

José Alberto PADRÓN NAVARTA

35 years-old

Born September 28th 1982, Spanish Citizen

CNRS Research Scientist (Chargé de Recherches)

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Education

2010: PhD, Univ. Granada, Spain

2005: Degree in Geology. Univ. Granada, Spain

Employment history

- Since 2014: **CNRS Research Scientist (Chargé de Recherches, full-time researcher)** – Géosciences Montpellier, France
- 2011-2014: EU Marie Curie Research Fellow (International Outgoing Fellowship) at the Research School of Earth Sciences, Australia and Géosciences Montpellier, France.
- 2010-2011: Postdoctoral Research Fellow at the University of Granada, Spain.

Main Research Interests

Multidisciplinary approach in metamorphic petrology, experimental petrology, and mineral sciences, focusing on (1) the interplay between fluids, metamorphism and textures, (2) the application of theoretical and experimental phase equilibria to constrain the evolution of physico-chemical parameters from natural rock paragenesis, and (3) the transfer of fluids in the Earth's mantle (dehydration reactions and incorporation/release of trace amounts of hydrogen in nominally anhydrous silicate minerals like olivine and pyroxenes).

Main achievements (superscripts refer to the selected publication list)

As a PhD student:

- Development of a bimodal fluid-flow model (punctuated and continuous fluid extraction) by linking microstructures of high-grade rocks to serpentinite dehydration kinetics at conditions relevant to subduction zones. This model explains the heterogeneous kinetics of the dehydration reaction (at cm to dm scale) as a consequence of temporal changes in permeability and fluid pressure^{16,17}.
- First experimental observation of a previously disregarded dehydration reaction (antigorite + talc) relevant for hybrid compositions in subduction channels¹⁸.

As a post-doc (Research School of Earth Sciences and then Géosciences Montpellier)

- First geothermometer specifically designed for serpentinites based on a new thermodynamic solid solution model for antigorite that incorporates Tschermak exchange. – Coll. JAD. Connolly (ETH, Zurich), V. López-Sánchez Vizcaíno (U. Jaén, Spain)¹⁴.
- Experimental study on proton diffusion in mantle silicates. It demonstrates that different time scales for transport properties can be related to the structure of the protonated defect – Coll. J. Hermann, H. O'Neill (RSES)¹³,

As a researcher at the CNRS – Géosciences Montpellier

- Estimation of local strain rates and shear stresses generated during antigorite dehydration and compaction. These data point to slow compaction (and fluid extraction) in nature with rates only marginally higher than the viscoplastic deformation of the solid matrix. Coll. A. Tommasi, D. Mainprice (GM, France)^{1,11}.
- Development of a new defect-specific water solubility equation for olivine for the subsolidus upper mantle (up to 6 GPa). Hydrous Ti is the most relevant defect in shallow upper mantle whereas Si-defects dominate at higher pressure. The new equation constrains water incorporation in the subducting slab and the mantle wedge⁴. Coll. J. Hermann (University of Bern, Switzerland).
- Characterization of the water content in NAMs (FTIR) and of its relation to the microstructures and crystallographic preferred orientations (CPO, texture) in alpine orogenic peridotites: Cima di Gagnone (Coll. J. Hermann and M. Scambelluri, Italy), Alpe Arami (MSc project of T. Leydier, GM, France), Ulten (Coll. M. Scambelluri, GM, France), and Finero (Coll. A. Zannetti, A. Langone, Pavia Italy).

- ANR-Tremplin-ERC (funded) on fluid-flow during dehydration reactions and compaction based on natural observations (Val Malenco, Italy) and experiments (Paterson press, coll. S. Demouchy).

Distinctions

- Prime for scientific excellence and mentoring of the CNRS (2016-2019).
- **Award** from the Spanish Ministry of Education and Science for best academic grade for students majoring in Geology (First prize, BOE nº 238, 2006).
- University of Granada **Medal** for majoring in Geology (2007).

Funded projects as Principal Investigator (PI)

- 2017-2018. ANR Tremplin. Funding to improve an ERC proposal (Geofluids at Extreme conditions) that was favourably evaluated in the first round (A class). 30,000 €
- 2016-2018 PHC PROTEUS. Bilateral project between Géosciences Montpellier (France) and the Department of Nanostructured material from the Jozef Stefan Institute (Slovenia). 8,000 € over 2 years.
- 2014-2017 Fluid transport and rheology during metamorphic devolatilization (MinCompact: mineral reaction and compaction). INSU-CNRS (France). (17,000 € over 3 years).
- 2011-2014 Hydrogen Incorporation in Subducting Lithosphere after Dehydration Reactions (HISLa-DR, PIOF-GA-2010-273017). MARIE CURIE FP7 (269,710 € including salary, research costs and participation to conferences). PI: J.A. Padrón-Navarta (J. Hermann and A. Tommasi as reference scientists in the outgoing and return phase respectively).

Present management responsibilities & service to community

- Organizer of the Doctoral school seminars, Géosciences Montpellier, University of Montpellier, Montpellier, France (2015-2018). ~20 seminars/year.
- Co-organizer of the international meeting "Serpentine days 2016" 25-29 September. Sète, France.
- Representative of the researchers in the Géosciences Montpellier Council (since 2015).
- Regular reviewer for international scientific A-ranked journals since 2010 (4-6 per year), including Earth and Planetary Science Letters, Geology, Contributions to Mineralogy and Petrology, Journal of Metamorphic Geology, Journal of Petrology, Nature Geosciences and for funding agencies (French ANR, National Science Foundation USA and Deutsche Forschungsgemeinschaft Germany).

Mentoring

Géosciences Montpellier

- Supervisor of one PhD student (from October 2015) Maxime CLEMENT: "Migration des fluides issus de la déshydratation des serpentinites : une approche naturelle et expérimentale" – French Ministry of Education and Research funding – co-supervised (50%) by A. Tommasi, Géosciences Montpellier.
- Co-supervisor of one Erasmus+ Master-2 student visiting Géosciences Montpellier, Stefania Corvo (from University of Pavia, Italy): "Water content in nominally anhydrous minerals (NAMs) from the Finero complex (Italy)" from 13/03/2017 to 13/07/2017, currently PhD student at University of Pavia (Italy).
- Full supervision of one Master-1 student (Géosciences Montpellier): Mr. Thomas Leydier. Hydrogen concentration and microstructure of Alpe Arami garnet peridotite (Lepontine Alps). 2015, currently PhD student at University of Franche-Comté, Besançon (France).

Australia

- Advisor of two PhD students from the RSES (ANU): Mr Shayne Lakey (experimental investigation of the chlorite breakdown at high-pressure conditions, 2013-2018), Ms Maria Rosa Scicchitano (oxygen isotopes and fluid-rock interaction in serpentinite and rodingite, 2013-2018, now Research associate at University Wisconsin-Madison, USA)
- Mentoring of international exchange internships of 4 PhD/master students: (1) Ms Tingting Shen at RSES, ANU (PhD candidate, Peking University, Beijing, China, 2013) working on the serpentinitized peridotites from Tianshan orogenic belt, China, (2) Ms. Celine Crepisson at RSES, ANU (ENS Paris, France, Yttrium diffusion in olivine, 2013) and (3) Ms. Frauke Patersen at RSES, ANU (Bochum University, Germany pressure dependence on water solubility in Ti-doped forsterite, 2012)

Spain

- Advisor of one PhD student from University of Zaragoza (Spain, 2014-2015): Dr. V. Colás (hydrous metamorphism of chromitites) currently postdoc at the National University of Mexico

Author of 46 articles (+3 in review) in international peer-reviewed journals (IF>1).

827 citations, h=19 (ISI Web Science, 20/09/2018) - <http://www.researcherid.com/rid/D-5400-2009>

1087 citations, h=20 (Google Scholar, 20/09/2018) <https://scholar.google.fr/citations?user=5x5JgplAAAAJ&hl=en>

Selected 20 publications in international journals

1. Clément, M., **Padrón-Navarta, J.A.**, Tommasi, A., Mainprice, D.H., (2018). Non-hydrostatic stress field orientation inferred from orthopyroxene (Pbc) to low-clinoenstatite (P2₁/c) inversion in partially dehydrated serpentinites. *Am. Mineral.* 103, 993-1001.
2. Thoraval, C., Demouchy, S., **Padrón-Navarta, J.A.**, (2018). Relative diffusivities of hydrous defects from a partially dehydrated natural olivine. *Phys. Chem. Minerals.*
3. Scicchitano, M.R., Rubatto, D., Hermann, J., Shen, T., **Padrón-Navarta, J.A.**, Williams, I.S., Zheng, Y.F., (2018). In situ Oxygen Isotope Determination in Serpentine Minerals by Ion Microprobe: Reference Materials and Applications to Ultrahigh-Pressure Serpentinites. *Geostand. Geoanal. Res.* (in press).
4. **Padrón-Navarta, J.A.**, Hermann, J., 2017. A Subsolidus Olivine Water Solubility Equation for the Earth's Upper Mantle. *Journal of Geophysical Research: Solid Earth* 122, 9862-9880.
5. Tommasi, A., Langone, A., **Padrón-Navarta, J.A.**, Zanetti, A., Vauchez, A. (2017) Hydrous melts weaken the mantle, hydrous minerals do not: Insights from a petrostructural study of the Finero pargasite and phlogopite-bearing peridotites, southern Alps. *Earth and Planetary Science Letters*, 473, 247-255.
6. Langone, A., **Padrón-Navarta J.A.**, Ji, W.-Q., Zanetti, A., Mazzucchelli, M., Tiepolo, M., Giovanardi, T., Bonazzi, M., (2017). Ductile–brittle deformation effects on crystal-chemistry and U–Pb ages of magmatic and metasomatic zircons from a dyke of the Finero Mafic Complex (Ivrea–Verbano Zone, Italian Alps). *Lithos* 284–285, 493-511.
7. Jollands MC, Hermann J, O'Neill HSC, Spandler C, **Padrón-Navarta JA** (2016) Diffusion of Ti and some Divalent Cations in Olivine as a Function of Temperature, Oxygen Fugacity, Chemical Potentials and Crystal Orientation. *J Petrol* 57 (10):1983-2010.
8. Hidas, K., Tommasi, A., Garrido, C.J., **Padrón-Navarta, J.A.**, Mainprice, D., Vauchez, A., Barou, F., Marchesi, C., (2016). Fluid-assisted strain localization in the shallow subcontinental lithospheric mantle. *Lithos* 262, 636-650.
9. Jollands, M. C., **Padrón-Navarta, J. A.**, Hermann, J. & O'Neill, H. S. C. (2016). Hydrogen diffusion in Ti-doped forsterite and the preservation of metastable point defects. *American Mineralogist* 101, 1571-1583.
10. Colás V., **Padrón-Navarta J.A.**, González-Jiménez J.M., Griffin W., Fanlo I., O'Reilly S., Gervilla F., Proenza J., Pearson N., Escayola M. (2016) Compositional effects on the solubility of minor and trace elements in spinel-type minerals: insights from crystal-crystal partition coefficients in chromite exsolution. *American Mineralogist* 101, 1360-1372.
11. **Padrón-Navarta JA**, Tommasi A, Garrido CJ, Mainprice D. (2015) On topotaxy and compaction during antigorite and chlorite dehydration: an experimental and natural study. *Contributions to Mineralogy and Petrology* 169(4):1-20
12. Debret N, Bolfan-Casanova N, **Padrón-Navarta JA**, Martín-Hernández F, Andreani M, Garrido CJ, López-Sánchez Vizcaíno V, Gómez-Pugnaire MT, Muñoz M, Trcera N. (2015). Redox state of iron during high pressure serpentinite dehydration *Contributions to Mineralogy and Petrology* 169(4):1-18.
13. **Padrón-Navarta JA**, Hermann J, O'Neill HSC (2014) Site-specific hydrogen diffusion rates in forsterite. *Earth and Planetary Science Letters* 392(0):100-112
14. **Padrón-Navarta, J.A.**, López Sánchez-Vizcaíno, V., Hermann, J., Connolly, J.A.D., Garrido, C.J., Gómez-Pugnaire, M.T. and Marchesi, C., (2013), Tschermak's substitution in antigorite and consequences for phase relations and water liberation in high-grade serpentinites. *Lithos* 15, 186–196.
15. **Padrón-Navarta, J.A.**, Tommasi, A., Garrido, C.J., López Sánchez-Vizcaíno, V. Plastic deformation and development of antigorite crystal preferred orientation in high-pressure serpentinites (2012) *Earth and Planetary Science Letters*, 349-350, pp. 75-86.

16. **Padrón-Navarta, J.A.**, Sánchez-Vizcaíno, V.L., Garrido, C.J., Gómez-Pugnaire, M.T. *Metamorphic record of high-pressure dehydration of antigorite serpentinite to chlorite harzburgite in a subduction setting (Cerro del Almiraz, Nevado-Filábride complex, Southern Spain) (2011) Journal of Petrology, 52 (10), pp. 2047-2078.*
17. **Padrón-Navarta, J.A.**, Tommasi, A., Garrido, C.J., et al. *Fluid transfer into the wedge controlled by high-pressure hydrofracturing in the cold top-slab mantle (2010) Earth and Planetary Science Letters, 297 (1-2), pp. 271-286.*
18. **Padrón-Navarta, J.A.**, Hermann, J., Garrido, C.J., López Sánchez-Vizcaíno, V., Gómez-Pugnaire, M.T. *An experimental investigation of antigorite dehydration in natural silica-enriched serpentinite (2010) Contributions to Mineralogy and Petrology, 159 (1), pp. 25-42.*
19. **Padrón-Navarta, J.A.**, Garrido, C.J., et al. *Oriented growth of garnet by topotactic reactions and epitaxy in high-pressure, mafic garnet granulite formed by dehydration melting of metastable hornblende-gabbronorite (Jijal Complex, Kohistan Complex, north Pakistan) (2008) Journal of Metamorphic Geology, 26 (8), pp. 855-870.*
20. **Padrón-Navarta, J.A.**, López Sánchez-Vizcaíno, V., Garrido, C.J., Gómez-Pugnaire, M.T., Jabaloy, A., Capitani, G.C., Mellini, M. *Highly ordered antigorite from Cerro del Almiraz HP-HT serpentinites, SE Spain (2008) Contributions to Mineralogy and Petrology, 156 (5), pp. 679-688.*

Scientific conferences (Summary)

- *Attended 17 international (Goldschmidt: 2009, 2010, 2011, 2013; EGU: 2008, 2010, 2011, 2014, 2016, 2017; International Geological Congress: 2012, AGU: 2013, 2014, 2017; EMPG-XVI 2018; TiGeR 2018) and 5 national conferences (Spain: 2006, 2008, 2011; Germany, 2010; Australia: 2011).*
- *27 (23 oral contributions) as presenting author out of a total of 100 contributions.*
- *5 Invited talks in international conferences:*
 - *TIGeR Conference 2018: Coupling between Metamorphism and Deformation 12-14 September 2018. Curtin University, Perth, Western Australia.*
 - *American Geophysical Union 2014 San Francisco, USA (Session: Volatiles and Earth's Mantle Processes).*
 - *European Geosciences Union 2014. Vienna, Austria (Session: On and through the plate interface: zooming into subduction zone processes).*
 - *American Geophysical Union 2013. San Francisco, USA (Session: Fluids in Slabs: Chemical and Physical Studies of Volatile-Bearing Minerals in Subduction Zones).*
 - *International Geological Congress 2012. Brisbane, Australia. (Session: Fluids in the lithospheric mantle).*
- *2 invited talks at the workshop "How to apply for the Marie Skłodowska-Curie grants Individual Fellowship and European Training Network" (EGU 2015, 2017).*
- *1 invited talk in a Marie Curie ITN Workshop (EU-7FP): Microstructures as indicators of reaction mechanisms (Santorini, Greece 2010).*
- *Co-organizer of the international meeting "Serpentine days 2016" 25-29 September 2016. Sète, France.*
- *Co-convener of the sessions "Progress in Metamorphic Geology: From Ultrahigh-temperature Terrains to Subduction Zones" (EGU Fall Meeting, 18-22 April, 2016) and "The subduction interface: cross-disciplinary views from Geodynamics-Geochemistry-Seismology", Vienna, Austria (EGU Fall Meeting, 03-08 April, 2011).*