Théophile Chaumont-Frelet

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Research interests

Partial differential equations	High performance computing
Numerical analysis	Wave propagation
Finite element methods	Geophysics
A posteriori error analysis	Electromagnetism

Professional history

Since 2018:	**Junior researcher**	Inria project-team Atlantis
	Sophia-Antipolis, France	
2018 - 2018:	**Postdoctoral fellow**	CERMICS
	Paris, France	
	Supervision: Alexandre Ern, Virginie Ehrlacher and Anthony Nouy	
2016 - 2018:	**Postdoctoral fellow**	Basque Center for Applied Mathematics
	Bilbao, Spain	
	Supervision: David Pardo	
2012 - 2015:	**PhD Student**	INSA Rouen and Inria project-team Magique3D
	Rouen, France	
	Supervision: Christian Gout and Hélène Barucq	

Education

2007 - 2012:	**Engineering degree**	Insa Rouen
	Rouen, France	
2011 - 2012:	**Master's degree**	University of Rouen
	Rouen, France	

Training experience

Since 2022:	**Ph.D. thesis**	of Florentin Proust
2021 - 2022:	**Postdoctoral appointement**	of Josselin Defrance
2019 - 2021:	**Postdoctoral appointement**	of Patrick Vega
2019 - 2022:	**Ph.D. thesis**	of Zakaria Kassali

Project management

2021 - 2025:	**Inria exploratory action**	[POPEG]
	Propagation d'Ondes Par États Gaussiens	
2019 - 2023:	**MATH-AmSud**	[EOLIS]
	Efficient offline strategies for multi-query problems	

Event organization

2022:	**Conference**	[Singular days]
	in Nice	
	<u>with</u>: Maxime Ingremeau	
2022:	**Conference**	[Recontre JCJC ondes]
	in Inria Université Côte d'Azur	
	<u>with</u>: Marcella Bonazzoli, Jérémy Heleine and Pierre Marchand	
2022:	**Minisymposium**	at [Eccomas congress 2022]
	Robust and scalable numerical methods for wave propagation: design, analysis and application	
	<u>with</u>: Hélène Barucq, Rabia Djelouli and Axel Modave	
2022:	**Minisymposium**	at [Conference on Mathematics of Wave Phenomena]
	Discretization methods for indefinite wave propagation problems	
	<u>with</u>: Markus Melenk	
2021:	**Minisymposium**	at [ICOSAHOM2020]
	High-order face-based discretization methods	
	<u>with</u>: Alexandre Ern and Simon Lemaire	
2020:	**Conference**	[Recontre JCJC ondes]
	online	
	<u>with</u>: Marcella Bonazzoli, Axel Modave and Bertrand Thierry	

Editorial activities

Associate Editor for [Examples & Counterexamples]

Guest editor for [Geosciences]:
Special issue "Petroleum Engineering Applications: Borehole Simulations"

Reviewer for the journals:
[Math. Comp.]; [SIAM J. Numer. Anal.]; [SIAM J. Sci. Comput.]; [Found. Comput. Math.];
[ESAIM Math. Model. Numer. Anal.]; [IMA J. Numer. Anal.]; [Calcolo];
[Comput. Geosci.]; [Geophys. J. Int.]

Publications

[1] T. Chaumont-Frelet, M.J. Grote, S. Lanteri, and J.H. Tang. *A controllability method for Maxwell's equations*. SIAM J. Sci. Comput. **44** (2022), no. 6, A3700–A3727.
preprint: hal-03250886. doi: 10.1137/21M1424445.

[2] T. Chaumont-Frelet and S. Nicaise. *An analysis of high-frequency Helmholtz problems in domains with conical points and their finite element discretisation*. Comput. Meth. Appl. Math. (2022).
preprint: hal-04001691. doi: 10.1515/cmam-2022-0126.

[3] T. Chaumont-Frelet and P. Vega. *Frequency-explicit a posteriori error estimates for finite element discretizations of Maxwell's equations*. SIAM J. Numer. Anal. **60** (2022), no. 4, 774–1798.
preprint: hal-02943386. doi: 10.1137/21M1421805.

[4] T. Chaumont-Frelet and P. Vega. *Frequency-explicit approximability estimates for time-harmonic Maxwell's equations*. Calcolo **59** (2022), article number: 22.
preprint: hal-03221188. doi: 10.1007/s10092-022-00464-7.

[5] T. Chaumont-Frelet, A. Ern, and M. Vohralík. *Stable broken $H(curl)$ polynomial extensions and p-robust a posteriori error estimates by broken patchwise equilibration for the curl–curl problem*. Math. Comp. **91** (2022), 37–74.
preprint: hal-02644173. doi: 10.1090/mcom/3673.

[6] T. Chaumont-Frelet, D. Gallistl, S. Nicaise, and J. Tomezyk. *Wavenumber explicit convergence analysis for finite element discretizations of time-harmonic wave propagation problems with perfectly matched layers*. Commun. Math. Sci. **20** (2022), no. 1, 1–52.
preprint: hal-01887267. doi: 10.4310/CMS.2022.v20.n1.a1.

[7] T. Chaumont-Frelet, A. Ern, S. Lemaire, and F. Valentin. *Bridging the multiscale hybrid-mixed and multiscale hybrid high-order methods*. ESAIM Math. Model. Numer. Anal. **56** (2022), no. 1, 261–285.
preprint: hal-03235525. doi: 10.1051/m2an/2021082.

[8] T. Chaumont-Frelet, S. Lanteri, and P. Vega. *A posteriori error estimates for finite element discretizations of time-harmonic Maxwell's equations coupled with a non-local hydrodynamic Drude model*. Comput. Meth. Appl. Engrg. **385** (2021), 114002.
preprint: hal-03164225. doi: 10.1016/j.cma.2021.114002.

[9] T. Chaumont-Frelet and M. Vohralík. *Equivalence of local-best and global-best approximations in $H(curl)$*. Calcolo **58** (2021).
preprint: hal-02736200. doi: 10.1007/s10092-021-00430-9.

[10] T. Chaumont-Frelet, A. Ern, and M. Vohralík. *On the derivation of guaranteed and p-robust a posteriori error estimates for the Helmholtz equation*. Numer. Math. **148** (2021), 525–573.
preprint: hal-02202233. doi: 10.1007/s00211-021-01192-w.

[11] T. Chaumont-Frelet and B. Verfürth. *A generalized finite element method for problems with sign-changing coefficients*. ESAIM Math. Model. Numer. Anal. **55** (2021), no. 3, 939–967.
preprint: hal-02496832. doi: 10.1051/m2an/2021007.

[12] T. Chaumont-Frelet, A. Ern, and M. Vohralík. *Polynomial-degree-robust $H(curl)$-stability of discrete minimization in a tetrahedron*. C. R. Math. Acad. Sci. Paris **358** (2020), no. 9–10, 1101–1110.
preprint: hal-02631319. doi: 10.5802/crmath.133.

[13] V. Darrigrand, D. Pardo, T. Chaumont-Frelet, I. Gomez-Revuelto, and L.E. Garcia-Castillo. *A painless automatic hp-adatptive strategy for elliptic probems*. Finite Elem. Anal. Des. **178** (2020), 103424.
preprint: hal-02071427. doi: 10.1016/j.finel.2020.103424.

[14] T. Chaumont-Frelet and F. Valentin. *A multiscale hybrid-mixed method for the Helmholtz equation in heterogeneous domains*. SIAM J. Numer. Anal. **58** (2020), no. 2, 1029–1067.
preprint: hal-01698914. doi: 10.1137/19M1255616.

[15] T. Chaumont-Frelet, S. Nicaise, and J. Tomezyk. *Uniform a priori estimates for elliptic problems with impedance boundary conditions*. Comm. Pure Appl. Anal. **19** (2020), no. 5, 2445–2471.
preprint: hal-01887269. doi: 10.3934/cpaa.2020107.

[16] T. Chaumont-Frelet and S. Nicaise. *Wavenumber explicit convergence analysis for finite element discretizations of general wave propagation problems*. IMA J. Numer. Anal. **40** (2020), 1503–1543.
preprint: hal-01685388. doi: 10.1093/imanum/drz020.

[17] T. Chaumont-Frelet. *Mixed finite element discretizations of acoustic Helmholtz problems with high wavenumbers*. Calcolo **56** (2019), no. 49.
preprint: hal-02197891. doi: 10.1007/s10092-019-0346-z.

[18] T. Chaumont-Frelet, M. Shahriari, and D. Pardo. *Adjoint-based formulation for computing derivaties with respect to bed boundary positions in resistivity geophysics*. Comput. Geosci. **23** (2019), 583–594.
preprint: hal-01790697. doi: 10.1007/s10596-019-9808-2.

[19] T. Chaumont-Frelet and S. Nicaise. *High-frequency behaviour of corner singularities in Helmholtz problems*. ESAIM Math. Model. Numer. Anal. **5** (2018), 1803–1845.
preprint: hal-01706415. doi: 10.1051/m2an/2018031.

[20] T. Chaumont-Frelet, D. Pardo, and Á. Rodríguez-Rozas. *Finite element simulations of logging-while-drilling and extra-deep azimuthal resistivity measurements using non-fitting grids*. Comput. Geosci. **22** (2018), 1161–1174.
preprint: hal-01706455. doi: 10.1007/s10596-018-9744-6.

[21] T. Chaumont-Frelet, S. Nicaise, and D. Pardo. *Finite element approximation of electromagnetic fields using nonfitting meshes for Geophysics*. SIAM J. Numer. Anal. **56** (2018), no. 4, 2288–2321.
preprint: hal-01706452. doi: 10.1137/16m1105566.

[22] H. Barucq, T. Chaumont-Frelet, and C. Gout. *Stability analysis of heterogeneous Helmholtz problems and finite element solution based on propagation media approximation*. Math. Comp. **86** (2017), no. 307, 2129–2157.
preprint: hal-01408934. doi: 10.1090/mcom/3165.

[23] T. Chaumont-Frelet. *On high order methods for the heterogeneous Helmholtz equation*. Comp. Math. Appl. **72** (2016), 2203–2225.
preprint: hal-01408943. doi: 10.1016/j.camwa.2016.08.026.

[24] H. Barucq, T. Chaumont-Frelet, J. Diaz, and V. Péron. *Upscaling for the Laplace problem using a discontinuous Galerkin method*. J. Comput. Appl. Math. **240** (2013), 192–203.
preprint: hal-00757098. doi: 10.1016/j.cam.2012.05.025.

Prepublications

[25] T. Chaumont-Frelet, A. Moiola, and E. Spence. *Explicit bounds for the high-frequency time-harmonic Maxwell equations in heterogeneous media.*
preprint: hal-04001866.

[26] A. Modave and T. Chaumont-Frelet. *A hybridizable discontinuous Galerkin method with characteristic variables for Helmholtz problems.*
preprint: hal-03909368.

[27] T. Chaumont-Frelet, D. Paredes, and F. Valentin. *Flux approximation on unfitted meshes and application to multiscale hybrid-mixed methods.*
preprint: hal-03834748.

[28] M. Bernkopf, T. Chaumont-Frelet, and J.M. Melenk. *Wavenumber-explicit stability and convergence analysis of hp finite element discretizations of Helmholtz problems in piecewise smooth media.*
preprint: hal-03771988.

[29] T. Chaumont-Frelet. *Duality analysis of interior penalty discontinuous Galerkin methods under minimal regularity and application to the a priori and a posteriori error analysis of Helmholtz problems.*
preprint: hal-03765207.

[30] T. Chaumont-Frelet, V. Dolean, and M. Ingremeau. *Efficient approximation of high-frequency Helmholtz solutions by Gaussian coherent states.*
preprint: hal-03747290.

[31] T. Chaumont-Frelet and M. Ingremeau. *Decay of coefficients and approximation rates in Gabor Gaussian frames.*
preprint: hal-03746979.

[32] T. Chaumont-Frelet and M. Vohralík. *A stable local commuting projector and optimal hp approximation estimates in $H(curl)$.*
preprint: hal-03817302.

[33] T. Chaumont-Frelet and M. Vohralík. *Constrained and unconstrained stable discrete minimizations for p-robust local reconstructions in vertex patches in the De Rham complex.*
preprint: hal-03749682.

[34] T. Chaumont-Frelet and P. Vega. *Frequency-explicit a posteriori error estimates for discontinuous Galerkin discretizations of Maxwell's equations.*
preprint: hal-03744230.

[35] T. Chaumont-Frelet. *Asymptotically constant-free and polynomial-degree-robust a posteriori estimates for space discretizations of the wave equation.*
preprint: hal-03632468.

[36] T. Chaumont-Frelet and E. Spence. *Scattering by finely-layered obstacles: frequency-explicit bounds and homogenization.*
preprint: hal-03354770.

[37] T. Chaumont-Frelet. *A simple equilibration procedure leading to polynomial-degree-robust a posteriori error estimators for the curl-curl problem.*
preprint: hal-03323859.

[38] T. Chaumont-Frelet and M. Vohralík. *p-robust equilibrated flux reconstruction in H(curl) based on local minimizations. Application to a posteriori analysis of the curl-curl problem.* preprint: hal-03227570.

[39] G. Nehmetallah, T. Chaumont-Frelet, S. Descombes, and S. Lanteri. *A postprocessing technique for a discontinuous Galerkin discretization of time-dependent Maxwell's equations.* preprint: hal-02956882.