

## Dr. Patrick ALLARD

Institut de Physique du Globe of Paris (IPGP), Systèmes Volcaniques  
1 rue Jussieu, 75005 Paris France  
[pallard@ipgp.fr](mailto:pallard@ipgp.fr) - phone : +33-183957630



### *Curriculum Vitae*

-----  
Patrick ALLARD, 69, Director of research emeritus within French CNRS  
Associate Researcher with INGV (Italy), Catania section, since 2003  
President of the Volcanology section of CNFGG (French National Committee for Geophysics & Geodesy), since 2002  
Vice-president of IAVCEI (2015-2019)  
Associate Editor of Bulletin of Volcanology (2015-present)  
Spoken foreign languages: English and Italian (fluently), Spanish (partly)

### **Professional experience**

- 48-year experience in studying active volcanoes on different continents (Afar, Congo, Italy, Iceland, Azores, Capo Verde, Greece, Antilles, Reunion, Central America, Indonesia, Japan, N. Zealand, Vanuatu, Kamchatka, Philippines, Galapagos)
- Trained with multidisciplinary monitoring in volcano Observatories (Soufrière of Guadeloupe 1976-78; Vesuvius Observatory 1986-88; Etna, Catania, Poseidon System 2000-2001; INGV 2003-present) and with eruptive emergency management (Guadeloupe, Indonesia, Italy, RD Congo)
- Coordinator and/or PI of research programmes and contracts at both national (INSU-CNRS, French ANR, Italian GNV and MIURST), bi-lateral (Italy, Indonesia, Central America, Azores, Vanuatu), European ("Etna's Volatiles", "Furnas Volc. Lab.", "AGMV"; "MVERRS", "MED-SUV") and international (DCO-DECADE) scales.
- Chairman or/and co-convenor of sessions at international meetings: AGU, EGU, IAVCEI, IUGG, GNV and INGV (Italy), CNFGG (France)
- Recent stays as invited professor: ERI, Tokyo (April-July 2013 and Sept.-Dec. 2015); EOS, Singapore (Jan.-March 2017 and Jan-April 2018)

### **Selected national and international responsibilities**

- Scientific advisor to the French Government for the Mitigation of Major Hazards; Secretary of the French Committee for Volcanic Risk Mitigation (CSERV, 1983-1985).
- Executive secretary of the IAVCEI Commission on "Chemistry of Volcanic Gases" (1991-1997)
- Member of the Italian Commission for triennial Programing in Volcanology (1998-1999)
- Scientific responsible of Etna's geochemical monitoring (Poseidon System, 2000-2001)
- Co-Leader of the IAVCEI Commission on "Chemistry of Volcanic Gases" (2011-2014)
- Member of the Observation Service in Volcanology of French CNRS-INSU (2010-2012)
- Responsible of IPGP's Transverse Research Program in Volcanology (2012-2014)
- Member of scientific program Committee of IAVCEI-2013 Assembly (Kagoshima, Japan)
- Member of steering committee 'Reservoirs & Fluxes' of the Deep Carbon Observatory (2012-2019)

### **Research field**

*Geochemistry of magmatic fluids and magma degassing processes:* chemical and isotopic composition of magmatic gases (H, C, O, S, He); mass fluxes of gaseous species and trace metals in volcanic plumes (ground-based/airborne measurements); magma degassing processes and budgets (coupling volatile fluxes and melt inclusion studies); OP-FTIR remote sensing of magmatic gas composition during effusive and explosive eruptions; chemical and isotopic tracking ( $^3\text{He}$ ,  $^{13}\text{C}$ , trace metals) of interactions between magmatic fluids and hydrothermal systems; diffuse volcanic soil degassing ( $\text{CO}_2$ , He,  $^{222}\text{Rn}$ ), survey and impact on  $^{14}\text{C}$ - $^{13}\text{C}$  in plants (radiocarbon aging effects); Doppler radar sensing of eruptive jet velocities; cross-correlation between geochemical and geophysical precursors of eruptions.

## **Selected publications**

- Moretti R., Métrich N., Arienzo I., Di Renzo V., Aiuppa A., **Allard P.**, (2018) Degassing vs. eruptive styles at Mt. Etna volcano (Sicily, Italy). Part I: Volatile stocking, gas fluxing, and the shift from low-energy to highly explosive basaltic eruptions. *Chem. Geol.* 482, DOI: 10.1016/j.chemgeo.2017.09.017. Citations : 5
- Allard P.**, Burton M., Sawyer G., Bani P. (2016) Degassing dynamics of basaltic lava lake at a top-ranking volatile emitter: Ambrym volcano, Vanuatu arc. *Earth Planet. Sci. Lett.* 448, 69-80. Citations: 5
- Allard P.**, Aiuppa A., Bani P., Métrich N., Bertagnini A., Gauthier P.-J., Shinohara H., Sawyer G., *et al.* (2016) Prodigious emission rates and magma degassing budget of major, trace and radioactive volatile species from Ambrym basaltic volcano, Vanuatu island Arc. *J. Volcanol. Geotherm. Res.* 304, 378–402. Citations: 21
- La Spina A., Burton M., **Allard P.**, Alparone S., Murè F. (2015) Open-path FTIR spectroscopy of magma degassing processes during eight lava fountains on Mount Etna. *Earth Plan. Sci. Lett.* 413, 123–134. Citations: 17
- Allard P.**, Aiuppa A., Beauducel, Gaudin D., Di Napoli R., Crispi O., Calabrese S., Parello F., Hammouya G., Tamburello G. (2014) Steam and gas emission rate from La Soufriere volcano, Guadeloupe (Lesser Antilles): implications for the magmatic supply during degassing unrest. *Chemical Geology* 384, 76–93. Citations: 23
- .....
- Allard P.**, Carbonnelle J., Dajlevic D., Le Bronec J., Morel P., Maurenas J.M., Robe M.C., Faivre-Pierret R., Sabroux J.C., Zettwoog P. (1991) Eruptive and diffuse emissions of carbon dioxide from Etna volcano. *Nature*, 351, 387-391, DOI: 10.1038/351387a0. Citations: 431
- Allard P.**, Carbonnelle J., Métrich N., Loyer H., Zettwoog P. (1994) Sulphur output and magma degassing budget of Stromboli. *Nature*, 368, 326-330, DOI: 10.1038/368326a0. Citations: 265
- Spilliaert N., **Allard P.**, Métrich N., Sobolev A. (2006) Melt inclusion record of the conditions of ascent, degassing and eruption of primitive alkali basalt during the powerful 2002 flank eruption of Mount Etna. *J. Geophys. Res. - Solid Earth* 111, B4, B04203, 10.1029/2005JB003934. Citations: 237
- Burton M., **Allard P.**, Muré F., La Spina A. (2007) Magmatic gas composition reveals the source depth of slug-driven Strombolian explosive activity. *Science*, 317, 227, doi: 10.1126/science.1141900. Citations: 235
- Allard P.**, Burton M., Muré F. (2005) Spectroscopic evidence for a lava fountain driven by previously accumulated magmatic gas. *Nature*, 433, 407-410. Citations: 215
- Allard P.**, Behnke B., D'amico S., Neri M., Gambino S. (2006) Mount Etna 1993-2005: Anatomy of an evolving eruptive cycle. *Earth Science Reviews*, 78, 85-114, 10.1016/j.earscirev.2006.04.00260. Citations: 212
- Baubron J.C., **Allard P.**, Toutain J.P. (1990) Diffuse volcanic emissions of carbon dioxide from Vulcano island, Italy. *Nature*, 344, 51-53, DOI: 10.1038/344051a0. Citations: 191
- Aiuppa A., **Allard P.**, D'Alessandro W., Michel A., Parello F., Treuil M., Valenza M. (2000) Mobility and fluxes of major, minor and trace metals during basalt weathering and groundwater transport at Mt. Etna volcano (Sicily). *Geochim. Cosmochim. Acta*, 64, 11, 1827-1841, Citations: 190
- Métrich N., **Allard P.**, Spilliaert N., Andronico D., Burton M. (2004) 2001 flank eruption of the alkali- and volatile-rich primitive basalt responsible of Mount Etna's evolution in the three decades. *Earth Plan. Sci. Lett.*, 228, 1-17. doi: 10.1016/j.epsl.2004.09.036. Citations: 188
- Allard P.** (1997) Endogenous magma degassing and storage at Mount Etna. *Geophys. Res. Lett.*, 24, 2219-2221, DOI: 10.1029/97GL02101. Citations: 176
- Allard P.**, Jean-Baptiste P., D'Alessandro W., Parello F., Parisi B., Flehoc C. (1997) Mantle-derived helium and carbon in groundwaters and gases of Mount Etna, Italy. *Earth Planet. Sci. Lett.*, 148, 501-516, DOI: 10.1016/S0012-821X(97)00052-6. Citations: 138
- De Natale G., Pingue F., **Allard P.**, Zollo A. (1991) Geophysical and geochemical modelling of the 1982-1984 bradyseismic unrest at Campi Flegrei caldera, Southern Italy. *J. Volcanol. Geotherm. Res.* 48, 199-222. Citations: 124
- Spilliaert N., Métrich N., **Allard P.** (2006) S-Cl-F degassing pattern of water-rich alkali basalt: modelling and relationship with eruptive styles on Mount Etna volcano. *Earth Plan. Sci. Lett.*, 248, 772-786. Citations: 116
- Baubron J.C., **Allard P.**, Sabroux J.C., Tedesco D., Toutain J.P. (1991) Soil gas emanations as precursory indicators of volcanic eruptions. *J. Geol. Soc. London*, 148, 571-576, Citations: 115
- Allard P.**, Maiorani A., Tedesco D., Cortecchi G., Turi B. (1991) Isotopic constraints on the origin of sulfur and carbon in Solfatara fumaroles, Campi Flegrei caldera. *J. Volcan. Geotherm. Res.*, 48, 139-159. Citations: 106
- Allard P.** (1983) Origins of hydrogen, carbon, sulfur, nitrogen and rare gases in volcanic exhalations: evidence from isotope geochemistry. In: *Forecasting volcanic events*", Eds. H. Tazieff and J.C. Sabroux, Elsevier, Amsterdam, Chap. 25: 337-386. Citations: 104
- Federico C., Aiuppa A., **Allard P.**, Bellomo S., Jean-Baptiste P., Parello F., Valenza M. (2002) Magma-derived gas influx and water-rock interactions in the volcanic aquifer of Mt. Vesuvius, Italy. *Geochim. Cosmochim. Acta*, vol. 66, 6, 963-981. Citations: 103
- Allard P.**, Aiuppa A., Loyer H., Carrot F., Gaudry A., Pinte G, Michel A., Dongarra G. (2000) Acid gas and metal emission rates during long-lived basalt degassing at Stromboli volcano. *Geophys. Res. Lett.* 27, 1207-1210. Citations 101
- Parello F., **Allard P.**, D'Alessandro W., Federico C., Jean-Baptiste P., Catani O. (2000) Isotope geochemistry of Pantelleria volcanic fluids, Sicily Channel Rift: A mantle end-member for volcanism in Southern Europe. *Earth Planet. Sci. Lett.*, 180, 325-339, DOI: 10.1016/S0012-821X(00)00183-7. Citations: 78
- Burton M., **Allard P.**, Muré F., Oppenheimer C. (2003) FTIR remote sensing of fractional magma degassing on Mt. Etna volcano, Sicily. In: *Volcanic degassing*, edits C. Oppenheimer, D. Pyle & J. Barclay, *Geological Society London Special Publications*, 213, 281-293, DOI: 10.1144/GSL.SP.2003.213.01.17. Citations: 77
- Tedesco D., **Allard P.**, Sano Y., Wakita H., Pece R. (1991) Helium-3 in subaerial and submarine fumaroles of Campi Flegrei caldera, Italy. *Geochim. Cosmochim. Acta*, 54, 1105-1116. Citations: 71
- Allard P.** (2010) A CO<sub>2</sub>-rich gas trigger of explosive paroxysms at Stromboli basaltic volcano. *J. Volcanol. Geotherm. Res.*, 189, 363–374. DOI: 10.1016/j.jvolgeores.2009.11.018. Citations: 70