

François Gay-Balmaz – Publications

1 Published and accepted papers in peer reviewed journals

2018

- 71. A variational derivation of the nonequilibrium thermodynamics of a moist atmosphere with rain process and its pseudoincompressible approximation**, F. Gay-Balmaz, *Geophys. Astrophys. Fluid Dyn.*, to appear. <https://arxiv.org/pdf/1701.03921.pdf>
- 70. Variational integrator for the rotating shallow-water equations on the sphere**, R. Brecht, W. Bauer, A. Bihlo, F. Gay-Balmaz, and S. MacLachlan, *Q. J. Royal Meteorol. Soc.*, to appear. <https://arxiv.org/pdf/1808.10507.pdf>
- 69. From Lagrangian mechanics to nonequilibrium thermodynamics: a variational perspective**, F. Gay-Balmaz and F. Gay-Balmaz, *Entropy*, to appear.
- 68. Geometric theory of flexible and expandable tubes conveying fluid: equations, solutions, and shock waves**, F. Gay-Balmaz and V. Putkaradze, *J. Nonlin. Sc.*, to appear. <https://arxiv.org/pdf/1805.11026.pdf>
- 67. Towards a geometric variational discretization of compressible fluids: the rotating shallow water equations**, W. Bauer and F. Gay-Balmaz, *J. Comp. Dyn.*, to appear. <https://arxiv.org/pdf/1711.10617.pdf>
- 66. On choosing state variables for piecewise-smooth dynamical system simulations**, J. S. Pei, J. P. Wright, F. Gay-Balmaz, J. L. Beck, and M. Todd, *Nonlinear Dynamics*, to appear.
- 65. Variational discretization of simple thermodynamical systems on Lie groups**, B. Couéraud and F. Gay-Balmaz, *Disc. Cont. Dyn. Syst. Series S.*, to appear. <https://arxiv.org/pdf/1806.09897.pdf>
- 64. Predicting uncertainty in geometric fluid mechanics**, F. Gay-Balmaz and D. D. Holm, *Disc. Cont. Dyn. Syst. Series S.*, to appear. <https://arxiv.org/pdf/1806.10470.pdf>.
- 63. A free energy Lagrangian variational formulation of the Navier-Stokes-Fourier system**, F. Gay-Balmaz and H. Yoshimura, *Int. J. Geom. Methods Mod. Phys.*, to appear, <https://arxiv.org/pdf/1706.09010.pdf>

62. Stability of helical tubes conveying fluid, F. Gay-Balmaz, D. Georgievskii, and V. Putkaradze [2018], *Journal of Fluids and Structures*, **78**, 146–174. <https://arxiv.org/pdf/1708.01943.pdf>

61. A variational formulation of nonequilibrium thermodynamics for discrete open systems with mass and heat transfer, F. Gay-Balmaz and H. Yoshimura [2018], *Entropy*, **20**(3), 163. <https://arxiv.org/pdf/1811.11665.pdf>

60. Stochastic geometric models with non-stationary spatial correlations in Lagrangian fluid flows, F. Gay-Balmaz and D. D. Holm [2018], *J. Nonlin. Sci.*, **28**(3), 873–904. <https://arxiv.org/pdf/1703.06774.pdf>

59. Variational discretization of the nonequilibrium thermodynamics of simple systems, F. Gay-Balmaz and H. Yoshimura [2018], *Nonlinearity*, **31**(4), 1673. <https://arxiv.org/pdf/1702.02594.pdf>

58. Dirac structures in nonequilibrium thermodynamics, F. Gay-Balmaz and H. Yoshimura [2018], *J. Math. Phys.*, **59**, 012701. <https://arxiv.org/pdf/1704.03935.pdf>

2017

57. Dual input-output pairs for modeling hysteresis inspired by mem-models, J.-S. Pei, F. Gay-Balmaz, J. P. Wright, M. D. Todd, S. F. Masri [2017], *Nonlinear Dynamics*, **88**(4), 2435–2455.

56. The geometric nature of the Flaschka transformation, A. M. Bloch, F. Gay-Balmaz, and T. S. Ratiu [2017], *Comm. Math. Phys.*, **352**(2), 457–517.

55. Coadjoint orbits in duals of Lie algebras with admissible ideals, A. M. Bloch, F. Gay-Balmaz, and T. S. Ratiu [2017], *Matematicheskii Sbornik*, **208**(10):1421.

54. A multisymplectic integrator for elastodynamic frictionless impact problems, F. Demoures, F. Gay-Balmaz, M. Desbrun, T. S. Ratiu, A. Aragón [2017], *Computer Methods in Applied Mechanics and Engineering*, **315**, 1025–1052.

53. A Lagrangian variational formalism for nonequilibrium thermodynamics. Part II: continuum systems, F. Gay-Balmaz and H. Yoshimura [2017], *J. Geom. Phys.*, **111**, 194–212.

52. A Lagrangian variational formalism for nonequilibrium thermodynamics. Part I: discrete systems, F. Gay-Balmaz and H. Yoshimura [2017], *J. Geom. Phys.*, **111**, 169–193.

2016

51. On noisy extensions of nonholonomic constraints, F. Gay-Balmaz and V. Putkaradze [2016], *J. Nonlin. Sci.*, **6**, 1571–1613.

50. Variational discretizations for the dynamics of fluid-conveying flexible tubes, F. Gay-Balmaz and V. Putkaradze [2016], *C. R. Mécanique*, **344**, 769–775.

49. Multisymplectic variational integrators for nonsmooth Lagrangian continuum mechanics, F. Demoures, F. Gay-Balmaz, and T. S. Ratiu [2016], *Forum of Mathematics, Sigma*, **4**, 54 pages.

48. Multisymplectic variational integrators and space/time symplecticity, F. Demoures, F. Gay-Balmaz, and T. S. Ratiu [2016], *Analysis and Applications*, **14**(3), 341–391. <http://arxiv.org/pdf/1310.4772.pdf>.

2015

47. The geometry of the universal Teichmüller space and the Euler-Weil-Petersson equation, F. Gay-Balmaz and T. S. Ratiu [2015], *Advances in Mathematics*, **279**, 717–778.

46. Understanding memristors and memcapacitors in engineering mechanics applications, J.-S. Pei, J. P. Wright, M. D. Todd, S. F. Masri, and F. Gay-Balmaz [2015], *Nonlinear Dynamics*, **80**(1), 457–489.

45. On flexible tubes conducting fluid: geometric nonlinear theory, stability and dynamics, F. Gay-Balmaz and V. Putkaradze [2015], *J. Nonlin. Sci.*, **25**(4), 889–936.

44. Lagrangian reductions and integrable systems in condensed matter, F. Gay-Balmaz, M. Monastyrsky and T. S. Ratiu [2015], *Comm. Math. Phys.*, **335**(2), 609–636, <http://arxiv.org/pdf/1404.7654v1.pdf>

43. Dynamics of elastic strings with rolling contact, F. Gay-Balmaz and V. Putkaradze [2015], *Physica D*, **294**, 6–23.

42. Dynamics and geometric control of flexible solar updraft towers, M. Chi, F. Gay-Balmaz, V. Putkaradze, and P. Vorobieff [2015], *Proc. R. Soc. A* **471**: 2014053.

41. A dual pair for free boundary fluids, F. Gay-Balmaz and C. Vizman [2015], *Int. J. Geom. Methods Mod. Phys.*, **12**(7), 1550068, <http://arxiv.org/pdf/1402.1516v1.pdf>

40. Dirac reduction for nonholonomic mechanical systems on semidirect products, F. Gay-Balmaz and H. Yoshimura [2015], *Adv. Appl. Math.*, **63**, 131–213. <http://arxiv.org/pdf/1410.5394v1.pdf>.

39. Discrete variational Lie group formulation of geometrically exact beam dynamics, F. Demoures, F. Gay-Balmaz, S. Leyendecker, S. Ober-Blöbaum, T. S. Ratiu, and Y. Weinand [2015], *Numerische Mathematik*, **130**, 73–123.

2014

- 38. A geometric theory of selective decay with applications in MHD**, F. Gay-Balmaz and D. D. Holm [2014], *Nonlinearity*, **27**, 1747–1777. <http://arxiv.org/pdf/1310.4543v1.pdf>
- 37. Principal bundles of embeddings and nonlinear Grassmannians**, F. Gay-Balmaz and C. Vizman [2014], *Annals of Global Analysis and Geometry*, **46**, 293–312, <http://arxiv.org/pdf/1402.1512.pdf>
- 36. Multisymplectic Lie group variational integrators for a geometrically exact beam in \mathbb{R}^3** , F. Demoures, F. Gay-Balmaz, M. Kobilarov, and T. S. Ratiu [2014], *Commun. Nonlinear Sci. Numer. Simulat.*, **19**(10), 3492–3512, <http://arxiv.org/pdf/1403.5410v1.pdf>
- 35. Exact geometric theory for flexible, fluid-conducting tubes**, F. Gay-Balmaz and V. Putkaradze [2014], *C. R. Mécanique*, **342**, 79–84.
- 34. Integrable G -strands on semisimple Lie groups**, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2014], *J. Phys. A: Math. Theor.*, **47** 075201, <http://arxiv.org/pdf/1308.3800.pdf>
- 33. Dual pairs for nonabelian fluids**, F. Gay-Balmaz and C. Vizman [2014], in *Geometry, Mechanics, and Dynamics: The Legacy of Jerry Marsden*, *Fields Institute Communications Series*, **73**, <http://arxiv.org/pdf/1304.5026.pdf>
- 32. Variational discretization for rotating stratified fluids**, M. Desbrun, E. Gawlik, F. Gay-Balmaz, and V. Zeitlin [2014], *Disc. Cont. Dyn. Syst. Series A*, **34**(2), 479–511.

2013

- 31. Equivalent theories of liquid crystal dynamics**, F. Gay-Balmaz, T. S. Ratiu, and C. Tronci [2013], *Archive for Rational Mechanics and Analysis*, **210**(3), 773–811. <http://arxiv.org/pdf/1102.2918>
- 30. Geometric dynamics on the automorphism group of principal bundles: geodesic flows, dual pairs and chromomorphism groups**, F. Gay-Balmaz, C. Tronci, and C. Vizman [2013], *Journal of Geometric Mechanics*, **5**(1) 39–84. <http://arxiv.org/pdf/1006.0650>
- 29. Clebsch variational principles in field theories and singular solutions of covariant EPDiff equations**, F. Gay-Balmaz [2013], *Rep. Math. Phys.* **71**(2), 231–277. <http://arxiv.org/pdf/1209.0109.pdf>
- 28. Selective decay by Casimir dissipation in inviscid fluids**, F. Gay-Balmaz and D. D. Holm [2013], *Nonlinearity* **26**, 495–524. <http://arxiv.org/pdf/1206.2607.pdf>

2012

- 27. Dynamics of elastic rods in perfect friction contact**, F. Gay-Balmaz and V. Putkaradze [2012], *Phys. Rev. Lett.* **109**(24), 244303. <http://arxiv.org/pdf/1207.3540.pdf>

- 26. Reduced variational formulations in free boundary continuum mechanics**, F. Gay-Balmaz, J. E. Marsden, and T. S. Ratiu [2012], *J. Nonlin. Sci.*, **22**(4), 463–497.
- 25. Vlasov moment flows and geodesics on the Jacobi group**, F. Gay-Balmaz and C. Tronci [2012], *J. Math. Phys.*, **53**, 123502. <http://arxiv.org/pdf/1105.1734>
- 24. Geometric dynamics of optimization**, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2012], *Comm. Math. Sci.*, **11**(1), 163–231. <http://arxiv.org/pdf/0912.2989>
- 23. Invariant higher-order variational problems II**, F. Gay-Balmaz, D. D. Holm, D. M. Meier, T. S. Ratiu, and F.-X. Vialard [2012], *J. Nonlin. Sci.*, **22**(4), 553–597.
- 22. Euler-Poincaré approaches to nematodynamics**, F. Gay-Balmaz, T. S. Ratiu, and C. Tronci [2012], *Act. Appl. Math.* **120**, 127–151. <http://arxiv.org/pdf/1110.2617>
- 21. Exact geometric theory of dendronized polymer dynamics**, F. Gay-Balmaz, D. D. Holm, V. Putkaradze, and T. S. Ratiu [2012], *Adv. Appl. Math.*, **48**, 535–574. <http://arxiv.org/pdf/1005.2701>
- 20. Invariant higher-order variational problems**, F. Gay-Balmaz, D. D. Holm, D. M. Meier, T. S. Ratiu, and F.-X. Vialard [2012], *Comm. Math. Phys.*, **309**(2), 413–458. <http://arxiv.org/pdf/1012.5060>
- 2011**
- 19. Un-reduction**, M. Bruveris, D. Ellis, F. Gay-Balmaz, and D. D. Holm [2011], *Journal of Geometric Mechanics*, **3**(4) 363–387. <http://arxiv.org/pdf/1012.0076>
- 18. Lagrange-Poincaré field equations**, D. Ellis, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2011], *Journal of Geometry and Physics*, **61**(11) 2120–2146. <http://arxiv.org/pdf/0910.0874>
- 17. Geometry of non-Abelian charged fluids**, F. Gay-Balmaz and T. S. Ratiu [2011], *Dynamics of PDEs*, **8**(1), 5–19.
- 16. Clebsch optimal control formulation in mechanics**, F. Gay-Balmaz and T. S. Ratiu [2011], *Journal of Geometric Mechanics*, **3**(1), 47–79.
- 15. Dual pairs in fluid dynamics**, F. Gay-Balmaz and C. Vizman [2011], *Annals of Global Analysis and Geometry*, **41**(1), 1–24. <http://arxiv.org/pdf/1007.1347>
- 14. Higher order Lagrange-Poincaré and Hamilton-Poincaré reductions**, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2011], *Journal of the Brazilian mathematical society*, **42**(4), 579–606. <http://arxiv.org/pdf/1407.0273v1.pdf>
- 13. The momentum map representation of images**, M. Bruveris, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2011], *J. Nonlin. Sci.*, **21**, 115–150. <http://arxiv.org/pdf/0912.2990>

2010

12. **The helicity and vorticity of liquid-crystal flows**, F. Gay-Balmaz and C. Tronci [2010], *Proc. R. Soc. Lond. Ser. A Math. Phys. Eng. Sci.* **467**(2128), 1197–1213. <http://arxiv.org/pdf/1006.2984>
11. **Reduction theory for symmetry breaking with applications to nematic systems**, F. Gay-Balmaz and C. Tronci [2010], *Phys. D*, **239** (20-22), 1929–1947. <http://arxiv.org/pdf/0909.2165>
10. **Symmetry reduced dynamics of charged molecular strands**, D. Ellis, F. Gay-Balmaz, D. D. Holm, V. Putkaradze, and T. S. Ratiu [2010], *Archive for Rational Mechanics and Analysis*, **197** (2), 811–902. <http://arxiv.org/pdf/0901.2959>
9. **A new Lagrangian dynamic reduction in field theory**, F. Gay-Balmaz and T. S. Ratiu [2010], *Annales de l'Institut Fourier*, **16** (3), 1125–1160. <http://arxiv.org/pdf/1407.0263v1.pdf>

2009

8. **Variational principles for spin systems and the Kirchhoff rod**, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu [2009], *Journal of Geometric Mechanics* **1** (4) 417–444. <http://arxiv.org/pdf/0904.1428>
7. **On the classification of coadjoint orbits of the Sobolev Bott-Virasoro group**, F. Gay-Balmaz [2009], *Journal of Functional Analysis*, **256** (9) 2815–2841.
6. **The geometric structure of complex fluids**, F. Gay-Balmaz and T. S. Ratiu [2009], *Adv. Appl. Math.*, **42** (2) 176–275. <http://arxiv.org/pdf/0903.4294>

2008

5. **Reduced Lagrangian and Hamiltonian formulations of Euler–Yang–Mills fluids**, F. Gay-Balmaz and T. S. Ratiu [2008], *Journal of Symplectic Geometry*, **6** (2) 189–237. <http://arxiv.org/pdf/0903.4287>
4. **Affine Lie-Poisson reduction, Yang-Mills magnetohydrodynamics, and superfluids**, F. Gay-Balmaz and T. S. Ratiu [2008], *J. Phys. A: Math. Theor.* **41** 344007. <http://arxiv.org/pdf/0903.4292>
3. **Poisson reduction and the Hamiltonian structure of the Euler-Yang-Mills equations**, F. Gay-Balmaz and T. S. Ratiu [2008], *Contemp. Math.*, Weinstein vol. **450**, 113–126.

2007

2. **Group actions on chains of Banach manifolds and application to fluid dynamics**, F. Gay-Balmaz and T. S. Ratiu [2007], *Annals of Global Analysis and Geometry*, **31** (3), 287–328. <http://arxiv.org/pdf/math/0603332>

2005

1. **The Lie-Poisson structure of the averaged Euler equations**, F. Gay-Balmaz and T. S. Ratiu [2005], *Dynamics of PDEs*, **2** (1), 25–57. <http://arxiv.org/pdf/math/0504381>

2 Book chapter

1. **Geometric analysis of noisy perturbations to nonholonomic constraints**, F. Gay-Balmaz and V. Putkaradze [2017], in *Stochastic Geometric Mechanics*, CIB-SGM 2015. Springer proceedings in Mathematics & Statistics, **202**, Springer, Cham. <https://arxiv.org/pdf/1707.03929.pdf>

3 Published papers in peer reviewed conference proceedings

5. **Dirac structures in nonequilibrium thermodynamics**, H. Yoshimura and F. Gay-Balmaz [2018], *IFAC-PapersOnLine* **51**(3), 31–37.

4. **A Lagrangian variational formulation for nonequilibrium thermodynamics**, F. Gay-Balmaz and H. Yoshimura [2018], *IFAC-PapersOnLine* **51**(3), 25–30.

3. **Dirac structures in nonequilibrium thermodynamics**, with H. Yoshimura, in *Geometric Science of Information*. GSI 2017. Lecture Notes in Computer Science, **10589**, 410–417. Springer, Cham.

2. **A variational formulation for fluid dynamics with irreversible processes**, F. Gay-Balmaz and H. Yoshimura, in *Geometric Science of Information*. GSI 2017. Lecture Notes in Computer Science, **10589**, 401–409. Springer, Cham.

1. **The Clebsch representation in optimal control and low rank integrable systems**, A. M. Bloch, F. Gay-Balmaz, and T S. Ratiu, to appear in the *Proceedings of the Abel Symposium, 2016*.

4 Published papers in conference proceedings, without peer review

6. **Double bracket flows, Toda flows and rigid body Toda**, A. M. Bloch, F. Gay-Balmaz, and T S. Ratiu, in *Proc. Allergen Conference*, 2013.

5. **Asynchronous variational Lie group integration for geometrically exact beam dynamics**, F. Demoures, F. Gay-Balmaz, T. Leitz, S. Leyendecker, S. Ober-Blöbaum, and T.S. Ratiu [2013], *Multibody Dynamics*, ECCOMAS, Zagreb, Croatia, 01-04 July 2013.

4. **Asynchronous variational Lie group integration for geometrically exact beam dynamics**, F. Demoures, F. Gay-Balmaz, T. Leitz, S. Leyendecker, S. Ober-Blöbaum, and T.S. Ratiu [2013], *GAMM Annual Meeting*, Novi Sad, Serbia, 18-22 March 2013.

3. **Hamilton-Pontryagin principle for incompressible ideal fluids**, F. Gay-Balmaz and H. Yoshimura [2011], *New Trends in Fluid Mechanics Research*, Proceeding of the Sixth International Conference on Fluid Mechanics, American Institute of Physics, Conf. Proc. Vol.**1376**, 552–554.

2. **Flexible beam in \mathbb{R}^3 under large overall motions and asynchronous variational integrators**, F. Demoures, F. Gay-Balmaz, J. Nembrini, T. S. Ratiu, Y. Weinand [2011], *IABSE-IASS Symposium*, London,

20-23 September 2011.

1. Well-posedness of higher dimensional Camassa-Holm equations, F. Gay-Balmaz [2008], *Bulletin of the Transilvania University of Braşov* **15**(50), Series B , 1-4. Proc. 9^{ème} Colloque franco-roumain de math. appl., 28 août - 2 septembre 2008, Braşov, Romania.

5 Submitted papers

5. Koopman wavefunctions and classical-quantum correlation dynamics, D. I. Bondar, F. Gay-Balmaz, and C. Tronci. <https://arxiv.org/pdf/1802.04787.pdf>

4. Single and double generator bracket formulations of geophysical fluids with irreversible processes, C. Eldred and F. Gay-Balmaz. <https://arxiv.org/pdf/1811.11609.pdf>

3. A variational principle for fluid sloshing with vorticity, dynamically coupled to vessel motion, H. Alemi Ardakani, T. J. Bridges, F. Gay-Balmaz, Y. Huang, and C. Tronci. <https://arxiv.org/pdf/1809.10909.pdf>

2. Variational integrators for soundproof models on arbitrary triangular C-grids, W. Bauer and F. Gay-Balmaz. <https://hal.inria.fr/hal-01970335>

1. Variational integrators for anelastic and pseudo-incompressible flows, W. Bauer and F. Gay-Balmaz. <https://arxiv.org/pdf/1701.06448.pdf>