

# Gwendal Rivière, CNRS Research scientist

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## Diplomas

- January 2012** **Habilitation thesis** (University Toulouse III).  
Title : Dynamics of mid-latitude cyclones and their role in the general circulation of the atmosphere.
- 1999 - 2002** **PhD Thesis** (University Paris VI) at Laboratoire de Météorologie Dynamique (Ecole Normale Supérieure, Paris, France).  
Title : Local dynamics of perturbation growth in quasigeostrophic flows and predictability.  
Advisors : Drs. Lien Hua and Patrice Klein.  
**Award “Prix Prud’homme 2004”** received from the Société Météorologique de France in december 2004 for this PhD work.
- 1998 - 1999** **Master of Science (University Paris VI)** in meteorology, oceanography and environment (DEA).
- 1995 - 1998** **Engineering degree from Ecole Polytechnique.**  
Majors : (i) fluid mechanics, (ii) meteorology.

## Research positions

- 2014 - now** **CNRS scientist position** at Laboratoire de Météorologie Dynamique - Ecole Normale Supérieure (Paris, France).
- 2006 - 2013** **CNRS scientist position** at Centre National de Recherches Météorologiques (CNRM-GAME) (CNRS and Météo-France, Toulouse, France).
- 2004 - 2005** **Postdoctoral position at GFDL** (Princeton University, USA).
- 2002 - 2003** **Postdoctoral position at CNRM-GAME** (Toulouse, France).

## Teaching

- 2012 - now** **Course in general atmospheric circulation** (master in geosciences) at Ecole Normale Supérieure (Paris).
- 2017** **Tutorials in atmospheric and oceanic dynamics** (bachelor level) at Ecole Polytechnique (Paris).
- 2009 - 2013** **Course in dynamical meteorology** (master level) at University Paul Sabatier and Ecole Nationale de la Météorologie (Toulouse).

## Publications list

41 in Peer-reviewed international journals ; 21 as a main author.

- Robert L., **G. Rivière**, F. Codron, 2018 : Effect of upper- and lower-level baroclinicity on the persistence of the leading mode of midlatitude jet variability. *J. Atmos. Sci.*, in press.
- Schemm S., **G. Rivière**, L. M. Ciasto, C. Li, 2018 : Understanding ENSO's influence on extratropical cyclones and their genesis over North America and the North Atlantic. *J. Atmos. Sci.*, 75, 3943-3964.
- Schäfler A., G. Craig, H. Wernli, P. Arbogast, J. D. Doyle, R. McTaggart-Cowan, J. Methven, **G. Rivière** and co-authors, 2018 : The North Atlantic Waveguide and Downstream Impact Experiment. *Bull. Amer. Meteor. Soc.*, 99, 1607-1637, <https://doi.org/10.1175/BAMS-D-17-0003.1>
- Varino F., P. Arbogast, B. Joly, **G. Rivière**, M.-L. Fandeur, H. Bovy, J.-B. Granier, 2018 : Northern Hemisphere extratropical winter cyclones variability over the 20th Century derived from ERA-20C Reanalysis. *Clim. Dyn.*, <https://doi.org/10.1007/s00382-018-4176-5>
- Messori, G., R. Caballero, F. Bouchet, D. Faranda, R. Grotjahn, N. Harnik, S. Jewson, J. G. Pinto, **G. Rivière**, S. Jewson, T. Woollings, P. Yiou, 2018. An interdisciplinary approach to the study of extreme weather events : large-scale atmospheric controls and insights from dynamical systems theory and statistical mechanics. *Bull. Amer. Meteorol. Soc.*, 99, ES81-ES85, doi : 10.1175/BAMS-D-17-0296.1
- **Rivière, G.**, S. Berthou, G. Lapeyre, M. Kageyama, 2018 : On the reduced North Atlantic storminess during the last glacial period : the role of topography in shaping synoptic eddies. *J. of Climate*, 31, 1637-1652, DOI : 10.1175/JCLI-D-17-0247.1.
- Davini P., S. Corti, F. D'Andrea, **G. Rivière**, J. von Hardenberg, 2017 : Improved winter European atmospheric blocking frequencies in high-resolution global climate simulations. *Journal of Advances in Modeling Earth Systems*, 9, 2615-2634. DOI : 10.1002/2017MS001082.
- Robert L., **G. Rivière**, F. Codron, 2017 : Positive and Negative Eddy Feedbacks Acting on Midlatitude Jet Variability in a Three-Level Quasigeostrophic Model. *J. Atmos. Sci.*, 74, 1635-1649.
- Shaw T., M. Baldwin, E. Barnes, R. Caballero, C. Garfinkel, Y.-T. Hwang, C. Li, P. O'Gorman, **G. Rivière**, I. Simpson and A. Voigt, 2016 : Storm track processes and the opposing influences of climate change. *Nature Geoscience*, 9, 656-664.
- **Rivière G.**, L. Robert, F. Codron, 2016 : A short-term negative eddy feedback on mid-latitude jet variability due to planetary wave reflection. *J. Atmos. Sci.*, in press.
- Coronel, B., D. Ricard, **G. Rivière** and P. Arbogast, 2016 : Cold-conveyor-belt jet, sting jet and slantwise circulations in idealized simulations of extratropical cyclones. *Q. J. R. Meteorol. Soc.*, 182, 1781-1796.
- **Rivière G.** and M. Drouard, 2015 : Dynamics of the Northern Annular Mode at weekly time scales. *J. Atmos. Sci.*, 72, 4569-4570.
- **Rivière G.** and M. Drouard, 2015 : Understanding the contrasting North Atlantic Oscillation anomalies of the winters of 2010 and 2014. *Geo. Res. Lett.*, 42, 6868-6875, doi :10.1002/2015GL065493.

- Coronel, B., D. Ricard, **G. Rivière** and P. Arbogast, 2015 : Role of moist processes in the tracks of idealized mid-latitude surface cyclones. *J. Atmos. Sci.*, 72, 2979-2996.
- Drouard, M., **G. Rivière**, and P. Arbogast, 2015 : The link between the North Pacific climate variability and the North Atlantic Oscillation via downstream propagation of synoptic waves. *J. of Climate*, 28, 3957-3976.
- **Rivière G.**, P. Arbogast and A. Joly, 2015 : Eddy kinetic-energy redistribution within winstorms Klaus and Friedhelm. *Q. J. R. Meteorol. Soc.*, 141, 925-938. doi :10.1002/qj.2412
- **Rivière G.**, P. Arbogast and A. Joly, 2015 : Eddy kinetic-energy redistribution within idealized extratropical cyclones using a two-layer quasigeostrophic model. *Q. J. R. Meteorol. Soc.*, 141, 207-223. doi :10.1002/qj.2350.
- Michel, C. and **G. Rivière**, 2014 : *Sensitivity of the position and variability of the eddy-driven jet to different SST profiles in an aquaplanet general circulation model.* *J. Atmos. Sci.*, 71, 349-371.
- Drouard, M., **G. Rivière**, et P. Arbogast, 2013 : *The North Atlantic Oscillation response to large-scale atmospheric anomalies in the Northeast Pacific.* *J. Atmos. Sci.*, 70, 2854-2874.
- **Rivière, G.**, J.-B. Gilet, et L. Oruba, 2013 : *Understanding the regeneration stage undergone by surface cyclones crossing a mid-latitude jet in a two-layer model.* *J. Atmos. Sci.*, 70, 2832-2853.
- Oruba, L., G. Lapeyre, et **G. Rivière**, 2013 : *On the poleward motion of midlatitude cyclones in a baroclinic meandering jet.* *J. Atmos. Sci.*, 70, 2629-2649.
- **Rivière, G.**, P. Arbogast, G. Lapeyre, et K. Maynard, 2012 : *A potential vorticity perspective on the motion of a mid-latitude winter storm.* *Geo. Res. Lett.*, 39, L12808.
- Michel, C., **G. Rivière**, L. Terray et B. Joly 2012 : *The dynamical link between surface cyclones, upper-tropospheric Rossby wave breaking and the life cycle of the Scandinavian blocking.* *Geo. Res. Lett.*, 39, L10806.
- Oruba, L., G. Lapeyre et **G. Rivière**, 2012 : *On the northward motion of midlatitude cyclones in a barotropic meandering jet.* *J. Atmos. Sci.*, 69, 1793-1810.
- Michel, C. et **G. Rivière**, 2011 : *The link between Rossby wave breakings and weather regimes transitions.* *J. Atmos. Sci.*, 68, 1730-1748.
- Lainé, A., G. Lapeyre et **G. Rivière**, 2011 : *A quasi-geostrophic model for moist storm-tracks.* *J. Atmos. Sci.*, 68, 1306-1322.
- **Rivière, G.**, 2011 : *A dynamical interpretation of the poleward shift of the jet streams in global warming scenarios.* *J. Atmos. Sci.*, 68, 1253-1272.
- **Rivière, G.**, 2010 : *The role of Rossby wave-breaking in the West Pacific teleconnection.* *Geo. Res. Lett.*, 37, L11802.
- **Rivière, G.**, A. Lainé, G. Lapeyre, D. Salas-Mélia et M. Kageyama, 2010 : *Rossby wave breaking and the North Atlantic Oscillation in PMIP2 simulations of the Last Glacial Maximum and pre-industrial climates and in ERA40 reanalysis.* *J. of Climate*, 23, 2987-3008.
- **Rivière, G.**, P. Arbogast, K. Maynard et A. Joly, 2010 : *The essential ingredients leading to the explosive growth stage of the European wind storm "Lothar" of Christmas 1999.* *Q. J. R. Meteorol. Soc.*, 136, 638-652.
- Gilet, J.-B., Plu M., **Rivière, G.**, 2009 : *Nonlinear baroclinic dynamics of surface cyclones crossing a zonal jet.* *J. Atmos. Sci.*, 66, 3021-3041.
- **Rivière, G.**, 2009 : *Effect of latitudinal variations in low-level baroclinicity on eddy life cycles*

and upper-tropospheric wave-breaking processes. *J. Atmos. Sci.*, 66, 1569-1592.

- Lainé, A., M. Kageyama, D. Salas-Mélia, A. Voldoire, **G. Rivière**, G. Ramstein, S. Planton, S. Tyteca et J. Y. Peterschmitt, 2009 : *Northern hemisphere storm-tracks during the Last Glacial Maximum in the PMIP2 Ocean-Atmosphere coupled models : energetic study, seasonal cycle, precipitation*. *Clim. Dyn.*, 32, 593-614.
- **Rivière, G.**, 2008 : *Barotropic regeneration of upper-level synoptic disturbances in different configurations of the zonal weather regime*. *J. Atmos. Sci.*, 65, 3159-3178.
- **Rivière, G.** et I. Orlanski, 2007 : *Characteristics of the Atlantic storm-track eddy activity and its relation with the North Atlantic Oscillation*. *J. Atmos. Sci.*, 64, 241-266.
- **Rivière, G.** et A. Joly, 2006b : *Role of the low-frequency deformation field on the explosive growth of extratropical cyclones at the jet exit. Part II : baroclinic critical region*. *J. Atmos. Sci.*, 63, 1982-1995.
- **Rivière, G.** et A. Joly, 2006a : *Role of the low-frequency deformation field on the explosive growth of extratropical cyclones at the jet exit. Part I : barotropic critical region*. *J. Atmos. Sci.*, 63, 1965-1981.
- **Rivière, G.** et B. L. Hua, 2004 : *Predicting areas of sustainable error growth in quasigeostrophic flows using perturbation alignment properties*. *Tellus*, 56A, 441-455.
- **Rivière, G.**, B. L. Hua, et P. Klein, 2004 : *Perturbation growth in terms of baroclinic alignment properties*. *Q. J. R. Meteorol. Soc.*, 130, 1655-1673.
- **Rivière, G.**, B. L. Hua, et P. Klein, 2003 : *Perturbation growth in terms of barotropic alignment properties*. *Q. J. R. Meteorol. Soc.*, 129, 2613-2635.
- **Rivière, G.**, B. L. Hua, et P. Klein, 2001 : *Influence of the  $\beta$ -effect on nonmodal baroclinic instability*. *Q. J. R. Meteorol. Soc.*, 127, 1375-1388.

## Other publications

- **Rivière G.**, P. Arbogast, 2018 : Tempêtes hivernales des latitudes tempérées : théories et prévisions. *Reflets de la physique*, 57, 4-9.
- **Rivière G.**, J. Delanoë, J. Pelon, P. Arbogast, J.-P. Chaboureau, 2016 : La campagne Nawdex. *La Météorologie*, 95, 5-6.
- **Rivière, G.**, 2005 : Prévisibilité des écoulements atmosphériques et océaniques aux latitudes tempérées. *La Météorologie*, 8ème série, 51, 23-36.

## Books / chapters of books / monographs / reports

- Mitchell, J. L., T. Birner, G. Lapeyre, N. Nakamura, P. Read, **G. Rivière**, A. Sanchez-Lavega and G. K. Vallis, 2018 : *Jets in nature*. in *Zonal jets* Ed. B. Galperin and P. Read. Cambridge University Press, ISBN : 9781107043886
- Martius, O. and **G. Rivière**, 2016 : Rossby wave breaking - climatology, interaction with low frequency climate variability, and links to extreme weather events. in *Dynamics and Predictability of Large-Scale, High-Impact Weather and Climate Events* Ed. Li, J., R. Swinbank, H. Volkert and R. Grotjahn. Special Publications of IUGG. Cambridge University Press, 370 pp.

- **Rivière, G.**, 2012. *Dynamique des dépressions des latitudes tempérées et leur rôle dans la circulation générale de l'atmosphère*. Habilitation thesis report. Université Toulouse III - Paul Sabatier. (159 pages).
- **Rivière, G.**, 2002. *Dynamique locale de la croissance des perturbations dans les écoulements quasigéostrophiques et prévisibilité*. PhD thesis report. Laboratoire de Météorologie Dynamique, Ecole Normale Supérieure, Paris (201 pages).
- **Rivière, G.**, 1999. *Instabilité généralisée d'écoulements océaniques et atmosphériques dans le cadre du modèle de Phillips*. Master report. océanologie, météorologie et environnement (38 pages).

## Student supervision

### PhD students

Emilien Jolly (PSL, Paris); Loic Robert (UPMC, Paris; defended in 2017); Filipa Varino (Univ. Paul Sabatier, Toulouse; defended in 2017); Benoit Coronel (Univ. Paul Sabatier, Toulouse; defended in 2015); Marie Drouard (Univ. Paul Sabatier, Toulouse; defended in 2014); Ludivine Oruba (UPMC, Paris; defended in 2012); Clio Michel (INP, Toulouse; defended in 2012); Jean-Baptiste Gilet (Univ. Paul Sabatier, Toulouse; defended in 2009).

### Postdocs / early-career scientists

Alexandre Lainé (2008-2009), Sebastian Schemm (2016), Hanin Binder (2017-2019), David Flack (2018-2019), Marie Mazoyer (2018-2019).

### Masters

Emilien Jolly (2017, UPMC); Rémi Pellerej (2014, Univ. Bretagne Occidentale); Loic Robert (2013, UPMC); Ségolène Berthou (2012, UPMC); Emmanuel Demael (2012, ENM, Univ. Paul Sabatier); Stéphane Beck (2011, Univ. Paul Sabatier); Clio Michel (2009, Univ. Paul Sabatier); Ludivine Oruba (2009, Univ. Paul Sabatier); Maiwenn Perrin (2008, Univ. Paul Sabatier); Lorraine Manlay (2007, Univ. Paul Sabatier); Jean-Baptiste Gilet (2006, ENM, Univ. Paul Sabatier); Gaelle Ouzeau (2008, master 1, Univ. Paul Sabatier); Katy Pol and Lorraine Manlay (2006, master 1, Univ. Paul Sabatier).

## Research management

- **President of scientific committee CNRS/INSU/LEFE/IMAGO** since 2015 and **member** since 2012. Goal : evaluation of proposals submitted to LEFE programme.
- **Convenor of the EGU dynamical meteorology session** from 2010 to 2015.
- **Member elected of ICDM-IAMAS** (international commission in dynamical meteorology of the International Association of Meteorology and Atmospheric Sciences) since 2015.

- **Member elected at the LMD council** since 2014.

## Project coordination

- **Principal investigator (PI) of the ANR project DIP-NAWDEX** : Diabatic processes during the North Atlantic Waveguide Downstream and impact EXperiment (2017-2019)
- **PI of two CNRS/INSU/LEFE projects** : "EPIGONE : Excitation, Propagation, et Impact du Guide d'Ondes Nord-Atlantique" (2010-2012) and "F-NAWDEX : French - North Atlantic Waveguide Downstream Impact Experiment" (2015-2017)
- **(Co)-PI of the French component of the international field campaign NAWDEX** (North Atlantic Waveguide Downstream Impact Experiment ; Septembre-Octobre 2016) : participation in the science plan (<http://www.nawdex.org/>), coordinator of the IPSL funding project "Ground-based-NAWDEX", (Co)-decision maker of the French Falcon aircraft flight tracks during NAWDEX.
- **(Co)-PI of the young grant ANR project "ENVISTORM** (Rôle de l'environnement (humidité, déformation) sur le cycle de vie et la variabilité des tempêtes)" from 2006 to 2009.