Curriculum vitae

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Blaise FAUGERAS

Laboratoire J.-A. Dieudonné (UMR 7351),
Université de Nice Sophia-Antipolis,
Faculté des Sciences, Parc Valrose,
06108 Nice Cedex 02, France

tel : 0033 6 50 37 41 54
e-mail : blaise.faugeras@univ-cotedazur.fr
url : http://math.unice.fr/~faugeras/

Personal data

Born in 1975 (Salt Lake City, USA). Citizenship: France and USA

Education

1999 - M.Sc. Applied Mathematics, *Numerical analysis, partial differential equations and scientific computing*, DEA, University Claude Bernard, Lyon, France
- *School of Mines Engineer*, Ingénieur civil de l'Ecole des Mines de St Etienne, France

2002 Ph.D. Applied Mathematics, University Joseph Fourier, Grenoble, France
-thesis: *Variational data assimilation in a coupled ocean-biogeochemistry model*
-committee: J. Blum (advisor), J. Verron (co-advisor); G. Chavent, L. Prieur (referees); F.X. Le Dimet, L. Memery, J.-P. Puel.

2015 Habilitation à diriger des recherches, University Nice Sophia-Antipolis, France.
-thesis: *Modeling, numerical simulation and inverse problems. Contributions in Tokamak plasma physics, in marine ecology and other works*
-committee: M. Asch, P. Auger, E. Lazzaro (referees); J. Blum, H. Guillard, F. Saint-Laurent

Employment

1999-2002 Ph.D. research and teaching assistant with a government grant, University Joseph Fourier, Grenoble, France

2002-2003 ATER (fixed term Assistant Professor position) in applied mathematics, INSA de Lyon, France

2003-2005 Post doctoral research, INRIA Sophia-Antipolis France and IRD Sète France

2005- Scientist (permanent position)

- CNRS, IR2 Laboratoire I3S, University Nice Sophia-Antipolis, France (2005-2006)
- IRD, CR2 Centre de Recherche Halieutique, Sète, France (2006-2007)
- CNRS, IR2 (2007) then IR1 (2013) and IRHC (2022), Laboratoire J.-A. Dieudonné, Université Côte d'Azur UCA (ex Université Nice Sophia-Antipolis), France
  -member of the PDEs and Numerical Analysis team
  -member of the INRIA CASTOR project team since 2012
  -"ITER scientist fellow" 2018-2021

Research

Interests Modeling, numerical simulation and inverse problems for physical and biological systems governed by partial differential equations.

Key words PDE, modeling, numerical analysis, numerical methods, scientific computing, numerical optimization, optimal control, adjoint model, inverse problems, data assimilation, marine ecology, structured population dynamics, magnetohydrodynamics, Tokamak, free-boundary plasma equilibrium

Publications 39 journal articles, 18 proceedings and book chapters

Citations 1931 citations on Google Scholar

Scientific projects

- INRIA CASTOR (Control Analysis and Simulation for TOkamak Research) since 2012
- INRIA Project Lab FRATRES 2015-2019
- FR FCM/ITER: Research federation on fusion by magnetic confinement since 2007
- European projects : EUROfusion (participation to several work packages since 2014), EFDA ITM Integrated Tokamak Modelling (2007-2013), JET Analysis and modelling Tasks 2017 (T17-15, T17-02)
- ANR SISTEM 2019-2023
- Contract with UKAEA STEP for the code NICE, 2023

Softwares

- APECOSM-E, 2005-2010, main developer. Finite differences Fortran code for the simulation of the dynamic of a fish population structured in size and space in the ocean. Adjoint code, obtained by automatic differentiation, used for parameter identification assimilating real fishing data.
- CEDRES++, 2010-2016, developer. Finite elements C++ code for direct and inverse simulation of the evolution of the equilibrium of the plasma at the resistive diffusion time scale in a Tokamak.
- EQUINOX, VacTH and VacTH-KV, 2007-2016, main developer. Finite elements C++/ Fortran codes for real-time reconstruction of the equilibrium of the plasma in a Tokamak from experimental measurements. Implemented on the european Tokamak JET (Oxford, UK) and on the french Tokamak ToreSupra-WEST, CEA Cadarache.
- NICE, Newton direct and Inverse Computation for Equilibrium, since 2017, main developer. Finite elements C++ code combining, among others, the different functionalities from CEDRES++, EQUINOX and VacTH.

Academic visits Several 2 weeks visits at JET (Oxford, UK) and at TCV (EPFL Lausanne) between 2007 and 2020

Teaching and supervision

Calculus and Linear algebra level L1 and L2 (First and second year of university studies)

- 40h/year, University of Nice Sophia-Antipolis (2010-2014)
- 96h, INSA de Lyon (2002-2003)
- 64h/year, University of Savoie, Chambéry (1999-2002)
- weekly oral examinations, Lycée Claude Fauriel, St-Etienne (1997-1999)

Optimization level M1 (fourth year of university studies)

- 20 to 40h/year, University of Nice Sophia-Antipolis (2012-2017)

Data assimilation level M2 (fifth year of university studies)

- 30h/year, University of Nice Sophia-Antipolis (2006-2012)

2007-2008 Participation in the postdoctoral work of S. Dueri, responsible O. Maury, IRD.

2007-2009 Participation in the postdoctoral work of C. Boulbe, responsible J. Blum, University of Nice Sophia-Antipolis.

2008-2009 Supervision with J. Blum and C. Boulbe of a M.Sc project for 1 student, University Nice Sophia-Antipolis.
Subject: *Equilibrium reconstruction in a Tokamak.*

2009-2012 Participation in the Ph.D work of G. Selig, supervisor J. Blum, University of Nice Sophia-Antipolis.

2011-2012 Participation in the postdoctoral work of H. Heumann, responsible J. Blum, University of Nice Sophia-Antipolis.

2014-2015 Supervision with S. Touati and C. Boulbe of a M.Sc. project for 4 students, University Nice Sophia-Antipolis.
Subject: *Optimization of the computation time for a plasma boundary reconstruction algorithm.*

2016-2019 Supervision (co-supervisor H. Heumann) of Xiao Song Ph.D thesis. University Nice Sophia-Antipolis.
Subject: *Model-based control-oriented scenario construction in tokamaks.*

2017 Supervision of L. Graniou 3 months research project, 2nd year (M.Sc) ENSTA.
Subject: *An optimal control numerical method for tokamak equilibrium reconstruction using the Stokes model for polarimetry.*

2021 Supervision with C. Boulbe of G. Gros 2 months project, 4th year engineering school Université Côte d'Azur UCA.
Sujet: *Machine learning for equilibrium reconstruction in a Tokamak.*

2021-... Supervision (co-supervisor R. Nouailletas CEA) of S. Kerboua-Benlarbi Ph.D thesis, UCA.
Subject: *Machine learning and control for fusion plasmas.*

2022-... Supervision (co-supervisor C. Boulbe) of G. Gros Ph.D thesis, UCA.
Subject: *Numerical simulator of Tokamak dicharges.*

2023 Supervision with A. Sangam of S Janati, 2 months Master project, UCA.
Subject: *Development et implementation of a finite difference numerical scheme for an evolution equation of electron temperature in a Tokamak plasma.*

Other scientific activities

- Organiser of a minisymposium "Simulation, Identification and Control in Tokamak Plasma Physics" at the ICIAM 2011 conference in Vancouver, Canada
- Co-organiser with C. Boulbe of a one week “Code Camp” in Nice in the frame of the european project EFDA-ITM
- Member of the scientific board of the "Problèmes Inverses: des Plasmas à l’Océanographie. PIPO’2011" conference in the honnor of Jacques Blum for his 60th birthday
- Expert referee for a PRACE project Partnership for advanced computing in Europe, on fusion, 2019
- Ph.D referee, F. Carpanese, EPFL 2020
  Development of free-boundary equilibrium and transport solvers for simulation and real-time interpretation of tokamak experiments
- Master of Science referee, A. Margarida Jorge dos Santos, Tecnico Lisbao, 2021
  Integrated modelling of the equilibrum reconstruction in tokamaks
- Expert jury panel member for permanent engineer positions (1 IE, 7 IR) at UCA, 2020
- Expert jury panel member for a permanent research engineer position at CEA, 2023
- Article reviews ($\approx$ 2 by year) for journals
  -of mathematical modeling in marine ecology (among which *Journal of Mathematical Biology*, *Applied Mathematical Modelling*)
  -of numerical simulation in Tokamak plasma physics (among which *Journal of Computer Physics, Fusion Engineering and Design*)

Publications

Journal articles

[1] B. Faugeras. On the well-posedness of a coupled one-dimensional biological-physical model for the upper ocean. *Mathematical Models and Methods in Applied Sciences* 8.13 (2003), pp. 1157–1184.

[2] B. Faugeras, M. Lévy, L. Mémery, J. Verron, J. Blum, and I. Charpentier. Can biogeochemical fluxes be recovered from nitrate and chlorophyll data? A case study assimilating data in the Northwestern Mediterranean Sea at the JGOFS-DYFAMED station. *J. Marine Systems* 40-41 (2003), pp. 99–125.

[3] B. Faugeras, O. Bernard, A. Sciandra, and M. Lévy. A mechanistic modelling and data assimilation approach to estimate the carbon/chlorophyll and carbon/nitrogen ratios in a coupled hydrodynamical-biological model. *Nonlinear Processes in Geophysics* 11.4 (2004), pp. 515–533.

[4] B. Faugeras and J. Pousin. Variational asymptotic derivation of an elastic model arising from the problem of 3D automatic segmentation of cardiac images. *Analysis and Applications (AA)* 2.4 (2004), pp. 275–307.

[5] B. Faugeras and O. Maury. A multi-region nonlinear age-size structured fish population model. *Nonlinear Analysis: Real World Appl.* 6.3 (2005), pp. 447–460.

[6] B. Faugeras and O. Maury. An advection-diffusion-reaction size-structured fish population dynamics model combined with a statistical parameter estimation procedure: Application to the Indian Ocean skipjack tuna fishery. *Math. Biosciences and Engineering* 2.4 (2005), pp. 719–741.

[7] O. Maury, B. Faugeras, and V. Restrepo. FASST: A Fully Age-Size and Space-Time structured statistical model for the assessment of tuna populations. *ICCAT Coll. Vol. Sci. Pap.* 57.1 (2005), pp. 206–217.

[8] B. Faugeras, J. Pousin, and F. Fontvieille. An efficient numerical scheme for precise time integration of a diffusion - dissolution / precipitation chemical system. *Math. of Computation* 75.253 (2006), pp. 209–222.

[9] B. Faugeras and O. Maury. Modelling fish population movements: from an individual-based representation to an advection-diffusion equation. *J. Theor. Biol.* 247 (2007), pp. 837–848.

[10] O. Maury, B. Faugeras, Y-J. Shin, J.C. Poggiale, T. Ben Ari, and F. Marsac. Modeling environmental effects on the size-structured energy flow through marine ecosystems. Part 1: the model. *Progress in Oceanography* 74 (2007), pp. 479–499.

[11] O. Maury, Y-J. Shin, B. Faugeras, T. Ben Ari, and F. Marsac. Modeling environmental effects on the size-structured energy flow through marine ecosystems. Part 2: simulations. *Progress in Oceanography* 74 (2007), pp. 500–514.

[12] C. Faugeras, B. Faugeras, M. Orlita, M. Potemski, R. R. Nair, and A. K. Geim. Thermal conductivity of graphene in Corbino membrane geometry. *ACS NANO* 4 (2010), p. 1889.

[13] A. Murari, J. Vega, D. Mazon, G.A Rattà, J. Svensson, S. Palazzo, G. Vagliasindi, P. Arena, C. Boulbe, B. Faugeras, L. Fortuna, D. Moreau, and JET-EFDA Contributors. Innovative signal processing and data analysis methods on JET for control in the perspective of next-step devices. *Nucl. Fusion* 50.5 (2010).

[14] P. Hertout, C. Boulbe, E. Nardon, J. Blum, S. Brémond, J. Bucalossi, B. Faugeras, V. Grandgirard, and P. Moreau. The CEDRES++ equilibrium code and its application to ITER, JT-60SA and Tore Supra. *Fusion Engineering and Design* 86.6-8 (2011), pp. 1045–1048.

[15] J. Blum, C. Boulbe, and B. Faugeras. Reconstruction of the equilibrium of the plasma in a Tokamak and identification of the current density profile in real time. *J. Computational Physics* 231 (2012), pp. 960–980.

[16] S. Dueri, B. Faugeras, and O. Maury. Modelling the skipjack tuna dynamics in the Indian Ocean with APECOSM-E: Part 1. Model formulation. *Ecological Modelling* 245 (2012), pp. 41–54.

[17] S. Dueri, B. Faugeras, and O. Maury. Modelling the skipjack tuna dynamics in the Indian Ocean with APECOSM-E: Part 2. Parameter estimation and sensitivity analysis. *Ecological Modelling* 245 (2012), pp. 55 –64.

[18] B. Faugeras, A. Ben Abda, J. Blum, and C. Boulbe. Minimization of an energy error functional to solve a Cauchy problem arising in plasma physics: the reconstruction of the magnetic flux in the vacuum surrounding the plasma in a Tokamak. *ARIMA* 15 (2012), pp. 37–60.

[19] G. L. Falchetto et al. The European Integrated Tokamak Modelling (ITM) effort: achievements and first physics results. *Nuclear Fusion* 54.4 (2014), p. 043018. DOI: http://dx.doi.org/10.1088/0029-5515/54/4/043018.

[20] B. Faugeras, J. Blum, C. Boulbe, P. Moreau, and E. Nardon. 2D interpolation and extrapolation of discrete magnetic measurements with toroidal harmonics for equilibrium reconstruction in a Tokamak. *Plasma Phys. Control Fusion* 56 (2014), p. 114010.

[21] H. Heumann, J. Blum, C. Boulbe, B. Faugeras, G. Selig, J.-M. Ané, S. Brémond, V. Grangirard, P. Hertout, and E. Nardon. Quasi-static free-boundary equilibrium of toroidal plasma with CEDRES++: computational methods and applications. *J. Plasma Physics* 81.3 (2015), p. 905810301. DOI: https://doi.org/10.1017/S0022377814001251.

[22] J. Urban, L.C. Appel, J.F. Artaud, B. Faugeras, J. Havlicek, M. Komm, I. Lupelli, and M. Peterka. Validation of equilibrium tools on the COMPASS tokamak. *Fusion Eng. Design* 96-97 (2015), pp. 998–1001. DOI: http://dx.doi.org/10.1016/j.fusengdes.2015.06.132.

[23] B. Faugeras. Tokamak plasma boundary reconstruction using toroidal harmonics and an optimal control method. *Fusion Sci. Tech.* 69.2 (2016), pp. 495–504.

[24] B. Faugeras, J. Blum, H. Heumann, and C. Boulbe. Optimal control of a coupled partial and ordinary differential equations system for the assimilation of polarimetry Stokes vector measurements in tokamak free-boundary equilibrium reconstruction with application to ITER. *Comput. Phys. Comm.* 217.Supplement C (2017), pp. 43 –57. ISSN: 0010-4655. DOI: https://doi.org/10.1016/j.cpc.2017.04.003.

[25] B. Faugeras and H Heumann. FEM-BEM coupling methods for Tokamak plasma axisymmetric free-boundary equilibrium computations in unbounded domains. *J. Computational Physics* 343.Supplement C (2017), pp. 201 –216. ISSN: 0021-9991. DOI: https://doi.org/10.1016/j.jcp.2017.04.047.

[26] B. Faugeras, F. Orsitto, and JET Contributors. Equilibrium reconstruction at JET using Stokes model for polarimetry. *Nuclear Fusion* 58.10 (2018), p. 106032. DOI: https://doi.org/10.1088/1741-4326/aad751.

[27] P. Moreau, A. Le-Luyer, P. Spuig, P. Malard, F. Saint-Laurent, J. F. Artaud, J. Morales, B. Faugeras, H. Heumann, B. Cantone, M. Moreau, C. Brun, R. Nouailletas, E. Nardon, B. Santraine, A. Berne, P. Kumari, and S. Belsare. The new magnetic diagnostics in the WEST tokamak. *Review of Scientific Instruments* 89.10 (2018), 10J109. DOI: 10.1063/1.5036537. eprint: https://doi.org/10.1063/1.5036537.

[28] B. Faugeras and F Orsitto. On the identification of the electron temperature profile from polarimetry Stokes vector measurements in Tokamak free-boundary equilibrium reconstruction. *Plasma Phys. Control Fusion* 61.11 (2019), p. 115002. DOI: 10.1088/1361-6587/ab411a.

[29] G Giruzzi etal. Advances in the physics studies for the JT-60SA tokamak exploitation and research plan. *Plasma Phys. Control Fusion* 62.1 (2019), p. 014009. DOI: 10.1088/1361-6587/ab4771.

[30] R. Santos, R. Coelho, P. Rodrigues, B. Faugeras, H. Fernandes, B. B. Carvalho, D. Corona, H. Figueiredo, and H. Alves. Plasma boundary reconstruction in ISTTOK using magnetic diagnostic data. *Journal of Instrumentation* 14.09 (2019), pp. C09019–C09019. DOI: 10.1088/1748-0221/14/09/c09019.

[31] X. Song, E. Nardon, H. Heumann, and B. Faugeras. Automatic identification of the plasma equilibrium operating space in tokamaks. *Fusion Eng. Design* 146 (2019). SI:SOFT-30, pp. 1242–1245. ISSN: 0920-3796. DOI: https://doi.org/10.1016/j.fusengdes.2019.02.050.

[32] B. Faugeras. An overview of the numerical methods for tokamak plasma equilibrium computation implemented in the NICE code. *Fusion Eng. Design* 160 (2020). https://hal.archives-ouvertes.fr/hal-02955053, p. 112020. DOI: 10.1016/j.fusengdes.2020.112020.

[33] A. Elarif, B. Faugeras, and F. Rapetti. Tokamak free-boundary plasma equilibrium computation using finite elements of class C0 and C1 within a mortar element approach. *J. Computational Physics* 439 (2021). , p. 110388. DOI: https://doi.org/10.1016/j.jcp.2021.110388.

[34] C. Piron, F. Felici, B. Faugeras, N. Ferron, G. Manduchi, N. Marconato, C. Meekes, L. Piron, Z. Stancar, D. Valcarcel, D. Voltolina, and M. Weiland. Development of the RAPTOR suite of codes towards real-time reconstruction of JET discharges. *Fusion Eng. Design* 169 (2021). https://doi.org/10.1016/j.fusengdes.2021.112431, p. 112431. DOI: 10.1016/j.fusengdes.2021.112431.

[35] X. Song, X.M. Song, B. Li, J. Zhou, E. Nardon, H. Heumann, B. Faugeras, J.X. Li, Sh Wang, SH.Y. Liang, J.Z. Zhang, T.F Sun, W.B Li, Zh.H. Huang, L. Liu, Z.C. Yang, H.X. Wang, X.Q. Ji, W.L. Zhong, and HL-2M Team. Plasma initiation and preliminary magnetic control in the HL-2M tokamak. *Nuclear Fusion* 61.8 (2021). https://doi.org/10.1088/1741-4326/ac09fc, p. 086010. DOI: 10.1088/1741-4326/ac09fc.

[36] B. Faugeras, J. Blum, and C. Boulbe. First equilibrium reconstruction for ITER with the code NICE. *Journal of Instrumentation* 17.02 (2022), p. C02024. DOI: 10.1088/1748-0221/17/02/c02024.

[37] J. Mailloux et al. Overview of JET results for optimising ITER operation. *Nuclear Fusion* 62.4 (2022), p. 042026. DOI: 10.1088/1741-4326/ac47b4.

[38] M Yoshida et al. Plasma physics and control studies planned in JT-60SA for ITER and DEMO operations and risk mitigation. *Plasma Physics and Controlled Fusion* 64.5 (2022), p. 054004. DOI: 10.1088/1361-6587/ac57a0.

[39] C. Boulbe, B. Faugeras, G. Gros, and F. Rapetti. Tokamak free-boundary plasma equilibrium computations in presence of non-linear materials. *J. Scientific Computing* 96:42 (2023). https://hal.sciences/hal-03423469. DOI: 10.1007/s10915-023-02265-8.

Conference proceedings and book chapters

[40] J. Blum, C. Boulbe, and B. Faugeras. "Real-time Equilibrium Reconstruction in a Tokamak". In: vol. 988. Burning Plasma Diagnostics. Varenna, Italy: AIP Conference Proceedings, 2007, pp. 420–429.

[41] J. Blum, C. Boulbe, and B. Faugeras. "Real-time plasma equilibrium reconstruction in a Tokamak". In: *Journal of Physics: Conference Series. Proceedings of the 6th International Conference on Inverse Problems in Engineering: Theory and Practice*. Vol. 135. 1. Dourdan (Paris), France: IOP Publishing, June 2008, p. 012019.

[42] D. Mazon, J. Blum, C. Boulbe, B. Faugeras, A. Boboc, M. Brix, P. De Vries, S. Sharapov, and L. Zabeo. "Real-time identification of the current density profile in the JET Tokamak: method and validation". In: *Proceedings of the 48th IEEE Conference on Decision and Control and 28th Chinese Control Conference*. Vol. WeA09.1. Shanghai, P. R. China, Dec. 2009, pp. 285–290.

[43] F. Saint-Laurent, B. Faugeras, C. Boulbe, S. Bremond, P. Moreau, and J. Blum. "Plasma position control and current profile reconstruction for tokamaks". In: *ICALEPCS Conference proceedings*. Kobe, Japan, Oct. 2009.

[44] D. Mazon, J. Blum, C. Boulbe, B. Faugeras, A. Boboc, M. Brix, P. DeVries, S. Sharapov, and L. Zabeo. EQUINOX: A Real-Time Equilibrium Code and its Validation at JET. In: *From physics to control through an emergent view*. Ed. by L. Fortuna, A. Fradkov, and M. Frasca. Vol. 15. World Scientific Book Series On Nonlinear Science, Series B. World Scientific, 2010, pp. 327–333.

[45] B. Faugeras, J. Blum, and C. Boulbe. "Equilibrium reconstruction from discrete magnetic measurements in a Tokamak". In: *Proceedings of the 6th International Conference PICOF'12*. Ecole Polytechnique, Paris, France, Apr. 2012.

[46] D. Mazon, P. Lotte, B. Faugeras, C. Boulbe, J. Blum, F. Saint-Laurent, S. Bremond, P. Moreau, A. Murari, and P. Blanchard. "Validation of the new real-time equilibrium code EQUINOX on JET and ToreSupra". In: *Proceedings of the 39th EPS Conference and 16th Int. Congress on Plasma Physics*. Stockholm, Sweden, July 2012.

[47] G. Falchetto et. al. "EUROfusion Integrated modelling (EU-IM) capabilities and selected physics applications". In: *26th IAEA Fusion Energy conference*. Kyoto, Japan, Oct. 2016.

[48] S.D. Pinches et. al. "Progress in the ITER Integrated modelling programme and the use and validation of IMAS within the ITER members". In: *26th IAEA Fusion Energy conference*. Kyoto, Japan, Oct. 2016.

[49] J. Blum, C. Boulbe, B. Faugeras, and H. Heumann. "Control Methods for the Optimization of Plasma Scenarios in a Tokamak". In: *System Modeling and Optimization: 27th IFIP TC 7 Conference, CSMO 2015, Sophia Antipolis, France, June 29 - July 3, 2015, Revised Selected Papers*. Ed. by L. Bociu, J.-A. Désidéri, and A. Habbal. Cham: Springer International Publishing, 2016, pp. 1–20. ISBN: 978-3-319-55795-3. DOI: 10.1007/978-3-319-55795-3_1.

[50] R. Coelho, B. Faugeras, E. Giovanozzi, P. McCarthy, W. Zwingmann, E.P Suchkov, F.S. Zaitsev, M Dunne, I. Lupelli, N. Hawkes, G. Szepesi, JET contributors, ASDEX Upgrade Team, and EUROfusion-IM Team. "Integrated equilibrium reconstruction and MHD stability analysis of tokamak plasmas in the EU-IM platform". In: *43rd EPS Conference on Plasma Physics*. Leuven, Belgium, July 2016.

[51] R. Coelho, W. Zwingmann, B. Faugeras, E. Giovanozzi, P. McCarthy, E.P Suchkov, F.S. Zaitsev, O Sauter, F. Carpanese, J.-M. Moret, the EUROfusion MST1 Teams, and EUROfusion-IM Team. "Equilibrium reconstruction analysis of TCV tokamak plasmas in the EU-IM platform". In: *44th EPS Conference on Plasma Physics*. Belfast, Northern Ireland, June 2017.

[52] S. Amraoui, D. Auroux, J. Blum, and B. Faugeras. "Nudging-based observers for geophysical data assimilation and joint state-parameters estimation". In: *UCA Complex Days*. https://hal.science/hal-02006637/document. Nice, France, Jan. 2018, pp. 25–34.

[53] R. Coelho, W. Zwingmann, B. Faugeras, E. Giovannozzi, P. McCarthy, E.P. Suchkov, F.S. Zaitsev, J. Hollocombe, N. Hawkes, G. Szepesi, L. Appel, S. Silburn, G. Poulipoulis, and D. Terranova. "Plasma equilibrium reconstruction of JET discharges using the IMAS modelling infrastructure". In: *27th IAEA Fusion Energy Conference IAEA-CN-258 FEC 2018*. Gandhinagar, India, Oct. 2018.

[54] P. Moreau, A. Le-Luyer, P. Spuig, P. Malard, F. Saint-Laurent, J.-F. Artaud, B. Faugeras, H Heumann, B. Cantone, M. Moreau, C. Brun, C. Gil, R. Nouilletas, E. Nardon, B. Sentraine, and S. Belsare. "The new magnetic diagnostics in the WEST tokamak". In: *22nd Topical Conference on High Temperature Plasma Diagnostics HTPD*. San Diego, California, USA, Apr. 2018.

[55] G. L. Falchetto et al. "Multi-machine analysis of EU experiments using the EUROfusion Integrated Modelling (EU-IM) framework". In: *46th EPS Conference on Plasma Physics*. Ed. by European Physical Society. Vol. 43C. Europhysics Conference Abstracts (ECA). Milan, Italy, 2019. ISBN: 979-10-96389-11-7.

[56] A. Merle, R. Coelho, F. Carpanese, S. Dixon, M. Dunne, B. Faugeras, L. Fleury, J. Hollocombe, F. Imbeaux, L. Kogan, M. Romanelli, O. Sauter, W. Zwingmann, ASDEX-Upgrade team, JET contributors, MAST team, TCV team, and EUROfusion-IM team. "Equilibrium reconstruction of discharges from EUROfusion tokamaks using the WPCD scientific workflows". In: *47th EPS Conference on Plasma Physics*. Ed. by European Physical Society. Vol. 45A. Europhysics Conference Abstracts (ECA). Milan, Italy, 2021, P2.1036. ISBN: 979-10-96389-13-1.

[57] S. Kerboua-Benlarbi, R. Nouailletas, B. Faugeras, E. Nardon, and P. Moreau. "Magnetic control of WEST plasmas through deep reinforcement learning". In: *SOFE 2023, 30th IEEE Symposium On Fusion Engineering*. Oxford, UK, 2023.

Conferences

[58] B. Faugeras, J. Blum, and J. Verron. "Estimation de paramètres dans un modèle d'écosystème marin." In: *CANUM*. Pompadour, France, 2001.

[59] B. Faugeras, M. Lévy, L. Mémery, J. Verron, J. Blum, and I. Charpentier. "Estimating the parameters of a 1D biogeochemical model to assimilate data from the DYFAMED station in the Northwestern Mediterranean Sea." In: *International Colloquium on Ocean Hydrodynamics*. Liège, Belgium, 2001.

[60] B. Faugeras, J. Blum, and J. Verron. "A direct and inverse problem in a marine ecosystem model." In: *AMAM*. Nice, France, 2003.

[61] B. Faugeras, O. Bernard, A. Sciandra, and M. Lévy. "Assessing the benefit of detailed physiological photosynthesis modelling through comparison of three coupled hydrodynamical-biological models." In: *European Geosciences Union, Geophysical Research Abstracts*. Vol. 6. Nice, France, 2004.

[62] B. Faugeras and O. Maury. "Modelling fish population movements: from an individual-based representation to an advection-diffusion equation." In: *1st CLIOTOP Symposium*. La Paz, Mexico, Dec. 2007.

[63] O. Maury, O. Aumont, V. Koné, and B. Faugeras. "Size-structured energy fluxes through the oceanic pelagic ecosystem: seasonal, interannual and decadal variability in the three oceans." In: *1st CLIOTOP Symposium*. La Paz, Mexico, Dec. 2007.

[64] O. Maury, B. Faugeras, A. Nielsen, M. Musyl, J. Gunn, J.Hampton, J.-C. Poggiale, and J. Sibert. "Mechanistic modelling of bigeye tuna vertical movements in an ecosystem context: a state-space approach using the unscented Kalman filter." In: *1st CLIOTOP Symposium*. La Paz, Mexico, Dec. 2007.

[65] J. Blum, C. Boulbe, and B. Faugeras. "Reconstruction of equilibrium configurations in Tokamaks." In: *NMCF'09 Numerical Flow Models for Controlled Fusion*. Porquerolles, France, Apr. 2009.

[66] D. Mazon, J. Blum, C. Boulbe, B. Faugeras, A. Boboc, M. Brix, P. DeVries, S. Sharapov, and L. Zabeo. "EQUINOX: A Real-Time Equilibrium Code and its Validation at JET". In: *4th International Scientific Conference on Physics and Control*. Catania, Italy, Sept. 2009.

[67] A. Murari, J. Vega, D. Mazon, G.A Rattà, J. Svensson, G. Vagliasindi, J. Blum, C. Boulbe, B. Faugeras, and JET-EFDA Contributors. "New Information Processing Methods for Control in Fusion". In: *7th IAEA Technical Meeting on control, Data Acquisition and Remote Participation for Fusion Research*. Aix en Provence, France, June 2009.

[68] S. Dueri, O. Maury, and B. Faugeras. "Modélisation numérique de la dynamique spatiale de la population de thons listao dans l'océan Indien : estimation de paramètres à l'aide de données de pêche". In: *1er Colloque National d'Ecologie Scientifique*. Montpellier, France, Sept. 2010.

[69] C. Boulbe, J. Blum, B. Faugeras, S. Bremond, E. Nardon, and G. Selig. "New developments on the free boundary equilibrium code CEDRES++ for plasma control". In: *ICIAM 2011 – 7th International Congress on Industrial and Applied Mathematics*. Vancouver, BC, Canada, July 2011.

[70] B. Faugeras, J. Blum, and C. Boulbe. "Identification of the current density profile in a Tokamak". In: *ICIAM 2011 – 7th International Congress on Industrial and Applied Mathematics*. Vancouver, BC, Canada, July 2011.

[71] J. Blum, C. Boulbe, and B. Faugeras. "Real time reconstruction of the equilibrium of the plasma in a tokamak and identification of the current density with the EQUINOX code". In: *7th Workshop on Fusion Data Processing Validation and Analysis*. Frascati, Roma, Italy, Mar. 2012.

[72] J. Blum, C. Boulbe, and B. Faugeras. "Some mathematical and numerical results for the identifiaility of the current density profile from experimental measurements". In: *EFDA Workshop on Equilibrium Reconstruction*. JET, Culham, UK, Nov. 2012.

[73] B. Faugeras, J. Blum, and C. Boulbe. "Numerical methods for the real time equilibrium reconstruction code EQUINOX". In: *EFDA Workshop on Equilibrium Reconstruction*. JET, Culham, UK, Nov. 2012.

[74] D. Mazon, B. Faugeras, C. Boulbe, and al. "Validation of EQUINOX at JET". In: *EFDA Workshop on Equilibrium Reconstruction*. JET, Culham, UK, Nov. 2012.

[75] D. Mazon, B. Faugeras, C. Boulbe, J. Blum, and A. Murari. "Procedure and results of the validation of the real time EQUINOX code on JET". In: *7th Workshop on Fusion Data Processing Validation and Analysis*. Frascati, Roma, Itlay, Mar. 2012.

[76] J. Blum, C. Boulbe, and B. Faugeras. "Equilibrium reconstruction from discrete magnetic measurements in a tokamak: the Equinox code". In: *8th Workshop on Fusion Data Processing, Validation and Analysis*. Ghent, Belgium, Nov. 2013.

[77] J. Urban, L.C. Appel, J.F. Artaud, B. Faugeras, J. Havlicek, M. Komm, I. Lupelli, and M. Peterka. "Validation of equilibrium tools on the COMPASS tokamak". In: *SOFT 2014*. San Sebastian, Spain, Sept. 2014.

[78] J. Blum, C. Boulbe, and B. Faugeras. "EQUINOX: a real-time identification code of the plasma current density from experimental measurements". In: *First IAEA Technical Meeting on Fusion Data Processing, Validation and Analysis*. Nice, France, June 2015.

[79] B. Faugeras, J. Blum, and C. Boulbe. "Tokamak plasma boundary reconstruction using toroidal harmonics and an optimal control method". In: *First IAEA Technical Meeting on Fusion Data Processing, Validation and Analysis*. Nice, France, June 2015.

[80] B. Faugeras. "Assimilation of polarimetry Stokes vector measurements in tokamak free-boundary equilibrium reconstruction with application to ITER". In: *2nd IAEA Technical Meeting on Fusion Data Processing, Validation and Analysis*. Cambridge, MA, USA, June 2017.

[81] X. Song, E. Nardon, H. Heumann, and B. Faugeras. "Automatic identification of the plasma equilibrium operating space in tokamaks". In: *SOFT, 30th Symposium On Fusion Technology*. Giardini Naxos, Sicily, Italy, Sept. 2018.

[82] L. Fleury, H. Ancher, J.F. Artaud, B. Faugeras, M. Geynet, F. Hollocombe, F. Imbeaux, P. Maini, and J. Morales. "WEST plasma reconstruction chain and IMAS related tools". In: *SOFT 2020*. Croatia, Sept. 2020.

[83] C. Piron, F. Felici, B. Faugeras, N. Ferron, G. Manduchi, N. Marconato, C. Meekes, L. Piron, Z. Stancar, D. Valcarcel, D. Voltolina, and M. Weiland. "Development of the RAPTOR suite of codes towards real-time reconstruction of JET discharges". In: *SOFT 2020*. Croatia, Sept. 2020.

[84] J. Blum, C. Boulbe, and B. Faugeras. "First equilibrium reconstruction for ITER with the code NICE". In: *International Conference on Fusion Reactor Diagnostics - ICFRD2021*. Varenna, Italy, 2021.

[85] F. Rapetti, B. Faugeras, and C. Boulbe. "High-order finite elements in tokamak free-boundary plasma equilibrium computations". In: *ICOSAHOM 2020(2021) International Conference on Spectral and High Order Methods*. Vienna, Austria, 2021.

[86] J. Blum, C. Boulbe, and B. Faugeras. "Identification of the plasma current density in a Tokamak". In: *ECCOMAS 2022, 8th European Congress on Computational Methods in Applied Sciences and Engineering*. Oslo, Norway, 2022.

[87] J. Blum, C. Boulbe, and B. Faugeras. "Identification of the plasma current density in a Tokamak". In: *Math 2 Product Conference (M2P) 2023*. Taormina, Sicily, Italy, 2023.

[88] J. Blum, C. Boulbe, B. Faugeras, and G. Gros. "Real-time plasma equilibrium reconstruction in a Tokamak". In: *ICCDPS-4, 4th International Conference on Data Driven Plasma Sciences*. Okinawa, Japan, 2023.

[89] G. Gros, C. Boulbe, and B. Faugeras. "Equilibrium reconstruction in Tokamaks using neural networks". In: *Math 2 Product Conference (M2P) 2023*. Taormina, Sicily, Italy, 2023.

Other communications

[90] B. Faugeras. *Estimation de paramètres dans un modèle d'écosystème marin.* LMC-IMAG, Grenoble, June 2001.

[91] B. Faugeras. *Estimation de paramètres dans un modèle d'écosystème marin.* LAMA, Université de Savoie, Chambéry, Nov. 2002.

[92] B. Faugeras. *Estimation de paramètres dans un modèle d'écosystème marin.* Université de Lyon, Dec. 2002.

[93] B. Faugeras. *Estimation de paramètres dans un modèle d'écosystème marin.* INRIA Sophia Antipolis, Oct. 2003.

[94] B. Faugeras. “Estimation de paramètres dans un modèle d’écosystème marin.” In: *Journée PROOF sur la modélisation de biogéochimie*. IPSL Jussieu, June 2003.

[95] B. Faugeras. *Modélisation par des EDP et identification de paramètres en dynamique des populations marines exploitées*. Sète, Oct. 2004.

[96] B. Faugeras. *Modélisation par des EDP et identification de paramètres en dynamique des populations marines exploitées*. IRD, Bondy, Mar. 2005.

[97] B. Faugeras. “Modelling fish population movements: from an individual-based representation to an advection-diffusion equation.” In: *2ièmes journées INRA-IRD Mathématiques pour les Ressources Renouvelables*. Montpellier, France, Mar. 2007.

[98] J. Blum, C. Boulbe, and B. Faugeras. “Identification en temps réel de l’équilibre du plasma dans un Tokamak.” In: *Workshop ITER: aspects plasmas et matériaux*. Lab. J.-L. Lions, Paris, France, May 2008.

[99] J. Blum, C. Boulbe, and B. Faugeras. “Identification en temps réel du profil de courant par le code EQUINOX.” In: *Colloque inaugural de la Fédération de Recherche Fusion Magnétique*. Ecole Polytechnique, Palaiseau, France, Apr. 2008.

[100] J. Blum, C. Boulbe, B. Faugeras, S. Bremond, D. Mazon, P. Moreau, and F. Saint-Laurent. “Reconstruction en temps réel de la configuration d’équilibre MHD: identification du profil de courant et du facteur de sécurité à partir de mesures magnétiques et polarimétriques combinées”. In: *Journée de la Fédération de Recherche sur la Fusion Magnétique*. Cadarache, France, May 2009.

[101] J. Blum, C. Boulbe, B. Faugeras, A. Sangam, J.-F. Artaud, V. Basiuk, S. Bremond, P. Hertout, and G. Selig. “Développement et intégration sur la plate-forme ITM d’un code d’équilibre MHD à frontière libre et couplage avec un code de transport pour l’optimisation de scenario de plasma: couplage Cedres++ et Cronos”. In: *Journée de la Fédération de Recherche sur la Fusion Magnétique*. Cadarache, France, May 2009.

[102] B. Faugeras, J. Blum, and C. Boulbe. *Identification de l’équilibre du plasma dans un tokamak en temps réel*. INRIA Sophia Antipolis, France, Apr. 2009.

[103] B. Faugeras, J. Blum, and C. Boulbe. *Identification de l’équilibre du plasma dans un tokamak en temps réel*. INRIA Sophia Antipolis, France, Jan. 2009.

[104] J. Blum, C. Boulbe, and B. Faugeras. “Real time equilibrium reconstruction with the code Equinox.” In: *IRFM meeting on Tokamak Control*. CEA, Cadarache, France, Mar. 2010.

[105] B. Faugeras, J. Blum, and C. Boulbe. “Reconstruction of the equilibrium of the plasma in a tokamak and identification of the current density profile in real time. EQUINOX”. In: *GT Plasma*. Université de Nice Sophia Antipolis, Mar. 2012.

[106] J. Blum, C. Boulbe, and B. Faugeras. “An inverse problem: the identification of the plasma current density profile in a Tokamak”. In: *Applied Analysis for the Material Sciences with a special hommage to Michael Vogelius on the occasion of his 60th Birthday*. Marseille, France, May 2013.

[107] B. Faugeras. “2D interpolation and extrapolation of discrete magnetic measurements for equilibrium reconstruction in a Tokamak”. In: *Journée Diagnostiques magnétiques pour le Tokamak WEST*. CEA, Cadarache, June 2013.

[108] B. Faugeras. “Tokamak plasma boundary reconstruction using toroidal harmonics and an optimal control method”. In: *IPL FRATRES 1st meeting*. INRIA Sophia Antipolis, France, Oct. 2015.

[109] B. Faugeras. “An overview of the code NICE”. In: *ANR SISTEM meeting*. UCA France, 2020.

Ph.D and Habilitation thesis

[110] B. Faugeras. *Assimilation variationnelle de données dans un modèle couplé océan-biogéochimie*. http://hal.archives-ouvertes.fr/tel-00002176/. Thèse de Doctorat. Université Joseph Fourier Grenoble I, 2002.

[111] B. Faugeras. *Modélisation, simulation numérique et problèmes inverses. Contributions en physique des plasmas de Tokamak, en écologie marine et autres travaux*. https://hal.archives-ouvertes.fr/tel-01227694/document. Habilitation à Diriger des Recherches. Université de Nice Sophia-Antipolis, 2015.

Research reports

[112] B. Faugeras. *Diffuse interface formulations for region based active contour image segmentation*. Rapport de recherche ISRN I3S/RR-2006-33-FR. Laboratoire I3S, Sophia-Antipolis, France: CNRS, Aug. 2006.

[113] F. Imbeaux, T. Aniel, B. Faugeras, P. Moreau, and E. Nardon. *Tokamak-generic equilibrium identification and profile reconstruction*. Rapport CEA. CEA, Cadarache, Fance: CEA-IRFM, 2014.

[114] B. Faugeras, J. Blum, H. Heumann, and C. Boulbe. *Optimal control of a coupled partial and ordinary differential equations system for the assimilation of polarimetry Stokes vector measurements in tokamak free-boundary equilibrium reconstruction with application to ITER*. INRIA Research Report RR-9014. INRIA CASTOR, Université Côte d'Azur, Laboratoire Jean Alexandre Dieudonné, Jan. 2017.

[115] B. Faugeras and H. Heumann. *FEM-BEM coupling methods for tokamak plasma axisymmetric free-boundary equilibrium computations in unbounded domains*. Research Report RR-9016. INRIA Sophia Antipolis - Méditerranée ; CASTOR, 2017.

[116] B. Faugeras and F. Orsitto. *Equilibrium reconstruction at JET using Stokes model for polarimetry*. INRIA Research Report RR-9153. INRIA CASTOR, Université Côte d'Azur, Laboratoire Jean Alexandre Dieudonné, Feb. 2018.

[117] A. Elarif, B. Faugeras, and F. Rapetti. *Tokamak free-boundary plasma equilibrium computation using finite elements of class C0 and C1 within a mortar element approach*. Research Report RR-9364. https://hal.archives-ouvertes.fr/hal-02955007. INRIA, Oct. 2020.

[118] B. Faugeras. *An overview of the numerical methods for tokamak plasma equilibrium computation implemented in the NICE code*. Research Report RR-9347. https://hal.archives-ouvertes.fr/hal-02734719. INRIA, 2020.