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MODELER in PHYSICAL OCEANOGRAPHY

My profile:

Modeler of the tropical Ocean
Specialist of Ocean-Atmosphere interactions
and connexion with the equatorial dynamics

My objectives:

Inter-comparison of the Upwelling systems of the Southern Hemisphere:
Connection with equatorial dynamics
and Ocean/Atmosphere interactions at regional and basin scales

RESEARCH ACTIVITIES

Since 2007



Research scientist for *Institut de Recherche pour le Développement* (IRD) at *Laboratoire d'Etudes en Géophysique et Océanographie Spatiale* (LEGOS, Toulouse, France): «Inter-comparison of the Upwelling Systems in the Southern Hemisphere: Equatorial Remote Connections and Climatic Evolutions on a Regional Scale».

My research focuses on the phenology of the Eastern Boundary Upwelling Systems (EBUS) of the southern hemisphere, along the coasts of Peru and Chile in the Humboldt Current System, and along the coasts of Angola and Namibia in the northern Benguela Upwelling System. I am specialized on the connection with the linear equatorial dynamics, and on the air-sea interactions at regional and basin scales.

2015-2019



Research scientist for IRD at the department of Oceanography in the University of Cape Town (UCT) in the framework of the ICEMASA LMI.

2010-2012



Research scientist at the *Instituto de la MAR del Perú* (IMARPE, Callao, Peru) and at the *Instituto de Geofisico del Perú* (IGP, La Molina, Peru) in the framework of the DISCOH LMI.

2005-2007



Post-Doc Position at CALTECH/JPL: *Use of satellite data and Intermediate coupled models to study the air-sea inter-action within the Indian ocean at inter-annual to decadal time scales.*

2005

3 months-**Research Position** at MERCATOR-OCEAN in the validation team: Quantify of the impact of the assimilation of data MERA-11 reanalysis: study of the long equatorial waves.

2001-2005

Three years of **Ph.D.** at LEGOS: Interannual variability of the equatorial Atlantic. Remote effects of Pacific El Niño Southern Oscillation using intermediate coupled models, *in situ* and satellite data.

↳ Co-PI of the Mercator proposals entitled "Analysis of the variability of the equatorial vertical structure of MERCATOR models", in 2003 and 2004.

TEACHING ACTIVITIES

2020/2021

15h course on Geophysical Fluid Dynamics in the framework of the M2 SOAC (UPS/ENSEEIH/ENM, Toulouse, France).

2016-2021

Annual Ocean statistics class at UCT (Cape Town, South Africa): *Introduction to time series analysis* in the framework of UCT *Honors* level curriculum. Classes and practicals with Matlab.

04/2019

5-day Regional ocean modeling training course, classes and hands-on sessions (model dynamics, numerical aspects, nesting capabilities, floats propagation, inter-annual simulation, validation).

02/2018

↳ 5 Trainings at UCT in the framework of the ICEMASA LMI

02/2017

↳ 1 training in Hanoi University (Vietnam) in the context of the Franco-Vietnamese Water-

02/2016

Environment-Oceanography co-badged master degree

02+09/2015

02/2011

↳ 1 training at *Instituto de Geofisico del Perú* (IGP, La Molina, Peru).

06/2018

15h-workshop on ocean-atmosphere coupling with ROMS/WRF/OASIS, Honors to researchers.

2008-2009

3 CNRS labialized Training courses on *FERRET external functions* (LEGOS and CERFACS, Toulouse, France).

HONORS

2019, 2017  Stanley Jackson Awards décerné par la South African Society for Atmospheric Sciences pour 2 articles reconnus contributions scientifiques majeures aux sciences atmosphériques et océaniques.

Since 2019  Editorial Board Member for Nature Scientific Reports

STUDENT SUPERVISION

PhD students	Co-advisor of Serge Tomety PhD (2017/2021): <i>Coastal climate change and variability around Southern Africa</i>. Co-advisor of Rodrigue Anicet Imbol Koungue PhD (2014/2018): <i>A study of Benguela Niños and Niñas from 1958 to 2015</i>. Co-advisor of Marie-Lou Bachèlery PhD (2013/16): <i>Physical and biogeochemical variability in the Benguela upwelling system: ocean teleconnexion versus local forcing</i> Co-advisor of Kobi Mosquera PhD (2010/15): <i>The intraseasonal Kelvin wave and the dynamics of the Central Pacific El Niño events</i>.
Master Students	Co-advisor of D. Gyeye Master2 project (Cotonou, Benin) in 2021: <i>Rôle de la dynamique océanique sur le « North Tropical Atlantic pattern »</i>. Co-advisor of D. Nola Master2 project (Cotonou, Benin) in 2021: <i>Variabilité interannuelle des propriétés biogéochimiques dans le Golfe de Guinée</i>. Co-advisor of E Adanmaze Master internship (Cotonou, Benin) in 2013: <i>Impact of coastal trapped waves on the upwelling on the North of Gulf of Guinea</i>. Co-advisor of Bruno Michon Master internship (ISAE engineering school) in 2012.
License and Honors	Co-advisor of Liisa Shangheta (UCT, Capetown, South Africa) in 2018: <i>Evaluation of the surface winds in the Benguela Upwelling System using the new reanalysis JRA-55</i>. Co-advisor of Nicholas Salonen (UCT, Capetown, South Africa) in 2017: <i>Effects of the seasonal stratification on the Benguela Niño developments: case study of the 2001 event</i>. Supervision of the internship of Pauline Charuyer, 2d year at ENSTA engineering school in 2014: <i>Coastal Trapped Wave spatial structures</i>. Co-advisor of Carlos Quispe's <i>maestria</i> (IMARPE, Callao, Peru) in 2011-2013: <i>Linear dynamics in the equatorial Pacific and El Niño forecasts</i>. Co-advisor of Yvan Romero's <i>maestria</i> (IMARPE, Callao, Peru) in 2011-2012: <i>High-resolution Regional modelisation along the Peruvian coasts</i>.

EDUCATION

- 2001/05** | **Ph.D.** in physical oceanography at the Laboratoire en Géophysique et Oceanography Spatiale (LEGOS, Toulouse, France): *Low frequency variability in the Tropical Atlantic: Role of the equatorial ocean dynamics and influence of El Niño Southern Oscillation*.
- 2000/01** | **Master** in marine environment sciences (coastal and ocean oceanography option) at the Centre d'Océanologie de Marseille (COM, Marseille, France). Graduated with honors.
- 1998/01** | **Engineer** at ISITV (Engineering School, Toulon, France), coastal and ocean engineering, marine technology specialty, specialization in physical oceanography. Graduated with honors.
- 1996/98** | Preparatory classes at the University of Toulouse (France), major in physics, mathematics and chemistry. Graduated with honors.
- 1996** | Scientific Baccalauréat with majors in physics and chemistry (Toulouse, France).

COMPETENCES

MODELISATION:

Ocean: ROMS, ROMS-tools, intermediate Models (upwelling and tropics)
Atmosphere: WRF, QTCM, intermediate Models
Coupling: OASIS3-MCT

INFORMATICS:

Development: Fortran 77 / 90, Python, C/C++.
Scientific Computation: Matlab, IDL, NCL
Visualization tools: FERRET, GMT, Matlab
Bureautics: Word, Power Point, Latex.
OS: Linux, Windows, Mac, Unix.

LANGUAGES:

English : Bilingual.
Spanish : Conversational.
German : Basics knowledge.

- Chenillat, F., S. Illig, J. Jouanno, F. M. Awo, G. Alory & P. Brehmer, **2021**: How do climate modes shape the chlorophyll-a interannual variability in the tropical Atlantic? Accepted for publication in *Geophysical Research Letter* in May 2021.
- Illig, S., M.-L. Bachèlery & J. F. Lübbecke, **2020**: Why do Benguela Niños lead Atlantic Niños? *Journal of Geophysical Research: Oceans*, 125, e2019JC016003. <https://doi.org/10.1029/2019JC016003>.
- Bachèlery, M.L., S. Illig & M. Rouault, **2020**: Interannual Coastal Trapped Waves in the Angola-Benguela Upwelling System and Benguela Niño and Niña events. *Journal of Marine Systems*, Vol 203, March 2020, 103262, <https://doi.org/10.1016/j.jmarsys.2019.103262>.
- Rouault M., B. Monyela, R. A. Imbol Kounge, A. S. Nkwinkwa Njouodo, B. Dieppois, S. Illig & Keenlyside N. **2019**: Ocean Impact on Southern African Climate Variability and Water Resources Report to the Water Research Commission. WRC Report No. 2425/1/18, ISBN 978-0-6392-0079-8.
- Imbol Kougue R.A., M. Rouault, S. Illig, M. Rouault, P. Brandt & J. Jouanno, **2019**: Benguela Niños and Benguela Niñas in forced ocean simulation from 1958 to 2015. *J. Geophys. Res.*, 124, 5923-5951. <https://doi.org/10.1029/2019JC015013>.
- Foltz, G.R. et al., **2019**: The Tropical Atlantic Observing system. *Front. Mar. Sci.* <https://doi.org/10.3389/fmars.2019.00206>.
- Illig, S. & M.L. Bachèlery, **2019**: Propagation of Subseasonal Equatorially-Forced Coastal Trapped Waves down to the Benguela Upwelling System. *Nature - Scientific Reports*, 9, 5306. <https://doi.org/10.1038/s41598-019-41847-1>.
- Bretagnon, M., A. Paulmier, V. Garçon, B. Dewitte, S. Illig, N. Lebond, L. Coppola, F. Campo, F. Velazco, C. Panagiotopoulos, A. Oschlies, J.M. Hernandez-Ayon, H. Maske, O. Vergara, I. Montes, P. Martinez, E. Carrasco, J. Grelet, O. Depretz-de-Gesincourt, C. Maes & L. Scouarnec, **2018**: Modulation of the vertical particules transfer efficiency in the Oxygen Minimum Zone off Peru. *Biogeosciences Discussions*, 15, 5093-5111. <https://doi.org/10.5194/bg-2018-103>.
- Desbiolles, F., R.C. Blamey, S. Illig, R. James, R. Barimalala, L. Renault & C.J.C. Reason, **2018**: Upscaling impact of Wind/sea surface temperature mesoscale interactions on southern Africa austral summer Climate. *Int. J. Climatol.*, 38, 4651-4660. <https://doi.org/10.1002/joc.5726>.
- Illig, S., E. Cadier, M.-L. Bachèlery & M. Kersalé, **2018a**: Subseasonal Coastal Trapped Wave propagations in the Southeastern Pacific and Atlantic oceans. Part I: A new approach to estimate wave amplitudes. *J. Geophys. Res. Oceans*. 123, 3915-3941. doi: 10.1029/2017JC013539.
- Illig, S., M.-L. Bachèlery & E. Cadier, **2018b**: Subseasonal Coastal Trapped Wave propagations in the Southeastern Pacific and Atlantic oceans. Part II: Wave characteristics and connection with equatorial variability. 123, 3942-3961. doi: 10.1029/2017JC013540.
- Rouault, M., S. Illig, J. Lübbecke & R.A. Imbol Kougue, **2017**: Origin, development and demise of the 2010-2011 Benguela Niño, *Journal of Marine Systems*, In Press, doi:10.1016/j.jmarsys.2017.07.007.
- Imbol Kougue R.A., S. Illig & M. Rouault, **2017**: Role of Interannual Kelvin wave propagations in the equatorial Atlantic on the Angola Benguela current system, *J. Geophys. Res.*, 122, doi:10.1002/2016JC012463.
- Astudillo O., B. Dewitte, M. Mallet, F. Frappart, J. Rutllant, M. Ramos, L. Bravo. K. Goubanova & S. Illig, **2017**: Surface Winds off Peru-Chile: Observing closer to the coast from radar altimetry, *Journal of Remote Sensing of Environment*, 191, doi: 10.1016/j.rse.2017.01.010.
- Bachèlery, M.-L., S. Illig & I. Dadou, **2016**: Forcings of Nutrient, Oxygen and Primary Production interannual variability in the South-East Atlantic Ocean, *Geophys. Res. Lett.*, 43, doi: 10.1002/2016gl070288.
- Renault, L., M. J. Molemaker, J. C. McWilliams, A. F. Shchepetkin, F. Lemarié, D. Chelton, S. Illig & A. Hall, **2016**: Modulation of Wind-Work by Oceanic Current Interaction with the Atmosphere, *J. Phys. Oceanogr.*, doi:10.1175/JPO-D-15-0232.1.
- Bachèlery, M.-L., S. Illig & I. Dadou, **2016**: Interannual variability in the South-East Atlantic Ocean, focusing on the Benguela Upwelling System: Remote versus local forcing, *J. Geophys. Res. Oceans*, 120, doi:10.1002/2015JC011168.
- Hernández-Carrasco I., J. Sudre, V. Garçon, H. Yahia, C. Garbe, A. Paulmier, B. Dewitte, S. Illig & I. Dadou, **2015**: Reconstruction of super-resolution fields of ocean pCO₂ and air-sea fluxes of CO₂ from satellite imagery in the Southeastern Atlantic, *Biogeosciences Discuss.*, 12, 1405-1452, doi:10.5194/bgd-12-1405-2015.
- Illig, S., B. Dewitte, K. Goubanova, G. Cambon, J. Boucharel, F. Monetti, C. Romero, S. Purca & R. Flores, **2014**: Forcing mechanisms of intraseasonal SST variability off Central Peru in 2000-2008, *J. Geophys. Res. Oceans*, 119, 3548-3573, doi:10.1002/2013JC009779.
- Dewitte B., K. Takahashi, K. Goubanova, A. Montecinos, K. Mosquera, S. Illig, I. Montes, A. Paulmier, V. Garçon, S. Purca, R. Flores, L. Bourrel, P. Rau, D. Labat, W. Lavado, J.C. Espinoza, **2014**: Las diversas facetas de El Niño y sus efectos en la costa del Perú, Book Chapter, *El Perú frente al cambio climático*, 125-140.
- Goubanova K., S. Illig, E. Machu, V. Garçon and B. Dewitte, **2013**: SST subseasonal variability in the Benguela upwelling system as inferred from satellite observations (2000-2008), *J. Geophys. Res.-Oceans*, 118, 4092-4110.

- Cambon G., K. Goubanova, P. Marchesiello, B. Dewitte, and S. Illig, **2013**: Assessing the impact of downscaled winds on a regional ocean model simulation of the Humboldt system, *Ocean Modelling*, 65, 11-24.
- Mosquera-Vásquez K., B. Dewitte & S. Illig, **2014**: The Central Pacific El Niño intraseasonal Kelvin wave, *Journal of Geophysical Research: Oceans*, 2014, 119, 10, 6605.
- Mosquera, K., B. Dewitte, S. Illig, K. Takahashi and G. Garric, **2013**: The 2002/03 El Niño: Equatorial wave sequence and their impact on Sea Surface Temperature. *J. Geophys. Res.-Oceans*, vol. 118, 1-12. ISSN 2169-9275.
- Thual. S., B. Dewitte, S.-I. An, S. Illig and N. Ayoub, **2013**: Influence of Recent Stratification Changes on ENSO stability in a Conceptual Model of the Equatorial Pacific. *J. Climate*, 26(13): 4790-4802.
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- Renault L., B. Dewitte, P. Marchesiello, S. Illig, V. Echevin, G. Cambon, M. Ramos, O. Astudillo, P. Minnis and J. K. Ayers, **2012**: Upwelling response to atmospheric coastal jets off Central Chile: A modeling study of the October 2000 event. *J. Geophys. Research*, V. 117, C02030.doi:10.1029/2011JC007446.
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- Garbe C.S., Butz A., Dadou I., Dewitte Boris, Garçon V., Illig S., Paulmier A., Sudre J., Yahia H. Climatically-active gases in the eastern boundary upwelling and oxygen minimum zone (OMZ) systems. In : IEEE international geoscience and remote sensing symposium (IGARSS) : proceedings . Piscataway : IEEE, **2012**, p. 6150-6153. (Geoscience and Remote Sensing Symposium). IEEE International Geoscience and Remote Sensing Symposium (IGARSS) : Remote Sensing for a Dynamic Earth, 31., Munich (DEU), 2012/07/22-27. ISBN 978-1-4673-1160-1.
- Dewitte B., S. Illig, L. Renault, K. Goubanova, K. Takahashi, D. Gushchina, K. Mosquera and S. Purca, **2011**: Modes of covariability between sea surface temperature and wind stress intraseasonal anomalies along the coast of Peru from satellite observations (2000-2008). *J. Geophys. Res.*, 116, doi:10.1029/2010JC006495.
- Purca S., B. Dewitte, S. Illig, M. Graco, J. Vazquez, L. Vasquez, **2011**: Seasonal to decadal variability of temperature off Peruvian coast: connection with the Equatorial variability. *The third Anchovy book (IMARPE)*.
- Dewitte B., S. Purca, S. Illig., L. Renault & B. Giese, **2008**: Low frequency modulation of the intra-seasonal equatorial Kelvin wave activity in the Pacific ocean from SODA: 1958-2001. *J. Climate*, 21, 6060-6069.
- Illig S., B. Dewitte, C. Perigaud, C. Derval. *Equatorial wave intra-seasonal variability in the Indian and Pacific oceans in the Mercator Ocean POG05B simulation. Mercator Newsletter. 2007, 45-56.*
- Illig S., & C. Perigaud, **2007**: Seasonal impact of intra-monthly rain fluctuations on the Indian Ocean surface salinity, *Geophys. Res. Lett.*, 34, L12609.
- Rouault M., S. Illig, C Bartholomae, C.J.C. Reason & A. Bentamy, **2007**: Propagation and origin of warm anomalies in the Angola Benguela upwelling system in 2001, *Journal of Marine Systems*, 68 (3-4), 473-488.
- Illig S., D. Gushchina, B. Dewitte, N. Ayoub & Y. du Penhoat, **2006**: The 1996 Equatorial Atlantic Warm Event: Origin and Mechanisms, *Geophys. Res. Lett.*, 33, L09701. *Editor's Highlight*
- Illig S., & B. Dewitte, **2006**: Local Coupled Equatorial Variability Versus Remote ENSO Forcing in an Intermediate Coupled Model of the Tropical Atlantic, *J. Climate*, Vol. 19, N° 20, 5227-5252.
- Gushchina D., B. Dewitte & S. Illig, **2006**: Remote ENSO forcing versus local air-sea interaction in QTCM: a sensitivity study to intraseasonal variability. *Advance in Geoscience*, 6, 289-297.
- Illig S., **2005**: Variabilité basse fréquence de l'Atlantique tropical: Rôle de la dynamique océanique équatoriale et Influence d'El Niño Southern Oscillation. Thèse de doctorat de l'université Paul Sabatier (Toulouse, France), 180pp.
- Illig S., B. Dewitte, N. Ayoub, Y. du Penhoat, G. Reverdin, P. De Mey, F. Bonjean & G.S. E. Lagerloef, **2004**: Interannual Long Equatorial Waves in the Tropical Atlantic from a High Resolution OGCM Experiment in 1981-2000. *J. Geophys. Res.*, 109 (C2).
- Dewitte B., S. Illig., L. Parent, Y. du Penhoat, L. Gourdeau & J. Verron, **2003**: Tropical Pacific baroclinic mode contribution and associated long waves for the 1994-1999 period from an assimilation experiment with altimetric data. *J. Geophys. Res.*, 108 (C4).