

# Théophile Chaumont-Frelet

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[theophile.chaumont@inria.fr](mailto:theophile.chaumont@inria.fr)

(+33) 6 48 10 80 60

47 boulevard Gambetta, 06000 Nice, France

[tchaumont.github.io](https://tchaumont.github.io)



## Research interests

Partial differential equations

Numerical analysis

Finite element methods

Multiscale methods

High performance computing

Wave propagation

Geophysics

Electromagnetism

## Professional history

Since 2018: **Junior researcher**  
Sophia-Antipolis, France

Inria project-team Atlantis

2018 - 2018: **Postdoctoral fellow**  
Paris, France  
Supervision: Alexandre Ern, Virginie Ehrlacher and Anthony Nouy

CERMICS

2016 - 2018: **Postdoctoral fellow**  
Bilbao, Spain  
Supervision: David Pardo

Basque Center for Applied Mathematics

2012 - 2015: **PhD Student**  
Rouen, France  
Supervision: Christian Gout and Hélène Barucq

INSA Rouen and Inria project-team Magique3D

## Education

2007 - 2012: **Engineering degree**  
Rouen, France

Insa Rouen

2011 - 2012: **Master's degree**  
Rouen, France

University of Rouen

## Publications

- [1] 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](#).
- [2] 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](#).
- [3] T. Chaumont-Frelet, A. Ern, and M. Vohralík. *Stable broken  $H(\text{curl})$  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](#).
- [4] 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](#).
- [5] 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](#).
- [6] 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** (2021), no. 1, 261–285.  
preprint: [hal-03235525](#). doi: [10.1051/m2an/2021082](#).
- [7] T. Chaumont-Frelet and M. Vohralík. *Equivalence of local-best and global-best approximations in  $H(\text{curl})$* . Calcolo **58** (2021).  
preprint: [hal-02736200](#). doi: [10.1007/s10092-021-00430-9](#).
- [8] 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](#).
- [9] 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](#).
- [10] T. Chaumont-Frelet, A. Ern, and M. Vohralík. *Polynomial-degree-robust  $H(\text{curl})$ -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](#).
- [11] V. Darrigrand, D. Pardo, T. Chaumont-Frelet, I. Gomez-Revuelto, and L.E. Garcia-Castillo. *A painless automatic hp-adaptive strategy for elliptic problems*. Finite Elem. Anal. Des. **178** (2020), 103424.  
preprint: [hal-02071427](#). doi: [10.1016/j.finel.2020.103424](#).
- [12] 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](#).

- [13] 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](#).
- [14] 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](#).
- [15] 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](#).
- [16] T. Chaumont-Frelet, M. Shahriari, and D. Pardo. *Adjoint-based formulation for computing derivatives 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](#).
- [17] 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](#).
- [18] 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](#).
- [19] 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](#).
- [20] 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](#).
- [21] 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](#).
- [22] 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

- [23] T. Chaumont-Frelet, V. Dolean, and M. Ingremau. *Efficient approximation of high-frequency Helmholtz solutions by Gaussian coherent states*. preprint: [hal-03747290](#).
- [24] T. Chaumont-Frelet and M. Ingremau. *Decay of coefficients and approximation rates in Gabor Gaussian frames*. preprint: [hal-03746979](#).
- [25] 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](#).

- [26] T. Chaumont-Frelet and P. Vega. *Frequency-explicit a posteriori error estimates for discontinuous Galerkin discretizations of Maxwell's equations*.  
preprint: [hal-03744230](#).
- [27] T. Chaumont-Frelet. *Asymptotically constant-free and polynomial-degree-robust a posteriori estimates for space discretizations of the wave equation*.  
preprint: [hal-03632468](#).
- [28] T. Chaumont-Frelet and E. Spence. *Scattering by finely-layered obstacles: frequency-explicit bounds and homogenization*.  
preprint: [hal-03354770](#).
- [29] T. Chaumont-Frelet. *A simple equilibration procedure leading to polynomial-degree-robust a posteriori error estimators for the curl-curl problem*.  
preprint: [hal-03323859](#).
- [30] T. Chaumont-Frelet, M.J. Grote, S. Lanteri, and J.H. Tang. *A controllability method for Maxwell's equations*.  
preprint: [hal-03250886](#).
- [31] 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](#).
- [32] T. Chaumont-Frelet and M. Vohralík. *p-robust equilibrated flux reconstruction in  $H(\text{curl})$  based on local minimizations. Application to a posteriori analysis of the curl-curl problem*.  
preprint: [hal-03227570](#).

<b>Editorial activities</b>
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**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.; ESAIM Math. Model. Numer. Anal.; Comput. Geosci.; Comput. Math. Appl.; Math. Meth. Appl. Sci.; Geophys. J. Int.;