aquest document només és vàlid per annexar-lo, **en format PDF**, al formulari de sol·licitud d'ajuts per a la incorporació de personal investigador postdoctoral al sistema de ciència i tecnologia català dins del programa Beatriu de Pinós (BP 2016).

ANNEX TO APPLICATIONS FOR 2016 BP GRANTS

This document is valid only when attached, **in PDF format**, to the application form for grants for incorporation of postdoctoral research staff into the Catalan science and research systems within the Beatriu de Pinós programme (BP 2016).

Dades de la persona responsable de la sol·licitud / *Details of person responsible for the application*

Nom / *Name:* Javier García Serrano
Telèfon / *Telephone:* +34 934137672
Adreça electrònica / *Email:* javier.garcia@bsc.es

Dades de la persona candidata / Details of the candidate

Nom / *Name:* Blanca Ayarzagüena Porras
Telèfon / *Telephone:* 00447914510095
Adreça electrònica / *Email:* blancaayarzag@gmail.com
ORCID:
ResearcherID:
Scopus Author ID:
Google Scholar: Blanca Ayarzagüena
(En cas d'indicar qualsevol referència, cal tenir indexades totes les publicacions / *If any reference is indicated all publications must be indexed*)

Altres pàgines web amb informació complementària / *Other web pages with complementary information*:

https://www.bsc.es/garcia-serrano-javier
http://tropa.fis.ucm.es/collaborators/jgs-pub

http://emps.exeter.ac.uk/mathematics/staff/ba292

1. Currículum de la persona candidata / *Candidate's curriculum vitae*

1.1 Estudis i formació acadèmica / *Academic studies and training*

January 2012: Doctor in Physics. Title of the PhD Thesis: 'Study of stratospheric warmings in the Northern Hemisphere and their tropospheric fingerprints: recent past, present and future'. Supervisors: Dra. Encarnación Serrano Mendoza and Dra. Ulrike Langematz; Dept. Geophysics and Meteorology, Universidad Complutense Madrid (UCM), Madrid, Spain. Mark: Distinction *Cum Laude* by unanimity.

September 2007: Master of Geophysics and Meteorology; Faculty of Physical Sciences, Universidad Complutense de Madrid, Madrid, Spain.

June 2006: Physics degree; Faculty of Physical Sciencies, Universidad Complutense de Madrid, Madrid, Spain

1.2 Experiència professional, incloses beques, ajuts i contractes de recerca postdoctorals (Copieu i enganxeu el format proposat tantes vegades com us sigui necessari) / *Professional experience, including postdoctoral grants, funding and research (copy and paste the proposed format as often as required)*

Experiència professional / *Professional experience*	
Posició actual / *Current position*: **Research fellow**	
Centre / *Centre*: University of Exeter	
Grup de recerca/departament / *Research group/department*: **College of Engineering, Mathematics and Physical Sciences**	
Localitat / *Town/city*: Exeter	**País / *Country*:** United Kingdom
Durada (mesos) / *Duration (months):18 (ongoing)*	**Dates d'inici i fi / *Start and end dates*: 01/06/2015-30/06/2018**

Experiència professional / *Professional experience*	
Posicions anteriors / *Previous positions*: **Postdoctoral researcher**	
Centre / *Centre*: Freie Universität Berlin	
Grup de recerca/departament / *Research group/department* **Atmospheric Dynamics/ Institut für Meteorologie**	
Localitat / *Town/city*: Berlin	**País / *Country*:** Germany
Durada (mesos) / *Duration (months):39,5*	**Dates d'inici i fi / *Start and end dates*: 15/02/2012-31/05/2015**

Experiència professional / *Professional experience*	
Posicions anteriors / *Previous positions*: **Contrato personal investigador de apoyo (Programa Comunidad de Madrid, Convocatoria 2007)**	
Centre / *Centre*: Universidad Complutense de Madrid	
Grup de recerca/departament / *Research group/department* **Dpto. Física de la Tierra, Astronomía y Astrofísica I/ Facultad de CC. Físicas**	
Localitat / *Town/city*: Madrid	**País / *Country*:** Spain
Durada (mesos) / *Duration (months):47,5*	**Dates d'inici i fi / *Start and end dates*: 01/03/2008-14/02/2012**

Experiència professional / ***Professional experience***	
Posicions anteriors / ***Previous positions*****:** **Beca de Posgrado Obra Social La Caixa**	
Centre / ***Centre*****:** Universidad Complutense de Madrid	
Grup de recerca/departament / ***Research group/department*** **Dpto. Física de la Tierra, Astronomía y Astrofísica I/ Facultad de CC. Físicas**	
Localitat / ***Town/city*****:** Madrid	**País** / ***Country*****:** Spain
Durada (mesos) / ***Duration (months):12***	**Dates d'inici i fi** / ***Start and end dates*****: 01/10/2006-30/09/2007**

Experiència professional / ***Professional experience***	
Posicions anteriors / ***Previous positions*****:** **Beca de colaboración del Ministerio de Educación español**	
Centre / ***Centre*****:** Universidad Complutense de Madrid	
Grup de recerca/departament / ***Research group/department*** **Dpto. Física de la Tierra, Astronomía y Astrofísica I/ Facultad de CC. Físicas**	
Localitat / ***Town/city*****:** Madrid	**País** / ***Country*****:** Spain
Durada (mesos) / ***Duration (months):9***	**Dates d'inici i fi** / ***Start and end dates*****: 01/12/2005-30/06/2006**

1.3 Experiència en recerca, incloent la participació en projectes de recerca, contractes i convenis. Indiqueu el càrrec o posició que ocupàveu, les tasques realitzades, la institució i la durada / *Research experience, including participation in research projects, contracts and agreements. Indicate office or position you held, the duties performed, the institution and duration.*

Research contracts/fellowships

June 2015-present: Research fellow at the University of Exeter (United Kingdom): Working on stratosphere-troposphere coupling Prof. Mark Baldwin under two projects (NERC Euroclim and EU StratoClim).

June 2014-May 2015: Postdoctoral researcher at the Freie Universität Berlin (Germany): working with Prof. Ulrike Langematz on the effects of different solar forcing data sets on climate under the German BMF SOLIC (Role Of the MIddle atmosphere in Climate: Quantification of Uncertainties of Solar Induced Climate variability) project and on the future changes in the Arctic stratosphere under the European StratoClim (Stratospheric and upper tropospheric processes for better climate predictions) project.

February 2012 – May 2014: Postdoctoral researcher at the Freie Universität Berlin (Germany): working with Prof. Ulrike Langematz on the stratosphere-troposphere coupling in a changing climate under the German DFG SHARP (Stratospheric Change and its Role in Climate Prediction) and BMF "Planetary Evolution and Life" projects.

March 2008 –February 2012: PhD student at the Universidad Complutense de Madrid: working with Prof. Encarna Serrano on stratospheric sudden warmings under a competitive contract of the Comunidad de Madrid.

October 2006 – September 2007: Master student at the Universidad Complutense de Madrid: working with Prof. Encarna Serrano on climate variability (stratosphere-troposphere coupling) under an Obra Social La Caixa fellowship.

December 2005 – June 2006: Undergraduate student at the Universidad Complutense de Madrid: working with Prof. Encarna Serrano on climate variability under a "Beca de Colaboracion (MEC)".

Participation in research projects without contractual relationship:

Jan 2013 – Dec 2015. Spanish national project 'Precursors of stratosphere-troposphere coupling affecting European climate: observational and modelling studies (PRESTAMOS)' (ref: CGL2012-34997). PI: Prof. E. Serrano (Universidad Complutense de Madrid). Duties: Analysis of precursors of stratosphere-troposphere coupling in a changing climate with EMAC model.

Jan 2012 – Dec 2013. Exchange project between Norway and Germany entitled 'Coupling processes during stratospheric sudden warnings as diagnosed in whole-atmosphere chemistry-climate models' and funded by the Deutsche Akademische Austausch Dienst (DAAD) and Norway Council. PI: Prof. Ulrike Langematz, Yvan Orsolini, Frode Stordal (Freie Universität Berlin, Norwegian Institute for Air Research). Duties: Analysis of stratosphere-troposphere coupling in EMAC model.

Jan 2009 – Dec 2011. Spanish national project 'Stratosphere-troposphere coupling in the Northern Hemisphere and its connection to climate change' (ref: CGL2008-06295). PI: Prof. E. Serrano (UCM). Duties: Study of stratospheric warmings in the Northern Hemisphere in reanalysis and model simulations output.

Sep 2008 – Jun 2012. Spanish national project 'Modelling global climate variability using a hierarchy of climate models. Relevance for the Iberian Peninsula climate (MOVAC)' (ref: 2008-00050084028). PI: Prof. M. L. Montoya (Universidad Complutense Madrid). Duties: Study of stratospheric warmings in the Northern Hemisphere and analysis of changes in the covariability in the Tropical Atlantic and the extratropical circulation in the Northern Hemisphere in the atmospheric column before and after the climate shift.

July 2007 – December 2007: Spanish national project 'The role of the tropical ocean and the stratosphere in the predictability of anomalous climatic regime of Europe' (Ref.: CCG07-UCM/ESP- 2152). PI: Prof. E. Serrano (Universidad Complutense de Madrid). Duties: Study of climate variability of Europe in springtime.

January 2008-November 2015: Regional Project 'Micrometeorology and climate variability'. PI: Prof. Carlos Yagüe (Universidad Complutense de Madrid). Duties: study of stratosphere-troposphere coupling in the Northern Hemisphere.

1.4 Publicacions (Copieu i enganxeu el format proposat tantes vegades com us sigui necessari) / *Publications (copy and paste the proposed format as often as required)*

Indicadors generals de recerca (cal especificar la base de dades (Web of Science, Scopus, etc..) utilitzada per calcular els valors / *General research indicators. You must specify the database (Web of Science, Scopus, etc.) used to calculate the values*
Base de dades / *Database*: Google scholar
Número total de cites / *Total number of citations*: 63
Número total d'articles / *Total number of articles*: 7 + 1 under review
Número total d'articles de Q1 / *Total number of Q1 articles*: 6
Índex-h / *h-index: 3*

Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: A. Diaz-Duran, E. Serrano, **B. Ayarzagüena**, M. Ábalos, and A. De la Cámara	
Títol / *Title*: Intra-seasonal variability of extreme boreal stratospheric polar vortex events and their precursors	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Climate Dynamics (CLDY-D-16-00348R1, under review, major revisions).	
Any / *Year*: 2016	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC):	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Consigneu els índexs d'impacte corresponents a l'any de publicació de l'article / Include impact factors for the article's year of publication

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Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Rodriguez-Fonseca; R. Suarez-Moreno; **B. Ayarzagüena**; J. López Parages; I. Gómara; J. Villamayor; E. Mohíno; T. Losada; A. Castaño-Tierno.	
Títol / *Title*: A Review of ENSO Influence on the North Atlantic. A Non-Stationary Signal	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Atmosphere. 7, 87.	
Any / *Year*: 2016	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 1.221	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):3rd quartile (METEOROLOGY & ATMOSPHERIC SCIENCES)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):0	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena, J. Screen	
Títol / *Title*: Future Arctic sea ice loss reduces severity of cold air outbreaks in midlatitudes	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Geophysical Research Letters, 43, 2801-2809.	
Any / *Year*: 2016	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 4.212	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):1st quartile (GEOSCIENCES, MULTIDISCIPLINARY)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):1 (google scholar)	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: J.A. Lopez-Bustins; E. Serrano, **B. Ayarzagüena**, A. Sánchez-Lorenzo	
Títol / *Title*: Spatial and temporal temperature trends in the lower stratosphere during the extended boreal Winter from reanalyses	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: International Journal of Climatology, 35, 3888 - 3901.	
Any / *Year*: 2015	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 3,398	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI): 1st quartile (METEOROLOGY & ATMOSPHERIC SCIENCES)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

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Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; Y. Orsolini; U. Langematz; J. Abalichin; A. Kubin	
Títol / *Title*: The relevance of the location of blocking highs for stratospheric variability in a changing climate	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Journal of Climate. 28, 531 - 549	
Any / *Year*: 2015	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 4,85	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):1st quartile (METEOROLOGY & ATMOSPHERIC SCIENCES)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; S. Meul; S. Oberländer; J. Abalichin; A. Kubin	
Títol / *Title*: The role of climate change and ozone recovery for the future timing of major stratospheric warmings	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Geophysical Research Letters. 40, 2460 - 2465	
Any / *Year*: 2013	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 4.476	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):1st quartile (GEOSCIENCES, MULTIDISCIPLINARY)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI): 11 (google scholar)	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena, U. Langematz, E. Serrano	
Títol / *Title*: Tropospheric forcing of the stratosphere: A comparative study of the two different Major Stratospheric Warmings in 2009 and 2010.	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Journal of Geophysical Research. 116 - D18114.	
Any / *Year*: 2011	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 3,021	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):1st quartile (GEOSCIENCES, MULTIDISCIPLINARY)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):32 (google scholar)	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

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Articles a revistes amb avaluació externa / *Journal articles with peer review*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena, E. Serrano	
Títol / *Title*: Monthly characterization of the tropospheric circulation over the Euro-Atlantic area in relation with the timing of stratospheric final warmings.	
Revista (títol, volum, pàgina inicial- final) / *Journal (title, volume, start and end page)*: Journal of Climate. 22, pp. 6313 - 6324	
Any / *Year*: 2009	**Clau (A: article, R: review) / *Key (A: article, R: review)*:** A
Índex d'impacte / *Impact factor* (SCI/SSCI/AHC): 3,63	**Quartil i àrea / *Quartile and area* (SCI/SSCI/AHCI):1st quartile (METEOROLOGY & ATMOSPHERIC SCIENCES)**
Número de cites / *Number of citations (*SCI/SSCI/AHCI):15 (google scholar)	
Altres índexs de qualitat (consignar base de dades i índex d'impacte) / *Other quality indices (state database and impact factor)*:	

Llibres i capítols de llibre / *Books and book chapters*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Rodríguez-Fonseca, C. Rodríguez-Puebla (**B. Ayarzagüena**, contributing author)	
Títol / *Title*: Climate teleconnections affecting Iberian Peninsula climate variability. Predictability and expected changes. In Climate in Spain: Past, Present and Future	
Pàgines (inicial-final) / *Pages (start-end)*: 53-67	
Editorial / *Publishing house*: CLIVAR and MICINN (F. F. Pérez, R. Boscolo Eds.) ISBN: 978-84-614-8115-6	
Any / *Year*: 2010	**Clau (L=llibre, C=capítol, EC=edicions crítiques, E=editor/a) / *Key (B=book, C=chapter, CP=critical publications, E=editor):*** C (chapter 4)

Llibres i capítols de llibre / *Books and book chapters*	
Autors/res (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena	
Títol / *Title*: Study of stratospheric warmings in the Northern Hemisphere and their tropospheric fingerprint: recent past, present and future. PhD Thesis	
Pàgines (inicial-final) / *Pages (start-end)*: 233pp	
Editorial / *Publishing house*: Universidad Complutense de Madrid, ISBN: 978-84-695-3544-8	
Any / *Year*: 2012	**Clau (L=llibre, C=capítol, EC=edicions crítiques, E=editor/a) / *Key (B=book, C=chapter, CP=critical publications, E=editor):*** B

Altres publicacions (Articles a revistes no indexades, informes tècnics, estudis de casos, traduccions, etc.) / *Other publications (Articles in non-indexed publications, technical reports, case studies, translations, etc.)*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: U. Langematz, **B. Ayarzagüena**, T. Birner, M. Budde, H. Garny, E. Gerber, S. Godin-Beekmann, P. Hitchcock, D. Hubbert, S. Lossow, S. Meul, S. Oberländer, M. Riese and A. Stenke	
Títol / *Title*: Stratospheric change and its role for climate prediction (SHARP2016)	**Any / *Year*:** 2016
Pàgines (inicial-final) / *Pages (start-end)*: SPARC Newsletter, 47, 20-23	
Editorial / *Publishing house*: SPARC, ISSN 1245-4680,	
Institució / *Institution*: SPARC	

Altres publicacions (Articles a revistes no indexades, informes tècnics, estudis de casos, traduccions, etc.) / *Other publications (Articles in non-indexed publications, technical reports, case studies, translations, etc.)*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: A. de la Cámara, J. García-Serrano, **B. Ayarzagüena**, M. Ábalos, E. Serrano	
Títol / *Title*: ENSO influence on the variability modes of the boreal winter stratosphere	**Any / *Year*:** 2010
Pàgines (inicial-final) / *Pages (start-end)*: Física de la Tierra, 21, 167-178	
Editorial / *Publishing house*: Universidad Complutense Madrid (UCM), ISSN: 0214-4557	
Institució / *Institution*: UCM, Madrid, Spain	

1.5 Estades de mobilitat de curta durada en altres centres i universitats (Copieu i enganxeu el format proposat tantes vegades com us sigui necessari) / *Short-term mobility stays at other centres and universities (copy and paste the proposed format as often as required)*

Estades de mobilitat / *Mobility stays*	
Centre / *Centre*: Norwegian Institut for Air Research (NILU)	
Investigador responsable / *Responsible researcher*: Yvan Orsolini	
Grup de recerca/departament receptor / *Host research group/department*:	
Localitat / *Town/city* : Oslo	**País / *Country*:** Norway
Durada (mesos) / *Duration (months): aprox. 1*	**Dates d'inici i fi / *Start and end dates*: 20/08/2012-31/08/2012 20/08/2013-28/08/2013**
Tema / *Subject*: Project on coupling processes during stratospheric sudden warmings as diagnosed in whole-atmosphere chemistry climate models	

Estades de mobilitat / *Mobility stays*	
Centre / *Centre*: Freie Universität Berlin	
Investigador responsable / *Responsible researcher*: Ulrike Langematz	
Grup de recerca/departament receptor / *Host research group/department*: **Atmospheric Dynamics/ Institut für Meteorologie**	
Localitat / *Town/city* : Berlin	**País / *Country*:** Germany
Durada (mesos) / *Duration (months): 3*	**Dates d'inici i fi / *Start and end dates*: 15/03/2010-15/06/2010**
Tema / *Subject*: Pre-doctoral stay: future changes in major stratospheric warmings	

Estades de mobilitat / *Mobility stays*	
Centre / *Centre*: Freie Universität Berlin	
Investigador responsable / *Responsible researcher*: Ulrike Langematz	
Grup de recerca/departament receptor / *Host research group/department*: **Atmospheric Dynamics/ Institut für Meteorologie**	
Localitat / *Town/city* : Berlin	**País / *Country*:** Germany
Durada (mesos) / *Duration (months): 2*	**Dates d'inici i fi / *Start and end dates*: 29/06/2009-28/02/2009**
Tema / *Subject*: Pre-doctoral stay: tropospheric forcing of major stratospheric warmings	

Estades de mobilitat / *Mobility stays*	
Centre / *Centre*: Freie Universität Berlin	
Investigador responsable / *Responsible researcher*: Ulrike Langematz	
Grup de recerca/departament receptor / *Host research group/department*: **Atmospheric Dynamics/ Institut für Meteorologie**	
Localitat / *Town/city* : Berlin	**País / *Country*:** Germany
Durada (mesos) / *Duration (months): 3*	**Dates d'inici i fi / *Start and end dates*: 01/12/2008-29/02/2009**
Tema / *Subject*: Pre-doctoral stay: representation of major stratospheric warmings in climate models	

1.6 Ponències a congressos i conferències / *Papers at congresses and conferences*

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; James Screen	
Títol / *Title*: Taking the chill off: Future Arctic sea ice loss reduces severity of cold air outbreaks in midlatitudes	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress*: American Geosciences Union (AGU) Assembly 2016	
Publicació / *Publication*:	
Lloc celebració / *Venue*: San Francisco (USA)	**Data / *Date*:** December 2016
Organisme/institució organitzadora / *Organising body/institution*: AGU	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Ulrike Langematz; Froila Palmeiro; David Barriopedro; Natalia Calvo	
Títol / *Title*: Major stratospheric warmings in reanalyses: Features and tropospheric forcing	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress*: SPARC DynVar Workshop & S-RIP Meeting	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Helsinki (Finland)	**Data / *Date*:** June 2016
Organisme/institució organitzadora / *Organising body/institution*: SPARC	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; James Screen; Elisabeth Barnes.	
Títol / *Title*: Effects of Arctic sea ice loss on northern hemisphere blocking highs	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress*: SPARC Workshop on Atmospheric Blocking	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Reading (United Kingdom)	**Data / *Date*:** April 2016
Organisme/institució organitzadora / *Organising body/institution*: SPARC	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Sophie Oberländer-Hayn; Ulrike Langematz; Hideharu Akiyoshi; Steve Hardiman;Andrew Klekociuk; Marion Marchand; Stephanie Meul; Martine Michou; Olaf Morgenstern; Luke Oman; Andrea Stenke; Kiyo Shibata.	
Títol / *Title*: Response of SSTs to climate change and its influence on the wintertime polar vortex in CCMs	
Tipus de contribució / *Contribution type*: Invited talk	
Congrés / *Congress*: SPARC Workshop: "Stratospheric Change and its Role in Climate Prediction (SHARP)	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Berlin (Germany)	**Data / *Date*:** February 2016
Organisme/institució organitzadora / *Organising body/institution*: SPARC	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Markus Kunze; Ulrike Langematz; Katja Matthes	
Títol / *Title*: The impact of different solar forcing data sets on the atmospheric radiation budget	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress*: 26th International Union of Geodesy and Geophysics General Assembly	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Prag (Czech Republic)	**Data / *Date*:** June 2015
Organisme/institució organitzadora / *Organising body/institution*: International Union of Geodesy and Geophysics	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Yvan Orsolini; Ulrike Langematz; Janna Abalichin; Anne Kubin	
Títol / *Title*: The relevance of the location of blocking highs for stratospheric variability in a changing climate	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress*: 26th International Union of Geodesy and Geophysics General Assembly	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Prag (Czech Republic)	**Data / *Date*:** June 2015
Organisme/institució organitzadora / *Organising body/institution*: International Union of Geodesy and Geophysics	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Ulrike Langematz; Lorenzo M. Polvani; Janna Abalichin; Hideharu Akiyoshi; Andrew Klekociuk; Martine Michou; Olaf Morgenstern; Luke Oman; Kiyo Shibata.	
Títol / *Title*: Future changes in major stratospheric warmings in CCMI models	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress*: American Meteorological Society Annual Meeting 2015	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Phoenix (United States of America	**Data / *Date*:** January 2015
Organisme/institució organitzadora / *Organising body/institution*: AMERICAN METEOROLOGICAL SOCIETY	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Catrin Gellhorn; Ulrike Langematz; Stephanie Meul; Sophie Oberländer; Janna Abalichin; Simone Dietmüller; Michael Ponater; **Blanca Ayarzagüena**	
Títol / *Title*: Past and future radiative forcing by climate active agents in the EMAC Chemistry-Climate model	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress*: American Meteorological Society Annual Meeting 2015	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Phoenix (United States of America	**Data / *Date*:** January 2015
Organisme/institució organitzadora / *Organising body/institution*: AMERICAN METEOROLOGICAL SOCIETY	

Congressos i conferències / *Congresses and conferences*
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Blanca Ayarzagüena; Ulrike Langematz; Janna Abalichin; Hideharu Akiyoshi; Martine Michou; Olaf Morgenstern; Luke Oman.
Títol / *Title*: Future changes in wintertime stratospheric Arctic variability in CCMI models
Tipus de contribució / *Contribution type*: Oral

Congrés / *Congress*: CHEMISTRY CLIMATE MODEL INITIATIVE 2014 SCIENCE WORKSHOP	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Lancaster (United Kingdom)	**Data / *Date*:** May 2014
Organisme/institució organitzadora / *Organising body/institution*: CHEMISTRY CLIMATE MODEL INITIATIVE	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: Janice Scheffler; Ulrike Langematz; Yvan Orsolini; **Blanca Ayarzagüena**	
Títol / *Title*: Future Changes in elevated stratopause events	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress*: European Geosciences Union General Assembly 2014	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2014
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; Y. J. Orsolini; U. Langematz; J. Abalichin; A. Kubin.	
Títol / *Title*: The relevance of blocking highs for stratospheric variability in a changing climate	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress*: SPARC2014 General Assembly	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Queenstown (New Zealand)	**Data / *Date*:** January 2014
Organisme/institució organitzadora / *Organising body/institution*: SPARC	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: U. Langematz; **B. Ayarzagüena;** S. Meul; S. Oberländer	
Títol / *Title*: Dynamical Variability and Antarctic Ozone under different climate states	
Tipus de contribució / *Contribution type*: Invited talk	
Congrés / *Congress*: American Geosciences Union General Assembly 2013	
Publicació / *Publication*:	
Lloc celebració / *Venue*: San Francisco (USA)	**Data / *Date*:** December 2013
Organisme/institució organitzadora / *Organising body/institution*: American Geosciences Union	

Congressos i conferències / *Congresses and conferences*
Autors/es (per ordre de signatura) / *Authors (in signing order)*: U. Langematz; **B. Ayarzagüena;** S. Meul; S. Oberländer; J. Abalichin; K. Grunow; E. Romanowsky.

Agència de Gestió d'Ajuts Universitaris i de Recerca

AGAUR

Títol / *Title*: The response of Arctic ozone to future climate change	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress*: IAGA 2013, the XIIth Scientific Assembly	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Merida (Mexico)	**Data / *Date*:** August 2013
Organisme/institució organitzadora / *Organising body/institution*: International Association of Geomagnetism and Aeronomy	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; J. Abalichin; A. Kubin; S. Meul; S. Oberländer.	
Títol / *Title*: Will dynamical processes trigger future changes in major stratospheric warmings?	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* Chemistry Climate Model Initiative 2013 science workshop	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Boulder (USA)	**Data / *Date*:** May 2013
Organisme/institució organitzadora / *Organising body/institution*: CCMI	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; S. Meul; S. Oberländer; J. Abalichin; A. Kubin	
Títol / *Title*: Future changes in dynamical processes triggering major stratospheric warmings	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* European Geosciences Union General Assembly 2013	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2013
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; J. Abalichin; A. Kubin; S. Meul; S. Oberländer.	
Títol / *Title*: Future changes of stratospheric sudden warmings: Any effect on the tropospheric circulation?	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* 3rd International Conference on Earth System Modelling	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Hamburg (Germany)	**Data / *Date*:** September 2012
Organisme/institució organitzadora / *Organising body/institution*:	

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Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: A. Kubin; J. Abalichin; **B. Ayarzagüena;** U. Langematz.	
Títol / *Title*: A model study on the downward propagation of the 11-year solar signal in a warming climate	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* European Geosciences Union General Assembly 2012	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2012
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; B. Rodriguez de Fonseca; A. de la Camara; J. Garcia Serrano; E. Serrano.	
Títol / *Title*: The tropical Atlantic-atmospheric column covariability before and after the Pacific climate shift	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* American Geosciences Union General Assembly 2011	
Publicació / *Publication*:	
Lloc celebració / *Venue*: San Francisco (USA)	**Data / *Date*:** December 2011
Organisme/institució organitzadora / *Organising body/institution*: American Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: U. Langematz; K. Grunow; **B. Ayarzagüena;** A. Kubin; E. Romanowsky.	
Títol / *Title* Will future Arctic ozone be affected by climate change?	
Tipus de contribució / *Contribution type*: Invited talk	
Congrés / *Congress* American Geosciences Union General Assembly 2011	
Publicació / *Publication*:	
Lloc celebració / *Venue*: San Francisco (USA)	**Data / *Date*:** December 2011
Organisme/institució organitzadora / *Organising body/institution*: American Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: J. A. Lopez Bustins; E. Serrano; A. Sanchez Lorenzo; **B. Ayarzagüena.**	
Títol / *Title* On the detection of cooling regions in the low boreal stratosphere during the 1957–2002 period	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* 11th European Meteorological Society Annual Meeting/ 10th European Conference on Applications of Meteorology (ECAM)	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Berlin (Germany)	**Data / *Date*:** September 2011

Organisme/institució organitzadora / *Organising body/institution*: European Meteorological Society

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; A. Kubin; J. Abalichin; E. Serrano.	
Títol / *Title* Will climate change affect future major stratospheric sudden warmings?	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* European Geosciences Union General Assembly 2011	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2011
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; E. Serrano.	
Títol / *Title* Which factors could have favored the occurrence of the unexpected Major Midwinter Warming of 2009?	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* European Geosciences Union General Assembly 2010	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** May 2010
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: C. Yagüe; D. Ramos; M. Sastre; G. Maqueda; S. Viana; E. Serrano; G. Morales; **B. Ayarzagüena;** C. Vinas; E. Sanchez.	
Títol / *Title* Análisis de la Capa Límite Atmosférica nocturna durante la campaña experimental CIBA2008.	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* XXXI Jornadas científicas de la AME	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Sevilla (Spain)	**Data / *Date*:** March 2010
Organisme/institució organitzadora / *Organising body/institution*: Asociacion Meteorologica Española	

Congressos i conferències / *Congresses and conferences*
Autors/es (per ordre de signatura) / *Authors (in signing order)*: U. Langematz; **B. Ayarzagüena**; P. Sinigog; T. Spangehl; U. Cubasch.
Títol / *Title* Stratosphere-troposphere dynamical coupling: A robust coupled mode of the Earth's atmosphere?
Tipus de contribució / *Contribution type*: Oral
Congrés / *Congress* MOCA-09 (Joint Assembly of IAMAS, IAPSO and IACS)
Publicació / *Publication*:

Lloc celebració / *Venue*: Montreal (Canada)	**Data / *Date*:** August 2009
Organisme/institució organitzadora / *Organising body/institution*: IAMAS, IAPSO and IACS	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: C. Yagüe; G. Maqueda; D. Ramos; M. Sastre; S. Viana; E. Serrano; G. Morales; **B. Ayarzagüena**; C. Viñas; E. Sanchez.	
Títol / *Title* Preliminary analysis of the Nocturnal Atmospheric Boundary Layer during the experimental campaign CIBA 2008.	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* European Geosciences Union General Assembly 2009	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2009
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; U. Langematz; A. Baumgärtner; C. Brühl; P. Jöckel; A. Kubin; E. Serrano.	
Títol / *Title* Stratospheric sudden warmings in the ECHAM5/MESSy CCMVal Ref.1 simulation	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* European Geosciences Union General Assembly 2009	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2009
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; E. Serrano.	
Títol / *Title* Relationship between the timing of northern Stratospheric Final Warmings and changes in the wave activity.	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* 8th Annual Meeting of the European Meteorological Society/ 7th European Conference on Applied Climatology.	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Amsterdam (Holland)	**Data / *Date*:** October 2008
Organisme/institució organitzadora / *Organising body/institution*: European Meteorological Society	

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Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: T. Rico; **B. Ayarzagüena**; E. Serrano.	
Títol / *Title* Diferencias entre los reanálisis ERA40 y NCEP/NCAR en la variabilidad estratosférica de la temperatura y del viento zonal	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* XXX Jornadas científicas de la Asociación Meteorológica Española.	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Zaragoza (Spain)	**Data / *Date*:** May 2008
Organisme/institució organitzadora / *Organising body/institution*: Asociación Meteorológica Española	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; E. Serrano.	
Títol / *Title* Interannual variability in the wave activity of spring months for years with early or late breakup of the stratospheric polar vortex.	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* European Geosciences Union General Assembly 2008	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Vienna (Austria)	**Data / *Date*:** April 2008
Organisme/institució organitzadora / *Organising body/institution*: European Geosciences Union	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: E. Serrano; T. Rico; **B. Ayarzagüena.**.	
Títol / *Title* Comparación entre los reanálisis ERA40 y NCEP/NCAR en su representación de la variabilidad estratosférica.	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* 6ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica	
Publicació / *Publication*:	
Lloc celebració / *Venue*: Tomar (Portugal)	**Data / *Date*:** February 2008
Organisme/institució organitzadora / *Organising body/institution*:	

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; E. Serrano; A. de la Cámara.	
Títol / *Title* Impact of interannual variability of stratospheric final warmings on the anomalous spring rainfall regime in the Mediterranean region	
Tipus de contribució / *Contribution type*: Poster	
Congrés / *Congress* 2nd ESF-MedCLIVAR Workshop	
Publicació / *Publication*:	
Lloc celebració / *Venue*: La Londe les Maures (France)	**Data / *Date*:** October 2007

Organisme/institució organitzadora / *Organising body/institution*: ESF-MedCLIVAR

Congressos i conferències / *Congresses and conferences*	
Autors/es (per ordre de signatura) / *Authors (in signing order)*: B. Ayarzagüena; E. Serrano; A. de la Cámara.	
Títol / *Title* Variation in the timing of the stratospheric final warming and its dynamical effects on spring tropospheric conditions over Europe.	
Tipus de contribució / *Contribution type*: Oral	
Congrés / *Congress* 7th Annual Meeting of the European Meteorological Society/ 8th European Conference on Applications of Meteorology	
Publicació / *Publication*:	
Lloc celebració / *Venue*: El Escorial (Spain)	**Data / *Date*:** October 2007
Organisme/institució organitzadora / *Organising body/institution*: European Meteorological Society	

1.7 Experiència en projectes de col·laboració amb empreses i en transferència de tecnologia / *Experience in partnership projects with companies and in technology transfer*

N/A

1.8 Altres mèrits acadèmics i/o científics rellevants, incloent premis d'investigació, reconeixements, ensenyaments impartits, supervisió d'estudiants, activitats divulgatives, informes, desenvolupament de hardware i software, etc. */ Other relevant academic and/or scientific merits, including research prizes, acknowledgements, teaching given, student supervision, dissemination activities, reports, hardware/software development, etc.*

Acknowledgements
Acreditación profesor Ayudante Doctor (Agencia Nacional de Evaluación de la Calidad y Acreditación). Date: 07/2015.

Teaching activities
1. Mathematics and Computing: Integrative Tools for Natural Sciences (Theoretical and practical lessons)
Bachelor in Natural Sciences; Date: 09/2015 - 03/2016; Nr. hours: 44h
College of Engineering, Mathematics and Physical Sciences (University of Exeter), UK.

2. Physik der mittleren Atmosphäre (Practical lessons)
Master in Meteorology; Date: 10/2014 - 02/2015; Nr. hours: 16h
Institut für Meteorologie (Freie Universität Berlin), Germany.

3. Dynamik I (Theoretical lessons)
Bachelor in Meteorology; Date: 04/2014 - 07/2014; Nr. hours: 8h
Institut für Meteorologie (Freie Universität Berlin), Germany.

4. Physik der mittleren Atmosphäre (Practical lessons)
Master in Meteorology; Date: 10/2013 - 02/2014; Nr. hours: 16h
Institut für Meteorologie (Freie Universität Berlin), Germany.

5. Dynamik I (Practical lessons)
Bachelor in Meteorology; Date: 04/2012 - 07/2012; Nr. hours: 18h
Institut für Meteorologie (Freie Universität Berlin), Germany.

6. Laboratorio de Computación científica (Practical lessons)
Grado en Física; Date: 10/2011 - 02/2012; Nr. hours: 50h
Facultad de Ciencias Físicas (Universidad Complutense de Madrid).

7. Laboratorio de Computación Científica (Practical lessons)
Grado en Física; Date: 10/2010 - 02/2011; Nr. hours: 45h
Facultad de Ciencias Físicas (Universidad Complutense de Madrid)

8. Matemáticas (Practical lessons)
Grado en Física; Date: 10/2009 - 02/2010; Nr. hours: 30
Facultad de Ciencias Físicas (Universidad Complutense de Madrid)

9. Termodinámica de la Atmósfera (Practical lessons)
Licenciatura en Física; Date: 02/2009 - 06/2009; Nr. hours: 9
Facultad de Ciencias Físicas (Universidad Complutense de Madrid)

10. Estadística
Licenciatura en Física; Date: 02/2008 - 06/2008; Nr. hours: 90
Facultad de Ciencias Físicas (Universidad Complutense de Madrid)

11. Estadística
Licenciado en Física; Date: 02/2007 - 06/2007; Nr. hours: 30
Facultad de Ciencias Físicas (Universidad Complutense de Madrid)

Student supervision
Bachelor thesis
1. Untersuchung der multidekadischen Variabilität der borealen winterlichen Stratosphäre und ihre Verbindung mit dem Ozean; Universidad: Freie Universität Berlin (Germany); Student: Michelle Breitbach; Date: Summer semester 2015
2. Einfluss des 11-Jährigen Sonnenfleckenzyklus auf die Variabilität der borealen Stratosphäre im Frühjahr, Universidad: Freie Universität Berlin (Germany); Student: Fabian Wunderlich; Date: Summer semester 2014.
3. Dynamische Variabilität in der südlichen polaren Stratosphäre unter verschiedenen Randbedingungen; Universidad: Freie Universität Berlin (Germany); Student: Adrian Schmidt; Date: Summer semester 2013

Master thesis
1. Zusammenhang zwischen stratosphärischer Zirkulation, Wellenausbreitung und Stratosphärenerwärmungen im EMAC-Klimachemiemodell; Universidad: Freie Universität Berlin (Germany); Student: Tobias Mahnkopf; Date: Summer semester 2013.
2. Ausbreitung des Signals von Stratosphärenerwärmungen in die Troposphäre für unterschiedliche Klimazeiträume; Universidad: Freie Universität Berlin (Germany); Student: Sarah Drefenstedt; Date: Winter semester 2012-2013

Reviewer of scientific journals
Journal of Geophysical Research: Atmospheres
Geophysical Research Letters
Atmospheric Chemistry and Physics
Journal of Climate
Climate Dynamics
Journal of Atmospheric and Solar-Terrestrial Physics
Monthly Weather Review
Advances in Atmospheric Sciences

Chairwoman of conference sessions
- “Mid-latitude dynamics, jets, and the vortex” session at the SPARC Workshop DynVar Workshop & S-RIP Meeting held in Helsiki (Finland) 6-10 June 2016.
- “Stratosphere-troposphere coupling” session at the SPARC Workshop SHARP 2016 held in Berlin (Germany) 16-19 February 2016.

Member of scientific initiative
Contributing author of the "Stratosphere-troposphere coupling" chapter of the SPARC Reanalyses Intercomparison Project.
Co-Leader of the project “Stratospheric Arctic winters under climate change and the decline of ODS” of the WCRP-SPARC Chemistry-Climate Model Initiative (CCMI)

Evaluation commision member
Member of two PhD thesis committee:
- "Upwelling in the tropical lower stratosphere: effects on tracer transport and drivers of variability". PhD thesis by Marta Ábalos Álvarez defended at Universidad Complutense de Madrid on 31st January 2014.
- "Die Änderungen der Brewer-Dobson Zirkulation mit dem Klimawandel. Eine Modellstudie mit dem Klima-Chemie-Modell Emac". PhD Thesis by Sophie Oberlaender defended at Freie Universitaet Berlin (Germany) on 25 June 2013.

Evaluator of three BSc thesis at the Institut für Meteorologie of Freie Universitaet Berlin (Germany).

Outreach

Invited seminars/talks at conferences

- Invited talk at the SPARC Workshop SHARP 2016 held in Berlin (Germany): "Response of SSTs to climate change and its influence on the wintertime polar vortex in CCMs". 16-19 February 2016.
- Seminar at the MetOffice (Exeter, United Kingdom): "The relevance of blocking highs for stratospheric variability in a changing climate". 25 August 2015.
- Seminar at GEOMAR center in Kiel (Germany): The relevance of blocking highs for stratospheric variability in a changing climate. 2 June 2014.
- Strathour seminar at the department of Meteorology of University of Reading (United Kingdom): Study of stratospheric sudden warmings in the Northern Hemisphere: Tropospheric forcing and climate change. 16 March 2012.
- Seminar at the Instituto Nacional de Técnicas Aeroespaciales: "Interannual variability of stratospheric final warmings". 9 March 2010.
- Seminar at the Faculty of Physics of Universidad Complutense de Madrid (Seminars in Atmospheric Physics of the Master in Geophysics and Meteorology): "Análisis de calentamientos súbitos estratosféricos en la simulacion CCMVal-REF1 con el modelo ECHAM/MESSY". 29 April 2009.

Committee work

September 2016 – present. Co-organizer of Physical Climate group Seminar, University of Exeter, United Kingdom.
March 2014. Local committee of the kick-off meeting of the European Project "StratoClim" (31March 2014-1April 2014) at the Freie Universität Berlin, Germany.
June 2010 – June 2011. Co-organizer of "UCM Seminar Series: Atmospheric Physics Seminars", UCM, Madrid, Spain.
November 2010. Co-organizer of "Experiments to understand the Atmosphere and the Ocean", X Science Week (Dept. Geophysics and Meteorology, UCM, Madrid Spain).

Dissemination activities

- Member of the team that developed the webpage http://meteolab.fis.ucm.es, in which homemade experiments are shown to explain atmospheric processes.
- November 2006, 2007, 2008, 2009, 2010 and 2011. Teacher of the "Experiments to understand the Atmosphere and the Ocean", VI, VII, VIII, IX, X and XI Science Week (Dept. Geophysics and Meteorology, UCM, Madrid Spain).
- November 2005. Teacher of the "Optics workshop", V Science Week (Dept. Optics, UCM, Madrid, Spain).

2. Entitat i grup de recerca receptor (màxim 8 fulls) / *Host research group and entity (maximum 8 sheets)*

2.1 Breu descripció del grup de recerca receptor i del seu impacte científic internacional incloent les principals publicacions i els projectes de recerca finançats en els darrers cinc anys / *Brief description of the host research group and its scientific/academic impact, including main publications and research projects funded in the last five years*

Description of research group

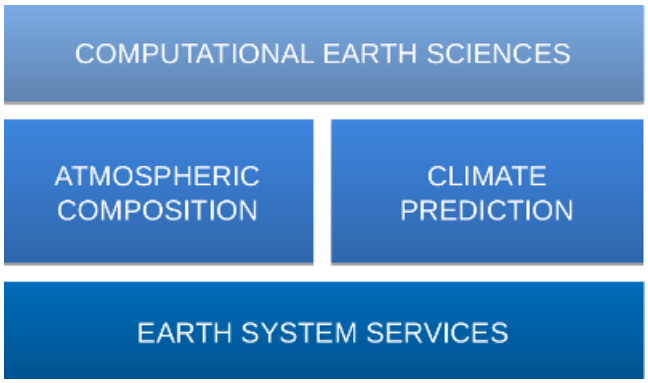
The Barcelona Supercomputing Center – Centro Nacional de Supercomputación (hereafter BSC) is the national supercomputing facility of Spain. BSC's mission is to research, develop and manage information technology in order to facilitate scientific and technological progress. BSC hosts a range of high-performance computing (HPC) systems, including MareNostrum III, one of the most powerful supercomputers in Europe with 48,128 cores and 1.1 Pflops capacity. BSC strives to be a first-class research centre in supercomputing and in scientific fields that demand HPC resources such as Life and Earth Sciences and Engineering. Following this approach, BSC has brought together a critical mass of first-rate researchers, high performance computing experts and cutting-edge supercomputing technologies in order to foster multidisciplinary scientific collaborations and innovations. In terms of attraction of talent, during the period 2011-2015, the BSC has recruited 75 pre-doctoral students, 51 postdocs and senior scientists, 83 technical support staff members and 31 management staff, 146 from Spain, 39 coming from EU countries and 55 from outside Europe, being currently more than 380 staff members, from around 40 countries. Recruitment procedures are based on principles of merit, transparency, competition and gender balance; the centre has been awarded with the badge of Human Resources Excellence in Research (HRS4R) in April 2015. Likewise, the BSC is accredited as Severo Ochoa Centre of Excellence, the award with which the Spanish Ministry of Economy and Competitiveness' Department of Research, Innovation and Development recognises leading centres in Spain of international standing in their fields. BSC first obtained a Severo Ochoa award in 2011, receiving a grant for 4 years (2012-2015). It was awarded a second for a programme to be developed in the period 2016-2019.

The BSC is located on a campus of the Technical University of Catalonia (Universitat Politècnica de Catalunya - UPC) and has an agreement with the UPC to use university facilities and services. Furthermore, many of the group leaders at BSC are also university professors with broad knowledge and experience in advance research and teaching, i.e., the BSC substantially contributes to and benefits from UPC higher educational environment. The BSC is a key element of and coordinates the Spanish Supercomputing Network (Red Española de Supercomputación - RES), which is the main framework for granting competitive HPC time to Spanish research institutions. It is also part of the Partnership for Advance Computing in Europe (PRACE), the top level of the European HPC ecosystem that grants computing time to European research centres.

The Earth Sciences department of the Barcelona Supercomputing Center (BSC-ES) conducts multi-facet research in Earth system modelling. Established in 2006, the initial core activity was focused on atmospheric composition modelling. The designation of Prof. Francisco J. Doblas-Reyes as Director of the BSC-ES in 2014 initiated the merging of the BSC-ES with the Climate Forecast Unit of the Institut Català de Ciències del Clima (IC3-CFU), which he was leading and who had become in a short time a main European actor in the development of climate predictions and climate services. The newly merged department is structured around four groups with more than 50 employees, including technical and support staff. It is a highly productive scientific entity that has published more than 150 research articles in peer-reviewed journals over the last 5 years, including 5 in prestigious high-impact journals.

BSC-ES research activities with the focus on global climate modelling and prediction are based on research, development and predictions with the EC-EARTH climate forecast system. EC-EARTH is a state-of-the-art ocean-atmosphere coupled model that is being developed and used for climate predictions and projections by the European consortium of more than 25 operational and research institutions from 10 European countries (https://www.ec-earth.org/), including the BSC. Besides contributing to the 5th phase of the Coupled Model Intercomparison Project (CMIP5), which was one of the key datasets used to produce the UN Intergovernamental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), global climate research activities at the BSC-ES enabled production of historical global climate reconstructions and initial conditions for the EC-EARTH community. Such data is critical for analysis of climate dynamics and initialization of seasonal-to-decadal climate predictions. The BSC-ES is an important contributor to the Infrastructure for the European Network for Earth System modelling – Phase1 and Phase2 (IS-ENES1 and IS-ENSE2). They are FP7 European projects fostering the integration of the European climate modelling community and the development of Earth System Models (ESM) for advancing the understanding and predictions of climate variability and change. Also, BSC-ES is already active in the planning of the next phase of CMIP, CMIP6, and is preparing to make core contributions including the groundbreaking high-resolution global climate simulations with EC-EARTH (horizontal resolution of 0.25° in the ocean and 25 km in the atmosphere).

The BSC-ES is structured in four groups as illustrated in the diagram below. The fellow will be enrolled in the Climate Prediction Group (CPG), lead by Dr. Virginie Guemas. The department strategy includes a management layer consisting of the department director and the group leaders that ensures the consistency of the activities with the strategic plan and that implements strategies to facilitate an adequate communication at all levels. This layer facilitates the integration of the department in the local and national research and services environment. The BSC-ES makes its best to respond to the requests of policy makers and society and to support as much as possible the growth of a robust air quality and climate modelling Spanish community. The management layer also works towards increasing the visibility of the BSC-ES, becoming more active in the international research programme arena (WWRP, WCRP[1], etc). Particularly relevant for this application, the host researcher at the CPG (Dr. García-Serrano) – the candidate's supervisor, is pushing EC-EARTH and BSC-ES in the framework of the DynVar and QBOi projects of the WCRP's SPARC initiative (Stratosphere-troposphere Processes And their Role in Climate).



Supervisor

During his scientific career, Dr. García-Serrano has worked upon the fundamental initiative of exploring *teleconnection dynamics for climate prediction*. He has recently been able to tackle this challenge with autonomy thanks to an EU-funded H2020 Marie Skłodowska-Curie Action, DPETNA, and a national project funded by the Spanish Ministry of Economy and Competitiveness, DANAE. Obtaining these grants has been the reflection of the supervisor's solid and coherent career during his postdoctoral stage, thoroughly building a bridge between his theoretical background in atmospheric dynamics and the practical requirements of climate forecasting. During his PhD, he developed a deep understanding of the atmospheric dynamics associated with remote forcing of Euro-Atlantic climate anomalies, such as El Niño-Southern Oscillation (ENSO) in the tropical Pacific. During his first three years as post-doctoral researcher, first hired at IC3 (Institut Català de Ciències del Clima) and then via his own funding at the University of Torkyo – AORI (Atmosphere and Ocean Research Institute; private grant from the CANON Foundation in Europe), he acquired an in-depth knowledge of the forecast quality of seasonal and decadal climate predictions; e.g. publishing pioneering work on the skill of the Atlantic multi-decadal oscillation (AMO). During the following two years, he started to merge his two research interests, namely teleconnection dynamics and climate forecasting, into a single research line at LOCEAN (Paris, France); this work focused on the predictability of the North Atlantic Oscillation (NAO) from Arctic sea-ice variability. Back in Barcelona as a senior scientist at BSC-ES, his research tackles the dynamics underlying ENSO-related predictability over the tropical Atlantic (DPTENA) and in the North Atlantic-European region (DANAE). DPETNA and DANAE are helping Dr. García-Serrano to strengthen and widen competences, like project management skills. He has advised a Master thesis (María Santoria, at UB) and is advising a PhD student (Bianca Mezzina) with a FPI fellowship linked to DANAE. He is currently leading the *Atlantic Variability and Predictability* research line in the CPG at BSC-ES, which involves four more post-docs. The candidate's host is an enthusiastic and ambitious researcher with a proved ability to obtain external funding to support his scientific objectives, e.g. for stays abroad (4 months at the MetOffice-UK and 3 months at KNMI-Netherlands during his PhD; 9 months in Japan during his post-doctoral stage; 3 months at Météo-France and 3 months at CERFACS, both in Toulouse, in 2016) or to host foreign researchers at BSC-ES (Severo Ochoa mobility grant in October 2015).

Author of 32 articles, 29 published - 3 under review, all in journals ranked in the first quartile (plus 2 in preparation); 472 total citations / H-index 12; 6 non peer-reviewed publications (e.g. CLIVAR Exchanges); 4 book chapters (e.g. CLIVAR-Spain); 21 oral contributions as first author (4 invited); participation in 5 European (FP6-FP7-H2020) and 8 national (total budget >1,2M€) projects; active collaboration with 11 international institutions; presence in the media; invited lecturer at workshops and summer schools; contributing author to the IPCC 5th Assessment Report.

[1] WMO's World Climate Research Programme

Scientific impact

The BSC-ES has a vast experience and a marked presence in international initiatives that allows maintaining a rich network of collaborations. A selection of relevant projects and publications during the last five years are listed below. These scientific achievements show how those interactions have been extremely fruitful and have always resulted in publications in major journals.

Selected projects

- APPLICATE: Advanced Prediction in Polar regions and beyond: modelling, observing system design and LInkages associated with a Changing Arctic climaTE; EU-H2020 GA.727862; 11/2016-10/2020; 677.375€ (total budget 8.715.066€).
- DANAE: Dynamics And predictability of the ENSO teleconnection in the North Atlantic-European region; MINECO-RETOS CGL2015-68342-R; 01/2016-12/2018; 146.410€.
- ClimatEurope: European Climate observations, modelling and services; EU-H2020 GA.689029; 12/2015-11/2020; 225.000€ (total budget 2.994.372€)
- PRIMAVERA: PRocess-based climate sIMulation: AdVances in high-resolution modelling and European climate Risk Assessment; EU-H2020 GA.641727; 11/2015-10/2019; 1.277.425€ (total budget 14.967.970€).
- EUCLEIA: EUropean CLimate and weather Events: Interpretation and Attribution; EU-FP7 GA. 607085; 09/2015-12/2016; 85.351€ (total budget 4.061.705€).
- ESiWACE: Excellence in Simulation of Weather And Climate in Europe; EU-H2020 GA.675191; 09/2015-08/2019; 269.750€ (total budget 4.951.049€).
- RESPONS: REgional Seasonal forecasts and multi-annual Predictions of tropical cyclONeS; MINECO-RETOS CGL2014-55764-R; 01/2015-12/2017; 36.420€.
- RESILIENCE: Strengthening the European energy network using climate services; MINECO-RETOS CGL2013-41055-R; 01/2014-12/2016; 273.460€.
- PREFACE: Enhancing prediction of tropical Atlantic climate and its impacts; EU-FP7 GA.603521; 11/2013-01/2017; 168.267€ (total budget 12.170.345€).
- IS-ENES2: InfraeStructure for the European Network for Earth System modelling – phase 2; EU-FP7 GA.312979; 04/2013-03/2017; 125.800€ (total budget 11.175.386€).
- SPECS: Seasonal-to-decadal climate Prediction for the improvement of European Climate Services; EU-FP7 GA.308378; 11/2012-01/2017; 1.997.986€ (total budget 11.766.236€).
- EUPORIAS: EUropean Provision Of Regional Impacts Assessments on Seasonal and decadal timescales; EU-FP7 GA.308291; 11/2012-01/2017; 1.015.725€ (total budget 13.245.139€).
- APPRAISAL: Air Pollution Policies foR Assessment of Integrated StrAtegies at regional and Local scales; EU-FP7 GA.308395; 06/2012-05/2015; 72.892€ (total budget 999.990€).

Selected publications (from more than 150; http://www.bsc.es/earth-sciences/publications-and-communications)

- Bellprat O, Doblas-Reyes FJ (2016): Attribution of extreme weather and climate events overestimated by unreliable climate simulations. Geophysical Research Letters, 43, 2158-2164.
- Blanchard-Wrigglesworth E, Barthélemy A, Chevallier M, Cullather R, Fuckar N, Massonnet F, Posey P, Wang W, Zhang J, Ardilouze C, Bitz CM, Vernieres G, Wallcraft A, Wang M (2016): Multi-model seasonal forecast of Arctic sea-ice: forecast uncertainty at pan-Arctic and regional scales. Climate Dynamics, doi:10.1007/s00382-016-3388-9.
- Boer GJ, Smith DM, Cassou C, Doblas-Reyes FJ, Danabasoglu G, Kirtman B, Kushnir Y, Kimoto M, Meehl GA, Msadek R, Mueller WA, Taylor K, Zwiers F (2016): The Decadal Climate Prediction Project. Geoscientific Model Development Discussion, doi:10.5194/gmd-2016-78.
- Camp J, Caron L-P (2016): Analysis of Atlantic hurricane landfall forecasts in coupled GCMs on seasonal and multi-annual timescales. Chapter in Hurricanes and Climate Change. 3rd edition. Springer.
- Carrassi A, Guemas V, Doblas-Reyes FJ, Volpi D, Asif M (2016): Sources of skill in near-term climate prediction. Part I: Generating initial conditions. Climate Dynamics, doi:10.1007/s00382-016-3036-4.
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- Orsolini Y, Senan R, Vitart F, Balsamo G, Weisheimer A, Doblas-Reyes FJ (2016): Influence of the

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- Prodhomme C, Doblas-Reyes FJ, Bellprat O, Dutra E (2016): Impact of land-surface initialization on sub-seasonal to seasonal forecasts over Europe. Climate Dynamics, 47, 919-935.
- Volpi D, Guemas V, Doblas-Reyes FJ, Hawkins E, Nichols N (2016): Decadal climate prediction with a refined anomaly initialisation approach. Climate Dynamics, doi:10.1007/s00382-016-3176-6.

- Batté L, Doblas-Reyes FJ (2015): Stochastic atmospheric perturbations in the EC-Earth3 global coupled model: impact of SPPT on seasonal forecast quality. Climate Dynamics, 45, 3419-3439.
- Caron L-P, Boudreault M, Bruyere CL (2015): Changes in large-scale controls of Atlantic tropical cyclone activity with the phases of the Atlantic Multidecadal Oscillation. Climate Dynamics, 44, 1801-1821.
- Caron L-P, Hermanson L, Doblas-Reyes FJ (2015): Multi-annual forecasts of Atlantic U.S. tropical cyclone wind damage potential. Geophysical Research Letters, 42, 2417-2425.
- Caron L-P, Boudreault M, Camargo SJ (2015): On the variability and predictability of Eastern Pacific tropical cyclone activity. Journal of Climate, 28, 9678-9696.
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- García-Serrano J, Frankignoul C (2015): On the feedback of the winter NAO-driven sea ice anomalies. Climate Dynamics, doi:10.1007/s00382-015-2922-5.
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Academic impact

The following dissertations have been completed in the doctoral programme Environmental Engineering (UPC) during the last five years. Before 2010, eleven PhD were completed in the same programme under the supervision of ES-BSC/UPC professors JM Baldasano and S Gassó.

- "Characterization of atmospheric pollution dynamics in Spain by means of air quality modeling", by Victor Valverde; 04/2016. Advisors: Dr M. T. Pay (ES-BSC) and Dr J.M. Baldasano (ES-BSC/UPC).
- "Development and evaluation of an atmospheric aerosol module implemented within the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM)" by Michele Spada; 11/2015. Advisors: Dr O. Jorba (ES-BSC) and Dr JM Baldasano (ES-BSC/UPC).
- "Air quality management: assessing the impacts of on-road transport strategies and industrial emissions in urban areas", by Albert Soret Miravet; 12/2014. Advisor: Dr JM Baldasano (ES-BSC/UPC).
- "Development of a high-resolution emission model for air quality modelling in Spain", by Marc Guevara Vilardell; 2014/12. Advisor: Dr JM Baldasano (ES-BSC/UPC).
- "Implementation, development and evaluation of the gas-phase chemistry within the Global/Regional NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM)", by Alba Badia i Moragas; 2014/12. Advisors: Dr O Jorba (ES-BSC), Dr S Gassó (ES-BSC/UPC).
- "Sistema de pronóstico de radiación solar a corto plazo a partir de un modelo meteorológico y técnicas de postproceso para España", by Ángela Rincón Rodríguez; 2013/06. Advisors: Dr JM Baldasano (ES-BSC/UPC), Dr O Jorba (ES-BSC).
- "Variational multiscale stabilization of finite and spectral elements for dry and moist atmospheric problems", by Simone Marras; 2012/12. Advisors: Dr O Jorba (ES-BSC), Dr M Vázquez (CASE-BSC).
- "Development of an atmospheric modeling system for regional and global mineral dust prediction: Application to Northern Africa, Middle East and Europe", by Karsten Haustein; 2012/01. Advisors: Dr C Pérez García-

Pando (IRI, Columbia, USA), Dr JM Baldasano (ES-BSC/UPC).
- "Desert dust characterization in Northern Africa, Middle East and Europe through regional dust modelling, and satellite-borne and ground-based observations", by Sara Basart Alpuente; 2012/01. Advisors: Dr C Pérez García-Pando (IRI, Columbia, USA), Dr E Cuevas Agulló (AEMET).

2.2 Infraestructures i instal·lacions de les que es disposarà per desenvolupar les activitats de recerca previstes / *Installations and facilities to be made available for the carrying out of the planned research activities*

The BSC has hosted outstanding high performance computing (HPC) facilities since its inception in 2006. All the computational resources that the center has are going to be available to the candidate to carry out the research plan of this fellowship (StratoCyclone). Currently, BSC has the following supercomputing infrastructures:

- MareNostrum3, a supercomputer based on Intel SandyBridge processors, iDataPlex Compute Racks, Linux Operating System and Infiniband interconnection. It has a total of 48896 cores, a peak computing power of 1017 TFlops and was ranked the 29th fastest supercomputing facility on June 2013 by the Top500 list.
- MinoTauro, a supercomputer (3 TB ram, 182.9 Tflops peak) that combines traditional CPU cores with GPU accelerators. It was ranked the 442th fastest machine in the world on June 2013.

At the time the fellow will join the CPG, BSC will host the new version of MareNostrum – MareNostrum4. It will be 12.4 times more powerful than the current MareNostrum 3. The centre has just approved the purchase of a new supercomputer that will have a performance capacity of 13, 7 Petaflop/s and will be located in the Torre Girona chapel, home to its predecessors, the MareNostrum 1, 2 and 3. The new machine will have two distinct parts. The general purpose element, provided by Lenovo, wil have 48 racks with more than 3.400 nodes with next generation Intel Xeon processors and a central memory of 390 Terabytes. Its peak power will be over 11 Pflops, ten times more than MareNostrum3. Despite this increase in capacity, it will consume only 30% more than power, reaching 1.3 MW/year. The second element of MareNostrum4 will be formed of clusters of three different technologies that will be added and updated as they become available. These are technologies currently being developed in the US and Japan to accelerate the arrival of the new generation of pre-exascale supercomputers. One of these clusters will consist of IBM POWER9 processors and NVIDIA GPUs, which are the same components that IBM and NVIDIA will use for the 'Summit' and 'Sierra' supercomputers the US Department of Energy has commited for the Oak Ridge and Lawrence Livermore National Laboratories. Its computing power will be over 1.5 Pflops. The second cluster will be made up of Intel Knights Landing (KNL) and Intel Knights Hill (KNH) processors provided by Fujitsu and Lenovo respectively. They are the same processors that will be inside 'Theta' and 'Aurora' supercomputers purchased by the US Department of Energy for the Argonne National Laboratory. Its computing power will be in excess of 0.5 Pflops. Finally, the third cluster will be formed of the same 64bit ARMv8 processors that Fujitsu will provide in a prototype machine from the Japanese Post-K supercomputer. Its computing power will be more than 0.5 Pflops. The goal of the progressive incorporation of these technologies into MareNostrum4 is enabling BSC to operate with what are expected to be some of the most state-of-the-art developments of the coming years and to test if they are suitable for future versions of MareNostrum. In terms of storage, MareNostrum4 will have a capacity exceeding 10 Petabytes and will be connected to the Big Data infrastructure of BSC, which have a total capacity of 24.6 Petabytes.

BSC-ES will provide a workplace with all required infrastructure and facilitites, including a workstation with unix-based operating system, specific software required for the proposed analyses and sufficient allocation for data storage. Nonetheless, most post-processing will be carried out at departmental level on the FatNodes of RAM memory. These computing nodes have the following basic characteristics: 'moore' with 8 cores and 144GB RAM memory; 'amdahl' with 12 cores and 256GB RAM memory; 'gustafson' with 20 cores and 256GB RAM memory. They are accessible via *ssh* and used through queue schedulers.

Additionally, the applicant will be able to run the EC-EARTH climate model for the proposed simulations in StratoCyclone (see Section 3.1). The simulations will be performed with the last version of the model, which is the one devoted to contribute to the ongoing WCRP Couple Model Intercomparison Project phase 6 (CMIP6), e.g. to DECK and HighResMIP. The main components of the CMIP6 version of EC-EARTH, i.e. EC-EARTH3.2, are: the atmosphere model IFS – Integrated Forecast System – version cy36r4, at T255L91 configuration [~80km horizontal resolution, 91 vertical levels with top 0.01hPa]; and the ocean model NEMO – Nucleus for European Modelling of the Ocean – version 3.6 at ORCA1L75 configuration [~1ºC horizontal resolution, 75 vertical levels]. IFS can also be run at T511 configuration [~40km horizontal resolution], e.g. for HighResMIP. Additionally, the output of produced model simulations will be also available for the use of the fellow for her project.

Aside from its excellence in research and (inter)national reputation, BSC hosts unique technical support. Additionally, at departmental level, BSC-ES counts on the technical support provided by the Computational Earth Sciences (CES) group. The combination of outstanding HPC capability and high-quality user support constitutes an excellent infrastructural basis for the successful execution of StratoCyclone.

2.3 Mitjans previstos per a la incorporació, coordinació i seguiment de la persona candidata / *Planned resources for the incorporation, coordination and oversight of candidate*

The Project Management Office at BSC will support the fellow, from the beginning and during the execution of StratoCyclone, regarding financial and administrative matters. The BSC-ES will make sure that the fellowship agreement follows the Spanish fiscal and social security laws and the Beatriu de Pinos 2016 contractual rules. She will also have access to support by different departments of the BSCs such as BSC's Technology Transfer Manager (orientation/help with science explotation, development of contracts, agreements, and seeking new opportunitites), Communications Team (outreach activities, organization of events and press releases) or Legal assessment (BSC has an agreement with an external office that gives advice on legal issues).
The proposed project will be managed through weekly meetings to ensure full coherence between the fellow's research and the general objectives of the BSC-ES. At all meetings with Dr. García Serrano, the advancements of the fellow's research will be discussed and the supervisor will provide adequate mentoring in the general background of the climate prediction and adapt the research programme to the difficulties encountered and to make progress in the most promising aspects of the research undertaken. Regular meetings will take place involving the rest of the CPG members to ensure an adequate integration of this activity into the rest of the research carried out in the host group. Periodic written reports detailing the progress and the issues raised during the development of the research plan will be prepared and stored to monitor the evolution. Additionally, there is a new professional development system for all BSC-ES staff with a new web tool that facilitates the annual evaluation of the fellow, monitoring the Plan's development, and keeping it aligned with annual goals of the department as well as of the entire Centre.
The fellow will have freedom to manage the fellowship research funds and will have all the required autonomy and all the necessary support for applying for projects during her stage at the BSC-ES. BSC will also provide support for project management and outreach.

2.4. Activitats per a la formació, especialització i desenvolupament de la carrera investigadora de les persones candidates / *Activities for candidates' training, specialisation and research career development*

The fellow will also benefit from the support and training provided by the Education and Training department of the BSC. This is a dedicated unit that is commited to provide researchers with high-quality training in scientific, technical, and other skills. The Education & Training department, together with Human Resources, organizes courses, sessions and workshops for all members of the centre. These events are multidisciplinary and transversal emphasizing in High Performance Computing and its applications (https://www.bsc.es/education/training/patc-courses), and Intellectual Property management, Project management, Scientific and Project writing and etcetera (https://intranet.bsc.es/files/Training%20Plan%202016_0.pdf). Aligned with these activities, the HR department has achieved the **Human Resources Excellence in Research** badge during April 2015.

As introduced above (see full description in Section 3.1), this project will require analysing outputs from the EC-EARTH climate model, as well as running computationally-demanding targeted siumulations. Therefore, a detailed understanding of EC-EARTH and the skills to effectively make use of BSC's supercomputing (HPC) facilities are fundamental for the success of the proposed research. The fellow will be trained with a priority on:

- the EC-EARTH model, its structure, and usage by Dr. García-Serrano and the rest of the members of the CPG; training will focus on the different components (IFS, NEMO), on how to generate initial conditions for launching seasonal hindcasts, and on how the non-orographic gravity waves, key for the representation of the QBO, are parameterized in IFS (e.g. EC-EARTH3.1 vs EC-EARTH3.2).
- the MareNostrum3 supercomputer by the CES group at BSC-ES; the proposed model simulations are only feasible in a HPC environment, and she will be trained on MareNostrum's file and batch system, and available software, tools and support.

In addition to the practical training on the model and its application, the fellow will be trained on:

- s2dverification R-package, in-house set of open-access tools developed jointly by CPG and CES to assess performance of models through the computation of standard prediction skill scores (Manubens-Gil et al. 2017).
- autosubmit, in-house tool developed by the CES group that allows creating, launching and monitoring experiments with EC-EARTH in any HPC facility, including MareNostrum (Manubens-Gil et al. 2016).

Finally, it is worth noting that BSC deploys an annual Career Plan for all staff members of the centre, which is revised at the end of the year through a new online tool accessible by staff members and by their supervisors.

3. Projecte o activitats de recerca (màxim 8 fulls) / *Research project or activities (maximum 8 sheets)*

3.1 Descripció del projecte o de les activitats de recerca que es volen desenvolupar, fent especial referència a l'estat de la qüestió, a la novetat i la originalitat de la recerca proposada. Descripció dels objectius, de l'enfocament metodològic i del pla de treball / *Description of the intended research project or activities, with special reference to the state of the art, and the innovative nature and originality of the proposed research. Description of goals, methodological focus and work plan.*

Stratospheric role in predictability of Atlantic tropical cyclones (StratoCyclone)

State of the art

Tropical cyclones in the Atlantic basin and the stratospheric effect

Tropical cyclones (TCs) are extreme weather events, characterized by strong winds and heavy rain. They have devastating consequences in human beings and food production systems (agriculture and livestock) in the tropics, particularly if they are not well understood and poorly predicted. TCs are generated by different types of disturbances such as easterly waves or monsoon troughs and are maintained by the latent heat extracted from warm water (tropical sea) and heat export at the low temperatures of the tropical upper troposphere (AMS Glossary). Consequently, variations in tropical components of the ocean and the whole atmosphere impact the TCs activity. Some of these variations concern changes in the sea surface temperatures (SSTs) such as El Niño-Southern Oscillation (ENSO) or the Atlantic multi-decadal oscillation (Gray, 1984a; Klotzbach and Gray, 2008). As for the atmosphere, tropospheric phenomena such as the tropical intraseasonal modulation of Asian tropical convection and winds (Madden-Julian Oscillation, MJO) also influence the TC activity (Maloney and Hartmann, 2000). Additionally, the stratosphere has been shown to have some effects on TCs through the Quasi-Biennial Oscillation (QBO; Gray, 1984a). However, according to the last IPCC report (2013), "the response of TCs to each factor is not yet well understood".

One of the clearest examples of this uncertainty is the relation of the QBO and TC activity in the Atlantic basin. The QBO is the most prominent variability mode of tropical stratospheric zonal winds characterized by downward-propagating westerly (WQBO) and easterly (EQBO) regimes with a periodicity of approximately 28 months; the QBO wind regimes descend at about 1km/month until they are dissipated in the tropical tropopause ~100hPa (Baldwin et al. 2001; Pascoe et al. 2005). The QBO produces a change in the background of the lowermost stratosphere that may affect the upper troposphere and in consequence, the TC activity. In fact, Gray (1984a) and some contemporary authors observed an enhanced frequency of occurrence of TCs in most basins under the west phase of the QBO in the period 1950-1980. The relationship seemed particularly clear for the Atlantic TCs because their development is not associated with a monsoon trough as in other regions (Gray 1984a). Although there was not a consensus about the exact mechanism explaining this relationship, the statistical relation was so clear that the National Oceanic and Atmospheric Administration (NOAA) included the QBO as a predictor for seasonal hurricane forecasting (Gray et al. 1993).

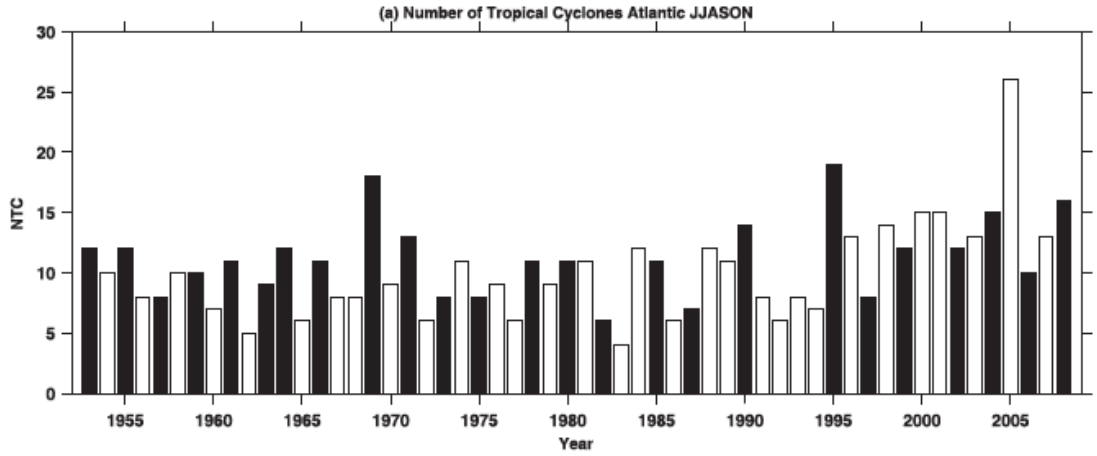

Figure 1. Number of tropical cyclones in the Atlantic basin. Black bars correspond to years in west phase of QBO and white bars to years in east phase of QBO. From Camargo and Sobel (2010).

Some decades later the relationship between QBO and hurricanes seems to have vanished (Camargo and Sobel, 2010; see Figure 1). Consequently, the NOAA has ceased to use the QBO as a predictor of hurricanes (Klotzbach, 2007). The reasons for the change in the QBO-TC relationship remain unclear. Camargo and Sobel tried to identify possible causes for this change in the observations such as QBO interaction with ENSO or QBO decadal variability but no conclusive results were obtained. The limited record of the observational data (only 55

years) might be one of the big constraints of the analysis, because it makes difficult to detect any multidecadal variability of the QBO or to assess any type of relationship between phenomena when the number of events is very small. These problems would be at least partially solved by using climate model simulations, but the number of models resolving the full stratosphere and specifically, reproducing relatively well the QBO is very low. Only in the very last years, a few climate models have been shown to internally generate an adequate QBO. This would explain that there has not yet been any model study that examines in detail the stratospheric modulation of TC activity. In fact, very recently Garfinkel and Hartmann (2011a,b) have given evidence of the influence of QBO on tropospheric winds in the Atlantic basin in early winter by means of a hierarchy of models, but they have not extended the analysis to other seasons and thus, any connection with hurricanes remains unestablished. Note that the climate model at BSC-ES, EC-EARTH, spontaneously generates QBO-like variability with a realistic frequency (Christiansen et al. 2016).

Dynamical forecasting of hurricanes

Information about precursors and processes involved in TCs will help to advance their predictability in different time scales (seasonal or multi-year). An improvement of TC predictions is required to develop potential mitigation and adaptation strategies of tropical countries to hurricanes.

The first attempts to predict TC activity on seasonal time-scales were done in early 80s. They were based on statistical relationships between TCs and meteorological predictors derived from historical records and supposed to be invariable with time (e.g. Gray, 1984b). However, as already mentioned for the QBO case, these assumptions might be wrong and empirical relationships may change with time. More recently, a new type of method appeared which is based on fully coupled dynamical models that follow the laws of the fluids and radiation physics. This method has been proved to have skill as high as the statistical methods particularly in the case of TCs (Vecchi et al. 2014), and it has the advantage of considering the interactions among different processes. In particular, hurricanes have been shown to be the tropical cyclones with the greatest seasonal forecast skill (Camp et al. 2015). For instance, the British Weather Agency (the MetOffice) in combination with the European Center for Medium-Range Weather Forecast (ECMWF) is using a coupled dynamical model for forecasting hurricanes since 2007 with good results (Camp et al 2015). However, there are still some deficiencies in the seasonal forecasting of hurricanes such as the prediction of the tropical landfall.

Prediction of hurricanes on longer time scales (multi-year scale) has been also developed in the recent years by means of global climate models (Smith et al. 2010). Specifically, Smith et al. (2010) found that it was possible to predict hurricanes at longer than seasonal time scales with promising results (Figure 2). They found that part of the prediction skill relies on external forcings (solar cycle, volcanoes or changes in greenhouse gases concentrations), but another part comes from the initialization, i.e. internal climate variability (also Caron et al. 2014, 2015). The authors linked enhancement in the forecast skills mostly to better predictions in the Pacific and North Atlantic SSTs. However, some atmospheric processes can also affect the decadal forecasting of hurricanes, but the time scale of the atmosphere is usually not long enough to aid dynamical predictions.

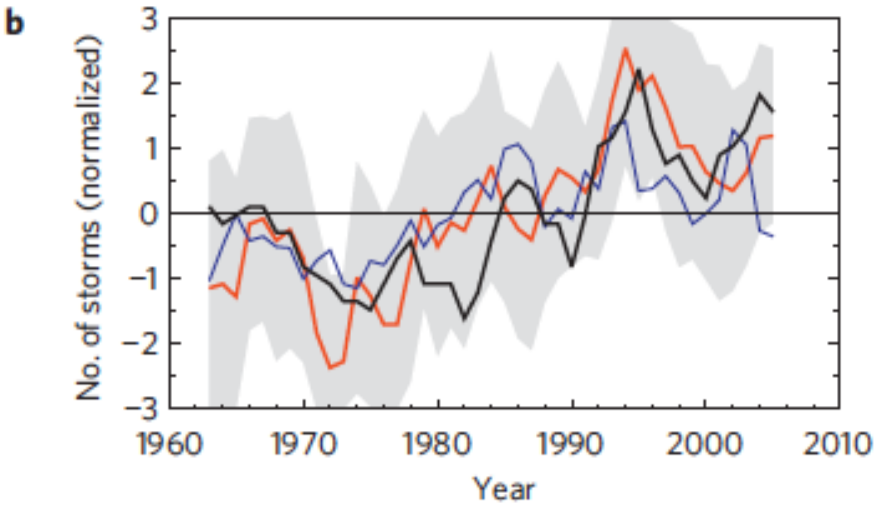

Figure 2. Five-year rolling means of multi-annual hindcasts of Atlantic tropical storm frequency. The black line corresponds to observations, the red line to initialized predictions and the blue line corresponds to predictions that only include external forcings. From Smith et al. (2010).

Nevertheless, the QBO is one of the few atmospheric processes that shows a relatively long period and thus, with a potential application to middle range prediction – seasonal to interannual (Scaife et al. 2014). Despite the potential enhancement of skill coming from QBO, the predictability of QBO has only just very recently studied (Scaife et al. 2014), because it has been very difficult for models to reproduce it due to resolution and parameterizations issues. Either way, Scaife et al (2014) have given evidence of predictability of QBO extending more than 3 years in two of the very few forecast systems that internally generate it. Consequently, QBO might also be one of the internal atmospheric factors that enhance the dynamical prediction of hurricanes (particularly at multi-year scales), but this has not been studied yet.

Objectives and novelty of the project

The main objective of this project is to determine the role played by the tropical stratosphere (particularly the QBO) on the variability and predictability of the Atlantic tropical cyclones (TCs) at seasonal-to-interannual timescales. The goal will be achieved by means of pioneering climate model simulations that will enable the analysis of QBO-TC characteristics that have been hindered so far.
To accomplish this goal the following specific questions will be addressed:

1. Influence of the tropical stratosphere on TCs: **Does the QBO have an effect on hurricane activity and which are the involved mechanisms?**
   As already mentioned, the existence of a relationship between QBO and hurricane activity is still unclear due to limitations of the observational record. Thus, we will try to elucidate this connection and the dynamics involved. As a novelty, this will be achieved by means of very long climate model simulations that will provide us enough data to obtain results with statistical significance. It will also allow us to gain insight into other features related to the QBO that can modulate the QBO-TC relationship and have not been analyzed yet such as the decadal variability of the QBO or a possible interaction of the QBO with other phenomena. For instance, the QBO interacts with other tropical phenomena that, in turn, influence the Atlantic TC activity, such as ENSO (e.g. Gray 1984a). The relationship between the QBO and ENSO will also be analyzed with a two-fold aim: the reduction of uncertainty in this topic and the identification of potential nonlinearities between their relationship and their impact on TCs.
2. Effects of the tropical stratosphere on the forecast quality of TCs: **How does the QBO affect the TC predictability in dynamical forecasting?**
   Seasonal and decadal forecast systems are the most suitable tools, as compared to empirical-statistical models, to assess the prediction skill and the underlying predictability sources of TCs, since coupled climate models are able to simulate and predict the mechanisms responsible for regional predictability. The second goal of StratoCyclone will be to evaluate how the forecast quality of Atlantic TCs depends on the QBO as well as to explore the link between model systematic errors and the success/lack of TC prediction skill. This is the first time that this relationship is assessed in dynamical forecast systems.

The current project provides a suitable scenario for improving seasonal-to-interannual forecasts of hurricanes. Due to the catastrophic effects of hurricanes, it is relevant to advance the predictability of TCs, resulting in better forecasts of their impacts on population and food production. Apart from their devastating consequences, TCs can be also beneficial and important for many tropical or subtropical areas, where TCs are a key element for providing rainfall and maintaining water resources (Sugg, 1968). Thus, a better understanding of TC-involved processes and improvement of TC forecasting is crucial to advance early warning systems. These systems are extremely important as they help to develop policies and programs for disaster prevention such as early harvesting and safe storage of crops or irrigation canals and embankment of rivers in the risk zone (Sivakumar and Motha, 2007)

Methodology

To achieve the objectives mentioned above (here associated with Work Packages - WPs), the EC-EARTH climate model will be employed. The use of EC-EARTH for this project is fully justified. Apart from the reasons specified in Section 2.1 on the role of BSC-ES in the EC-EARTH consortium, some studies have already shown that previous versions of this model are able to simulate qualitatively well the two key phenomena of this proposal (TCs and QBO) (Rathmann et al., 2014 and Christiansen et al. 2016, respectively). The following set of tasks has been considered:

WP1: Influence of the tropical stratosphere on TCs
This WP will focus on the study of the influence of the tropical stratosphere and in particular, of the QBO on the TC activity in current climate. The possible variations in the frequency and tracks of TCs in the Atlantic basin will be examined based on the phase of the QBO, but also its interaction with ENSO.

Task 1.1. Validation of the ability of EC-EARTH to reproduce the main characteristics of the Atlantic TCs (hurricanes). TCs and their track will be identified in this task and the rest of the project by applying a criterion based on the daily maximum wind speed values (Leckebusch et al., 2008). The validation will be carried out by comparing these aspects in historical simulations 1960-2015 performed at T255 (~80km)

and T511 (~40km) atmospheric resolution (*HIST*) with those in reanalysis data (JRA-55, the Japanese 55-year Reanalysis, http://jra.kishou.go.jp/JRA-55/index_en.html) and observational data of hurricanes of the US National Hurricane Center (http://www.nhc.noaa.gov/data/). The historical simulations are already produced (with EC-EARTH3.2) and available to be used by the fellow at the BSC.

Task 1.2. Evaluation of the internally-generated QBO in EC-EARTH. The *HIST* simulations (Task 1.1) will also be used to analyze the QBO properties (e.g. amplitude and period) in the last version of the model (EC-EARTH3.2) and its comparison to observations.

Task 1.3. Analysis of the QBO influence on the hurricanes activity. This task will be carried out by means of a 50-yr time-slice run nudging the atmospheric component of EC-EARTH (i.e. IFS) to the observed atmospheric state in the equatorial stratosphere (i.e. the observed QBO; *SenQBO*). The external forcing such as greenhouse gases and ozone concentrations are fixed at the values of the year 2000. In this run, climatological SSTs for the period 1981-2010 of *HIST* will be also prescribed, so that any influence of ENSO or other SST variability will be eliminated. The period considered for averaging the SSTs extends for 30 years as suggested by NOAA.

Task 1.4. Study of the modulation of the QBO by ENSO and its effects on TCs. This will be addressed in three different steps by means of simulations with the internally-generated QBO:

- **a.** Modulation of the QBO by ENSO: Changes in the period and amplitude of the QBO will be first analyzed in detail under conditions of El Niño and La Niña by compositing both ENSO phases in the *HIST* simulations (Task 1.1). The results will be secondly compared with those of two 50-yr simulations where El Niño and La Niña SST conditions are prescribed, respectively *SenEN* and *SenLN*. The external forcings will be fixed at the values of the year 2000. This comparison will provide robustness and confidence to the conclusions derived from the *HIST* run.
- **b.** Effects of the modulation of the QBO by ENSO on TCs: This will be assessed by the comparison of the TC characteristics in the simulation with a specific precribed phase of the QBO from Task 1.3 (*SenQBO*) with those where the QBO is not prescribed (*SenEN* and *SenLN*; from Task 1.4a) under El Niño and La Niña conditions.

WP2: Effects of the tropical stratosphere on the forecast quality of TCs

The goal of WP2 will be to analyze the QBO influence on the TC predictability. This will be undertaken by means of analyzing a set of climate retrospective forecasts, i.e. re-forecasts or hindcasts, performed with the EC-EARTH climate model. The forecast verification will be done by comparing the hindcasts with observational, reference datasets. It will comprise two targeted approaches:

Task 2.1. Isolating the influence of the QBO on the TC seasonal prediction skill. Two set of seasonal hindcasts, initialized with atmospheric conditions from ECMWF ERA-Interim and oceanic conditions from ECMWF ORAS4 over the period 1979-2015, will be compared: (i) a control hindcast (CTL) with the full ocean-atmosphere model and realistic initialization; and (ii) a hindcast similar to CTL but nudging the tropical stratosphere to model climatology (noTROP), thus suppressing tropical stratospheric variability (i.e. the QBO). The noTROP sensitivity hindcast are constrained by relaxing the zonal-mean spectral component of the temperature, vorticity, and divergence fields to the corresponding climatology from 50hPa upwards.

Task 2.2. Analysis of the conditional multi-year skill of the QBO and TC activity depending on the QBO phase, west vs. east. Decadal hindcasts initialized on November 1st every year in the period 1960-2015 will be used, which are being produced at BSC-ES for CMIP6/DCPP; they consist of 5 members derived from the 5-member ECMWF ORAS4 ocean reanalysis. As the QBO shows some phase asymmetries in its amplitude and downward propagation, this evaluation of the conditional skill is fundamental. Note that this approach has never been adopted in the forecast quality assessment of TCs (c.f. Smith et al. 2010) or the QBO (c.f. Scaife et al. 2014), thereby representing a pioneering activity in the climate forecasting community.

Task 2.3. Exploring the link between model biases and forecast quality. To better understand the performance of EC-EARTH, i.e. relative merits and deficiencies, its systematic errors in the course of the forecast time (namely, the model drift) will be identified. Likewise, the link between these model systematic errors and the success/lack of prediction skill of the QBO and TC activity will be assessed. The purpose is to lay the foundation for reducing bias-related uncertainties and improving the simulation and prediction of both phenomena and their connection in future seasonal and decadal hindcast/forecast experiments.

Work plan

	First year				Second year			
	M3	**M6**	**M9**	**M12**	**M15**	**M18**	**M21**	**M24**
Task 1.1								
Task 1.2								
Task 1.3								
Task 1.4								
Task 2.1								
Task 2.2								
Task 2.3								

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3.2 Impacte previst dels resultats del projecte en el camp d'investigació i en la de la seva aplicació en el desenvolupament de nous coneixements, productes o processos / *Forecast impact of project's results in the field of research and in its application in the development of new knowledge, products or processes.*

The QBO is the most prominent phenomenon of the tropical stratospheric variability with a relatively long time scale and thus, with a potential predictive power. Despite its importance, there are still many aspects related to this phenomenon and in particular, its influence on the tropical troposphere that are still unknown. In this project, one of the few climate models that can generate relatively well the QBO is used to accomplish most of the tasks of the analysis. Thus, we will have the possibility of examining several aspects of the QBO effect on the tropical weather that have not yet been addressed or had been only poorly studied due to a limited record of observational data whose measuring instruments were changing with time.

Specifically, the analysis of the hurricane activity in relation with the phase of the QBO will allow us to gain insight into this relationship and the possible factors that can modulate it with statistical robustness. The results will try to answer some of the biggest unanswered questions: *What is the impact of the QBO on the frequency, intensity and trajectories of hurricanes? Why did the QBO-hurricane relationship vanish in 1980s?* The answers to these questions are particularly important for many different areas such as middle-range forecasting (as indicated later) and climate change projections. In the case of future climate change scenario, the projections of hurricane activity by different models do not show a coherent picture, probably because the response of TCs to internal atmospheric factors is not well understood. Thus, the results of StratoCyclone will inform modeling groups to which extent the tropical stratospheric variability must be well resolved to capture a correct variability of hurricanes.

Not only will the knowledge about the modulation of the hurricane variability by the QBO be expanded, but also StratoCyclone will make advances in the basic science related to the interactions between the two most important variability modes of the whole climate system: QBO and ENSO. Again, this is particularly useful for the future climate projections. On one hand, the pattern of future change of SSTs is close to an El Niño-like pattern (Cai et al. 2014). On the other hand, most of the CMIP5 and CCMI models do not have an internally generated QBO and usually prescribed perpetual weak easterly winds or varying observed winds. Our study will determine the importance of these approximations and could advice models contributing to future multi-model comparison initiatives and IPCC reports.

This proposal also presents the novelty of evaluating the QBO-hurricane relationship in a set of dynamical hindcasts. It is worth highlighting that no previous study has assessed the QBO influence on the TC predictability with dynamical forecasting systems. Additionally, it will be the first time that the multi-year skill of the QBO and hurricane activity will be studied depending on the QBO phase. Thus, our approach and outcomes will be of great interest for the climate forecasting community and the SPARC SNAP initiative (Stratospheric Network for the Assessment of Predictability, http://www.met.reading.ac.uk/~pn904784/snap/). StratoCyclone offers a favourable scope for substantial progress of seasonal-to-interannual predictions in the tropical Atlantic sector. Consequenty, the early warning systems will also benefit them from the outcome of the project.

From a methodological point of view, the representation of the QBO is one of the most important challenges of climate models. Thus, the detection of biases in this representation in Task 1.2 can contribute to their improvement by sharing the results with the groups in charge of the development of models, particularly in the EC-EARTH consortium and the SPARC QBOi initiative (SPARC QBOi – Towards Improving the Quasi-Biennial Oscillation in Global Cimate Models, http://users.ox.ac.uk/~astr0092/QBOi.html)). The project will also undertake investigating the influence of model systematic errors on the prediction skill of the QBO and TC activity.

The acquired skills and knowledge will be easily transferred to the host institution (BSC-ES), which undertakes developing research in the applicant's field. The BSC is well equipped with the necessary tools and facilities to also make the transfer of technical developments very feasible. In fact, the host center has recently established a Technology Transfer Office (TTO) that manages all the technologies developed in the center. Thus, the TTO will also help the fellow to transfer the knowledge to the already mentioned institutions and initiatives.

3.3 Activitats de difusió i de divulgació de la recerca previstes en el marc del projecte de recerca: disseminació dels resultats del projecte, explotació de resultats, comunicació i estratègia de compromís públic de l'acció / *Planned research dissemination activities within the framework of the research project: dissemination of project results, exploitation of results, communication and public commitment to action.*

StratoCyclone is committed to both expand the basis for the stratospheric role on the occurrence of hurricanes and apply the new knowledge in activities of scientific disclosure, communication and education. These outreach activities will be offered in a communication language that can be understood by non-specialists, thereby improving the public's understanding of climate science. Such commitment is integrated via the following activities:

Communication and public engagement strategy of the action

- The project will prepare leaflets for the UK Met Office and US National Hurricane Center, which are the main research centres producing hurricane forecasts and could also benefit from the outcomes of the project. A first leaflet would be distributed at the beginning of the project, providing basic and popularizing information about the premises and objectives. The second leaflet would be distributed at the end of the project and will provide information about the assessment and achievements. The interaction with these centers might in turn impact positively on the development of the project, because they have a large expertise on hurricanes and a large record of observations of these phenomena.
- The fellow will also connect with the Tropical Cyclone Programme (TCP) of the World Meteorological Organization (WMO) (https://www.wmo.int/pages/prog/www/tcp/) that tries to establish national and regionally coordinated systems to reduce the dramatic consequences of TCs. The TCP organizes workshops on hurricane forecasting and warning where the fellow will participate to present the results of StratoCyclone.
- The host institution (BSC-ES) has good bonds with the University of Barcelona (UB) and the Technical University of Catalonia (UPC), and promising options for participating in doctoral programs. The project will contribute to create teaching materials to enable the widest possible outreach and uptake of the results derived from the fellowship by students. Regular seminars and master classes will also be offered by the fellow.
- The fellow will also organize an activity about hurricanes in the framework of the "Setmana de la Ciència" held every year in Barcelona (http://www.fundaciorecerca.cat/setmanaciencia/frontend/). The activity will bring the public closer to hurricanes and the role of the stratosphere on global climate, and some outcomes of the project will be explained in a comprehensive way to the public.
- Other activities about hurricanes for the public might also be offered to the public during the visits of schools and universitiesto the BSC-ES that are organized by the Communication team.
- The fellow has a Twitter account (@blancassw) where she advertises her new research to the public and interacts with some non-academic public interested in stratospheric research. She plans to do the same with the outcome of StratoCyclone. The BSC-ES also has Twitter (@BSC-CNS) and Facebook accounts where they can advertise the main results of the project to the public.

Dissemination of the research results

The results will be presented at top scientific meetings, such as those of the American Geophysical Union (AGU) or the European Geosciences Union (EGU).
It is also expected that the research results of the project will be published in high-impact factor journals. The papers will be collected, managed and disseminated by the Open Access (UPCommons) that is available at the BSC-ES. UPCommons uses the interoperability protocol of the Open Archives Initiative (OAI-PMH). This increases the visibility of the documents by offering them jointly with other international repositories.
The Communication team of the BSC –ES will send a press release about outstanding outcomes of the project to communicate results to the media. Additionally, the same team also carries out dissemination tasks for different projects and the fellow will also benefit from this service.
Finally, the project will produce periodic newsletter-like brochures that will be uploaded to the BSC-ES's webpage.

Exploitation of results

- Due to the devastating consequences of hurricanes, the outcome of StratoCyclone will be extremely useful for insurance companies. For instance, some insurance companies such as AXA have a regional section in Mexico devoted to extreme weather events risks and in particular, in association with TCs. The fellow will contact some of these companies and share with them the most important conclusions of the project.
- The fellow will also connect indirectly with insurance companies through the Risk Prediction Initiative (RPI, http://rpi.bios.edu). RPI funds research relevant to the insurance and (re)insurance industry and assists in translating this research into usable and actionable results for their member companies. One of the most important topics of interest of RPI is the tropical cyclones.
- The TTO of the BSC-ES will also help the fellow to transfer and exploit the results with other institutions and companie. The office is focused on finding the best transfer strategy for each technology and knowledge developed in the centre identifying those with the highest TRL (Technology Readiness Level) in order to bring them to market.

- This fellowship will notably increase the capability of Spanish and European research groups on dynamical ensemble climate forecasting by encouraging visits to the host institution (BSC-ES), and via the unique data repository and analysis tools that will be created.

4. Aspectes ètics del projecte de recerca previst / *Ethical aspects of the planned research project*

4.1 Indiqueu si la recerca que es vol desenvolupar inclou algun d'aquests aspectes / *Indicate whether the intended research work includes any of the following aspects*:

Investigació sobre embrions humans/Fetus *Research on human embryos /foetuses*	SI / YES	NO
La investigació proposada implica embrions humans? *Does the proposed research involve human embryos?*	☐	☒
La investigació proposada implica teixits o cèl·lules fetals humanes? *Does the proposed research involve human foetal tissue or cells?*	☐	☒
La investigació proposada implica cèl·lules mare embrionàries humanes? *Does the proposed research involve human embryo stem cells?*	☐	☒
La proposta d'investigació amb cèl·lules mare embrionàries humanes implica cultiu cel·lular o l'obtenció de cèl·lules a partir d'embrions? *Does the proposed research with human embryo stem cells involve cell cultures or the obtaining of cells from embryos?*	☐	☒

Investigació sobre éssers humans *Research on human beings*	SI / YES	NO
La investigació proposada implica la participació de nens? *Does the proposed research involve the participation of children?*	☐	☒
La investigació proposada implica la participació de pacients? *Does the proposed research involve the participation of patients?*	☐	☒
La investigació proposada implica la participació de persones incapacitades per donar el seu consentiment? *Does the proposed research involve the participation of persons incapable of giving their consent?*	☐	☒
La investigació proposada implica voluntaris adults sans? *Does the proposed research involve healthy adult volunteers?*	☐	☒
La investigació proposada implica material genètic humà o mostres biològiques humanes? *Does the proposed research involve human genetic material or human biological specimens?*	☐	☒
La investigació proposada implica la recopilació de dades personals? *Does the proposed research involve the gathering of personal data?*	☐	☒

Privacitat *Privacy*	SI / YES	NO
La investigació proposada implica el processament de la informació genètica o de les dades personals (per exemple, salut, vida sexual, origen ètnic, les opinions polítiques, les conviccions religioses o filosòfiques)? *Does the proposed research involve the processing of genetic information or personal data (for example, health, sex life, ethnic origin, political opinions, religious or philosophical convictions)?*	☐	☒
La investigació proposada implica el seguiment de la ubicació o de l'observació de les persones? *Does the proposed research involve the monitoring of the location or the observation of persons?*	☐	☒

Investigació amb animals *Research with animals*	SI / YES	NO
La investigació proposada implica la investigació amb animals? *Does the proposed research involve research with animals?*	☐	☒
Aquests animals són petits animals transgènics de laboratori? *Are these animals transgenic small laboratory animals?*	☐	☒
Aquests animals són animals de granja transgènics o clonats? *Are these animals transgenic or cloned farm animals?*	☐	☒
Aquests animals són primats no humans? *Are these animals non-human primates?*	☐	☒

Investigació amb els Països en Desenvolupament *Research with developing countries*	SI / YES	NO
La investigació proposada implica l'ús de recursos locals (genètics, animals, vegetals, etc)? *Does the proposed research involve the use of local resources (genetic, animal, plant, etc.)?*	☐	☒
És la investigació proposada en benefici de les comunitats locals (per exemple, la creació de capacitats, accés a la salut, l'educació, etc? *Does the proposed research benefit local communities (for example, skills creation, access to health, education, etc.?*	☐	☒

Doble us *Dual use*	SI / YES	NO
La investigació proposada té un ús militar directe? *Does the proposed research have a direct military use?*	☐	☒
La investigació té un potencial ús terrorista? *Does the research have a potential terrorist use?*	☐	☒

4.2 Si el projecte de recerca que es vol desenvolupar inclou algun tipus d'estudi amb dades personals o genètiques, algun tipus d'experimentació amb éssers humans, la utilització de mostres biològiques d'origen humà o algun tipus d'experimentació amb animals, expliqueu-ne breument els motius. Indiqueu també si el projecte ja compta amb l'aprovació del comitè d'ètica del propi centre. / *If the intended research project includes some kind of study with personal or genetic data, some kind of experiment with human beings, the use of biological samples of human origin or some kind of experiment with animals, briefly explain the reasons. Also indicate whether the project has already been approved by the centre's own ethics committee.*

4.3 En els casos en que el projecte presentat inclogui algun tipus d'estudi amb dades personals o genètiques o algun tipus d'experimentació amb éssers humans, també caldrà especificar si existeix algun tipus de remuneració o de compensació per als subjectes participants i, en el moment de presentar la sol·licitud, també caldrà adjuntar el model d'informació i de consentiment que rebran els participants / *In cases in which the submitted project includes some kind of study with personal or genetic data or some kind of experiment with human beings, you must also specify whether there is any kind of remuneration or compensation for participating subjects and, at the time of submitting the application, the information and consent form to be received by participants must also be attached.*