

Nestor G. Cerpa

French, 32 years

CONTACT INFORMATION

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RESEARCH INTERESTS

Topics : **Geodynamics, Subduction dynamics, Fluid-mantle coupled dynamics, Numerical modeling.**

I am interested in understanding thermo-chemical-mechanical processes in subduction zones and in mid-ocean ridges using and developing computational tools. My PhD project focused on developing a new method to model the lithosphere/mantle mechanical interaction in subduction zones that allowed the investigation of the role of deep slab dynamics on overriding plate tectonics. As a post-doctoral researcher, I became interested in fluids/mantle two-phase flow coupled dynamics. I have investigated the mechanisms that control the migration of slab-derived fluids through the mantle wedge of subduction zones. I also studied the impact of sea-level variations during glacial cycles on mid-ocean ridge magmatism.

PROFESSIONAL EXPERIENCE

2018 - Now : **Postdoctoral Fellow**, University Montpellier, France
2017 - 2018 : **Postdoctoral Research Assistant**, University of Oxford, UK
2015 - 2017 : **Postdoctoral Research Associate**, University of Minnesota, USA
2014 - 2015 : **A.T.E.R (Temporary Teaching and Research Associate)**, University of Nice-Sophia Antipolis, France.

EDUCATION

Geoazur, University of Nice-Sophia Antipolis, Nice, France.
PhD, **Geodynamic Numerical Modeling**, 2015,
Three-dimensional Lithosphere-Asthenosphere interaction in subduction zones. Relation between deep processes and surface deformation.
Advisors: Hassani, R. & Gerbault, M.
University of Montpellier II, Montpellier, France.
M.S., **Mechanics**, 2011,
University of Nantes, Nantes, France.
B.S., **Physics**, 2008.

PUBLICATIONS

- [6] **Cerpa, N. G.**, Wada, I., & Wilson, C (2019). Effects of fluid influx, fluid viscosity, and fluid density on fluid migration in the mantle wedge and their implications for hydrous melting, *Geosphere, Themed issue: Subduction Top to Bottom 2*.
- [5] **Cerpa, N. G.**, Guillaume, B & Martinod, J. (2018). The interplay between overriding plate kinematics, slab dip, and tectonics, *Geophys. J. Int.*
- [4] Guillaume, B., Hertgen, S., Martinod, J., & **Cerpa, N. G.** (2018). Slab dip, surface tectonics: How and when do they change following an acceleration/slow down of the overriding plate, *Tectonophysics*.
- [3] **Cerpa, N. G.**, Wada, I., & Wilson, C. (2017). Fluid migration in the mantle wedge : influence of mineral grain size and mantle compaction, *J. Geophys. Res. : Solid Earth*.
- [2] **Cerpa, N. G.**, Araya, R., Gerbault, M., & Hassani, R. (2015). Relationship between slab dip and topography segmentation in an oblique subduction zone : insights from numerical modeling, *Geophys. Res. Lett.*
- [1] **Cerpa, N. G.**, Hassani, R., Gerbault, M., Prevost, J.-H. (2014). A fictitious domain method for lithosphere/asthenosphere interaction : Application to periodic slab folding in the upper mantle, *Geochem., Geophys., Geosyst.*

MANUSCRIPTS
UNDER REVIEW/IN
PREPARATION

Cerpa, N. G., Rees Jones, D., & Katz, R. F., (*to be submitted to EPSL*). Consequences of sea-level variations during glacial cycles on magmatism and carbon transport at mid-ocean ridges.
Turner, S. J., Langmuir, C., **Cerpa, N. G.**, & Smythe, D. (*to be submitted to Geochem., Geophys., Geosyst.*). Towards an internally consistent geochemical framework for subduction zones volcanism.

INVITED TALKS

Possible causes and consequences of variations in slab dip: insights from numerical modeling
University of Nice – Géoazur, France, Nov. 2018.
Possible causes and consequences of variations in slab dip: insights from numerical modeling
University of Grenoble-Alpes – ISTerre, France, Nov. 2018.
Physical factors that control fluid migration pathways in the mantle wedge
Imperial College of London – Department of Earth Sciences, UK, Jul. 2018.
Numerical modeling of lithosphere / asthenosphere mechanical interactions in subduction zones
University of Montpellier – Géosciences Montpellier, France, Nov. 2016.
A fictitious domain method for fluid/solid coupling : application to the plates/mantle interaction in the upper mantle. *Summer school: Numerical Modeling in Earth Sciences*
University of Concepcion – Department of Geology, Chile, Jan. 2015.

ORAL
COMMUNICATIONS
(1ST AUTHOR)

Cerpa, N. G., Ikuko, W., Wilson, C., Katz, R. F., May, D. & Rees Jones, D., Physical factors that control fluid migration pathways in the mantle wedge, *EGU-GC: Exploring new frontiers in fluids processes in subductions zones*, Graz, Austria, Jun. 2018.
Cerpa, N. G., Ikuko, W., & Wilson, C., Fluid pathways in the mantle wedge : Influence of mineral grain size and mantle compaction, *DCO Third Early Career Scientist Workshop*, Nicolosi, Italy, Aug. 2017.
Cerpa, N. G., Ikuko, W., Wilson, C., & Spiegelman, M., Influence of mantle viscosity structure and mineral grain size on fluid migration pathways in the mantle wedge, *AGU Fall meeting*, San-Francisco, USA, Dec. 2016.
Cerpa, N. G., Ikuko, W., Wilson, C., & Spiegelman, M., Effects of grain size variation and mantle viscosity on fluid migration in the mantle wedge, *GeoMod*, La Grande-Motte, France, Sept. 2016.
Cerpa, N. G., Hassani, R., & Gerbault, M., A fictitious domain method to model the lithosphere/asthenosphere interaction : study of slab folding at a 660-km depth and induced slab dip variations, *RST (Earth Science French Meeting)*, Pau, France, Oct. 2014.
Cerpa, N. G., Hassani, R., & Gerbault, M., A fictitious domain method for fluid/solid interaction applied to the lithosphere-asthenosphere interaction, *EGU General Assembly*, Vienna, Austria, Apr. 2014.

POSTER
COMMUNICATIONS
(1ST AUTHOR)

Cerpa, N. G., Katz, R., Keller, T., & Rees Jones, D., Effects of sea-level changes on mid-ocean ridges magmatism and implications for emission rates of carbom, *AGU Fall meeting*, New Orleans, USA, Dec. 2017.
Cerpa, N. G., Ikuko, W., & Wilson, C., Fluid pathways in the mantle wedge : Influence of mineral grain size and mantle compaction, *DCO Third Early Career Scientist Workshop*, Nicolosi, Italy, Aug. 2017.
Cerpa, N. G., Ikuko, W., Wilson, C., & Spiegelman, M., Fluid transport by porous flow in the mantle wedge : Effects of grain size and mantle viscosity, *CIG All Hands Meeting*, UC Davis, Davis, USA, Jun. 2016.
Cerpa, N. G., Gerbault, M., & Hassani, R., A fictitious domain method for fluid/solid interaction applied to the lithosphere/asthenosphere interaction, *XIV International workshop on modeling of mantle and lithosphere dynamics*, Oléron, France, Aug. 2015.
Cerpa, N. G., Hassani, R., & Gerbault, M., A fictitious domain method for fluid/solid interaction applied to the plate folding over the 660-km depth discontinuity, *EGU General Assembly*, Vienna, Austria, Apr. 2014.
Cerpa, N. G., Hassani, R., & Gerbault, M., A fictitious domain method for fluid/solid coupling applied to the lithosphere/asthenosphere interaction, *4th CrystalToPlate Workshop*, Fréjus,

France, Jun. 2012.

Cerpa, N. G., Hassani, R., & Gerbault, M., A simplified fictitious domain method for fluid/solid interaction, *GeoMod*, University of Lausanne, Switzerland, Jun. 2012.

GRANTS

Research Support, **7500 €**, University of Montpellier, 2019.

Travel Grant for attendance to Galileo Conference, **500 €**, EGU, 2017.

Travel Grant for attendance to DCO Workshop, **1500 €**, Alfred P. Sloan Foundation, 2017.

AWARDS AND FELLOWSHIPS

Ministry of research and higher education fellow, 2011 - 2014.

TEACHING EXPERIENCE

Temporary Teaching and Research Associate (A.T.E.R), 2014-2015

Mathematics and Computing, B.S., with Prof. Hassani, R.

Physics, B.S., with Prof. Carbillet, M.

Rheology and Geomechanics, B.S., with Prof. Bouissou S.

Assistant during the summer school “Numerical modeling of geological processes” (open to M.S. and PhD students) in University of Concepcion, Chile, Jan. 2015.

Teaching assistant, 2011 - 2014.

Mathematics and Computing, B.S., with Prof. Hassani, R.

Physics, B.S., with Prof. Carbillet, M.

SKILLS

Operating systems : Linux, Unix, Windows.

Programming languages : Fortran(77-90), Python, Matlab/Scilab, C++,

Numerical libraries : MKL, Pardiso, PETSc.

Geodynamic open-source codes : Adeli, TerraFERMA.

Scientific software : Paraview, Gmsh, \LaTeX .

Developed Codes : Finite element solver for the Stokes equations, ADELIM

Languages : Spanish (native), French (bilingual), English (fluent).

OUTREACH

Animation of a Geology outreach stand at the “Fete de la Science” (French Science week) in the International Valbonne Center, 2012.