

Cécile FABRE

53 ans

Professeure des Universités Laboratoire GeoRessources – Université de Lorraine

Depuis 2018- Directrice du Département des Géosciences de l'UL
2024-2025 Responsable de la Licence Sciences de la Terre
2018-2024 Responsable du Master Sciences de la Terre et des Planètes, Environnement
08-2024 Passage au grade PR 1C
09-2021 Passage au grade de Professeure

Publications scientifiques

89 articles rang A (~13 800 citations)

h-index = 53 (<https://scholar.google.fr/citations?user=4MU3G78AAAAJ&hl=fr>)

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Carrière scientifique

Spécialiste de la technique spectroscopique LIBS et référente internationale sur ses applications en Géosciences. Développement de l'analyse localisée et de l'imagerie multi-élémentaire microLIBS (collaboration ILM Lyon) et applications des outils portables LIBS. Co-investigatrice scientifique sur la **mission Mars Science Laboratory**-Rover Curiosity en tant qu'experte des données LIBS et sur la **mission Mars 2020**-Rover Perseverance.

6 conférences invitées (Paris, Lyon, Marseille, Bari, Palm Springs, Cincinnati)

12 participations à des jurys de thèse ou d'HDR (Nancy, Paris, Lyon, Lille, Dijon, Nantes, Rouen, Orléans, Allemagne, Australie)

9 participations à des comités de sélection MCF ou PR.

8 encadrements de thèse

Portages et participations à des projets scientifiques

ANR-2023 (368 k€) projet AILES Advanced Imaging of Strategic Light Elements

Programme International : Work Package «Ground geochemistry using handheld spectrometers» H2020 ERA-MIN LIGHTS

Programme national (91,5 k€) : CPER, INSU dans le Programme National en Planétologie, INSU Instrumentation Innovantes et Transverses (laser Cobolt 1 kHz)

Programme régional (78k€) : Carnot ICEEL, programme GISFI-Tech sur les friches industrielles

Programme local (total 171 k€) : projets interdisciplinaires de l'observatoire OTELO, financement de thèse via le Labex Ressources21

Financement industriel (total 163 k€) : thèse en partenariat avec ORANO, Extra&Co et IMERYS pour des M2 et développement technique de tri de déchets

PUBLICATIONS

1. Korbelt, C., Demeusy, B., Kahou, Z. S., **Fabre, C.**, Motto-Ros, V., Teitler, Y., ... & Cauzid, J. (2026). Data fusion method to identify light elements bearing minerals from the Li-Beauvoir granite based on SEM, μ XRF, and μ LIBS. *Minerals Engineering*, 241, 110158.
2. Z. Abboud, Gaudel, N., Matera, V., **Fabre, C.** (2026). Methodological approach for using portable LIBS in the field of occupational health. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 107494.
3. M. Jatteau, Cauzid, J., **Fabre, C.**, Voudouris, P., Soulamidis, G., & Tarantola, A. (2025). Portable Analyses of Strategic Metal-Rich Minerals Using pXRF and pLIBS: Methodology and Database Development. *Data*, 10(2), 12.
4. N. Mezoued, **Fabre, C.**, Cauzid, J., Kim, Y., & Jatteau, M. (2025). Analysis of Minerals Using Handheld Laser-Induced Breakdown Spectroscopy Technology. *Data*, 10(3), 40.
5. N. Mezoued, **Fabre, C.**, Cauzid, J., Kahou, Z. S., & Rocher, O. (2025). Handheld LIBS contribution to quantify critical elements during mining operations: The Beauvoir granite case study. *Journal of Geochemical Exploration*, 107689.
6. C. Noel, Neoričić-Maclot, L., Alvarez-Llamas, C., Cugérone, A., **Fabre, C.**, Duponchel, L., & Motto-Ros, V. (2025). Automated line identification for atomic spectroscopy (ALIAS): Application to LIBS imaging data processing. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 107255.
7. S. Sadeg, Cauzid, J., **Fabre, C.**, & Djermoune, E. H. (2024). Diffraction peak identification and correction in EDXRF spectroscopy. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 221, 107060.
8. B. Le Bellego, Motto-Ros, V., Luais, B., **Fabre, C.**, Dalou, C., Condamine, P., & Tissandier, L. (2024). Semi-quantitative μ LIBS mapping of germanium diffusion between metal and silicate during planetary core–mantle segregation. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 222, 107059.
9. **C. Fabre**, Marulier, L., Monfaredi, B., Motto-Ros, V., Bousquet, B., Eglinger, A., & Tarantola, A. (2024). Exploring Rare Earth Elements in complex microscopic mineral phases: Inputs from μ LIBS imaging. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 106954.
10. Korbelt, C., Mezoued, N., Demeusy, B., **Fabre, C.**, Cauzid, J., Filippova, I. V., & Filippov, L. O. (2024). Quantification of lithium using handheld instruments: application of LIBS and XRF spectroscopy to assay the lithium content of mineral processing products. *Journal of Analytical Atomic Spectrometry*.
11. Alvarez-Llamas, C., Tercier, A., Ballouard, C., **Fabre, C.**, Hermelin, S., Margueritat, J., ... & Motto-Ros, V. (2024). Ultrafast μ LIBS imaging for the multiscale mineralogical characterization of pegmatite rocks. *Journal of Analytical Atomic Spectrometry*, 39(4), 1077-1086.
12. R.S. Harmon, **C. Fabre**, G.S. Senesi (2023), Laser-induced breakdown spectroscopy, in: *Reference Module in Earth Systems and Environmental Sciences*, Elsevier, 2023: p. B9780323997621000036.
13. L. Duponchel, **C. Fabre**, B. Bousquet, V. Motto-Ros (2023), Statistical comparison of predictive models for quantitative analysis and classification in the framework of LIBS spectroscopy: A tutorial, *Spectrochimica Acta Part B: Atomic Spectroscopy*. 208 106776.
14. G. Soulamidis, Jatteau, M., Stouraiti, C., Voudouris, P., Mavrogonatos, C., Soukis, K., **Fabre, C.**, Tarantola, A. (2023). Application of Portable Spectroscopic Tools in the Exploration of Manganese Oxide Minerals: Preliminary Results from the Case Study of Drama Mn-Oxide Deposits, Northern Greece. *Materials Proceedings*, 15(1), 54.

15. A. Tercier, Vasileva, E., Alvarez-Llamas, **C., Fabre, C.**, Hermelin, S., Soula, B., ... & Motto-Ros, V. (2023). High-Resolution High-Speed LIBS Microscopy. *Spectroscopy*, 38(11), 34-40.
16. A. Nardecchia, Anna de Juan, V. Motto-Ros, **C. Fabre**, L. Duponchel (2022), LIBS and Raman image fusion: an original approach based on the use of chemometric methodologies, *Spectrochimica Acta Part B*, 198, 106571.
17. **Best paper Award du journal Spectrochimica Acta Part B C. Fabre**, Trebus, K., Tarantola, A., Cauzid, J., Motto-Ros, V., Voudouris, P. (2022). Advances on microLIBS and microXRF mineralogical and elemental quantitative imaging. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 194, 106470.
18. **C. Fabre**, Ourti, N. E., Ballouard, C., Mercadier, J., Cauzid, J. (2022), Contribution of portable LIBS tool for in situ quantification of lithium and trace elements (Rb, Sr, Cs, Be), *Journal of Geochemical Exploration*, 236, 106979.
19. Y. Kim, **Fabre, C.**, Cauzid, J. (2022) Access to quantitative analysis of carbonates using a portable LIBS instrument: First applications to single minerals and mineral mixtures, *Spectrochimica Acta Part B: Atomic Spectroscopy*, 191, 106397.
20. K. Trebus, Tarantola, A., **Fabre, C.**, Caumon, M.C., Cauzid, J., Motto-Ros, V., ... Mavrogonatos, C. (2022), Trace element distribution in zoned kyanite of Thassos Island (Greece) by combined spectroscopic analyses, *Applied Spectroscopy*, 76(9), 1051-1067.
21. R.B. Anderson, Forni, O., Cousin, A., Wiens, R. C., Clegg, S. M., Frydenvang, J., **C. Fabre**, ... & Ehlmann, B. (2022). Post-landing major element quantification using SuperCam laser induced breakdown spectroscopy. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 188, 106347.
22. J.M. Madariaga, Aramendia, J., Arana, G., Castro, K., Gómez-Nubla, L., de Vallejuelo, S.F.O,... & Willis, P.A. (2022). Homogeneity assessment of the SuperCam calibration targets onboard rover perseverance. *Analytica chimica acta*, 1209, 339837. (SuperCam Team)
23. S. Maurice, Chide, B., Murdoch, N., Lorenz, R. D., Mimoun, D., Wiens, R. C.,... & Williford, K. (2022). In situ recording of Mars soundscape. *Nature*, 605(7911), 653-658. (SuperCam Team)
24. A. Cousin, Sautter, V., **Fabre, C.**, Dromart, G., Montagnac, G., Drouet, C., ... & Wiens, R. C. (2021). SuperCam calibration targets on board the perseverance rover: Fabrication and quantitative characterization. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 106341.
25. **C. Fabre**, Ourti, N. E., Mercadier, J., Cardoso-Fernandes, J., Dias, F., Perrotta, M., ... & Cauzid, J. (2021). Analyses of Li-Rich Minerals Using Handheld LIBS Tool. *Data*, 6(6), 68.
26. E. Clavé, Gaft, M., Motto-Ros, V., **Fabre, C.**, Forni, O., Beyssac, O., ... & Bousquet, B. (2021). Extending the potential of plasma-induced luminescence spectroscopy. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 177, 106111.
27. S. Maurice, Wiens, R. C., Bernardi, P., Caïs, P., Robinson, S., Nelson, T., ... & Sobron, P. (2021). The SuperCam instrument suite on the Mars 2020 rover: Science objectives and Mast-Unit description. *Space Science Reviews*, 217(3), 1-108.
28. R.C. Wiens, Maurice, S., Robinson, S. H., Nelson, A. E., Cais, P., Bernardi, P., ... & Willis, P. (2021). The SuperCam instrument suite on the NASA Mars 2020 rover: body unit and combined system tests. *Space Science Reviews*, 217(1), 1-87.

29. J.A. Manrique, Lopez-Reyes, G., Cousin, A., Rull, F., Maurice, S., Wiens, R. C., ... & Veneranda, M. (2020). SuperCam Calibration Targets: Design and Development. *Space Science Reviews*, 216(8), 1-27.
30. J. Vrabel, Kepeš, E., Duponchel, L., Motto-Ros, V., **Fabre, C.**, Connemann, S., Gundawar, M. K. (2020). Classification of challenging LIBS soil sample data-EMSLIBS contest. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 169, 105872.
31. A. Nardecchia, **Fabre, C.**, Cauzid, J., Pelascini, F., Motto-Ros, V., & Duponchel, L. (2020). Detection of minor compounds in complex mineral samples from millions of spectra: A new data analysis strategy in LIBS imaging. *Analytica Chimica Acta*, 1114, 66.
32. **Fabre, C.** (2020). Advances in Laser-Induced Breakdown Spectroscopy analysis for geology: A critical review. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 166, 105799.
33. O. Vanderhaeghe, Guergouz, C., **Fabre, C.**, Duchene, S., Baratoux, D. (2019). Secular cooling and crystallization of partially molten Archaean continental crust over 1 Ga. *Comptes Rendus Geoscience*, 351(8), 562-573.
34. Y. Foucaud, **Fabre, C.**, Demeusy, B., Filippova, I. V., Filippov, L. O. (2019). Optimisation of fast quantification of fluorine content using handheld laser induced breakdown spectroscopy. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 158, 105628.
35. V. Payre, **Fabre, C.**, Sautter, V., Cousin, A., Mangold, N., Le Deit, L., ... & Meslin, P. Y. (2019). Copper enrichments in the Kimberley formation in Gale crater, Mars: Evidence for a Cu deposit at the source. *Icarus*, 321, 736-751.
36. **Fabre, C.**, Devismes, D., Moncayo, S., Pelascini, F., Trichard, F., Lecomte, A., ... & Motto-Ros, V. (2018). Elemental imaging by laser-induced breakdown spectroscopy for the geological characterization of minerals. *Journal of Analytical Atomic Spectrometry*, 33(8), 1345-1353.
37. J. Guezencoc, Payre, V., **Fabre, C.**, Syvilay, D., Cousin, A., Gallet-Budynek, A., & Bousquet, B. (2018) Variable selection in laser-induced breakdown spectroscopy assisted by multivariate analysis: An alternative to multi-peak fitting. *Spectrochimica Acta Part B: Atomic Spectroscopy*, 152, 6-13. <https://doi.org/10.1016/j.sab.2018.12.001>
38. J. Lasue, Cousin, A., Meslin, P. Y., Mangold, N., Wiens, R. C., Berger, **Fabre, C.**, Rapin, W. (2018). Martian eolian dust probed by ChemCam. *Geophysical Research Letters*, 45(20), 10-968.
39. W. Rapin, B. Bousquet, J. Lasue, P.-Y. Meslin, J.-L. Lacour, **C. Fabre**, R.C. Wiens, J. Frydenvang, E. Dehouck, S. Maurice, O. Gasnault, O. Forni, A. Cousin (2017), Roughness effects on the hydrogen signal in laser-induced breakdown spectroscopy, *Spectrochimica Acta Part B: Atomic Spectroscopy*, Volume 137, 13-22, ISSN 0584-8547, <https://doi.org/10.1016/j.sab.2017.09.003>.
40. V. Payre, **C. Fabre**, A. Cousin, V. Sautter, R. C. Wiens, O. Forni, O. Gasnault, N. Mangold, P.-Y. Meslin, J. Lasue, A. Ollila, W. Rapin, S. Maurice, M. Nachon, L. Le Deit, N. Lanza, S. Clegg (2017), Alkali Trace Elements in Gale Crater, Mars with ChemCam: Calibration Update and Geological Implications: Alkali Trace Elements with ChemCam. *The Journal of Geophysical Research Planets*, 03, DOI:10.1002/2016JE005201
41. R. C. Wiens, D. M. Rubin, W. Goetz, A.G. Fairen, S. P. Schwenzer, J. R. Johnson, R. Milliken, B. Clark, N. Mangold, K. M. Stack, D. Oehler, S. Rowland, M. Chan, D. Vaniman, S. Maurice, O. Gasnault, W. Rapin, S. Schroeder, S. Clegg, O.Forni, D. Blaney, A. Cousin, V. Payre, **C. Fabre**, M. Nachon, S. Le Mouelic, V. Sautter, S. Johnstone, F. Calef, Ashwin R. Vasavada, J. P. Grotzinger (2017), Centimeter

to Decimeter Hollow Concretions and Voids In Gale Crater Sediments, Mars. *Icarus* 02, DOI:10.1016/j.icarus.2017.02.003

42. M. Nachon, N. Mangold, O. Forni, L.C. Kah, A. Cousin, R.C. Wiens, R. Anderson, D. Blaney, J.G. Blank, F. Calef, S.M. Clegg, **C. Fabre**, M.R. Fisk, O. Gasnault, J.P. Grotzinger, R. Kronyak, N.L. Lanza, J. Lasue, L. Le Deit, S. Le Mouélic, S. Maurice, P.-Y. Meslin, D.Z. Oehler, V. Payré, W. Rapin, S. Schröder, K. Stack, and D. Sumner (2016), Chemistry of diagenetic features analyzed by ChemCam at Pahrump Hills, Gale crater, Mars, *Icarus*, 281:121-136, doi:10.1016/j.icarus.2016.08.026.
43. N. Lanza, R.C. Wiens, R.E. Arvidson, B.C. Clark, W.W. Fischer, R. Gellert, J. Grotzinger, J. Hurowitz, S.M. McLennan, R.V. Morris, M. Rice, J. Bell, J. Berger, D. Blaney, N.T. Bridges, F. Calef, J.L. Campbell, S.M. Clegg, A. Cousin, K. S. Edgett, **C. Fabre**, M. Fisk, O. Forni, K. Hardy, C. Hardgrove, J.R. Johnson, J. Lasue, S. Le Mouélic, M. Malin, N. Mangold, J. Martín-Torres, S. Maurice, M.J. McBride, D. Ming, H.E. Newsom, L. Thompson, A. Treiman, S. VanBommel, D. Vaniman, M.L. Zorzano. Oxidation of manganese in an ancient aquifer, Kimberley formation Gale crater, Mars. *Geophysical Research Letters*, 43(14), 7398-7407.
44. A. Mezzacappa, N. Melikechi, A. Cousin, R.C. Wiens, J. Lasue, S.M. Clegg, R. Tokar, S. Bender, N. L. Lanza, S. Maurice, G. Berger, O. Forni, O. Gasnault, M.D. Dyar, T. Boucher, E. Lewin, **C. Fabre**, and MSL Team (2016), Application of Distance Correction to ChemCam LIBS Measurements, *Spectrochimica Acta Part B: Atomic Spectroscopy*, 120, 19-29.
45. L. Le Deit, N. Mangold, O. Forni, A. Cousin, J. Lasue, S. Schröder, R. C. Wiens, D. Sumner, **C. Fabre**, K. M. Stack, R. B. Anderson, D. Blaney, S. Clegg, G. Dromart, M. Fisk, O. Gasnault, J. P. Grotzinger, S. Gupta, N. Lanza, S. Le Mouélic, S. Maurice, S. M. McLennan, P.-Y. Meslin, M. Nachon, H. Newsom, V. Payré, W. Rapin, M. Rice, V. Sautter, and A. H. Treiman (2016). The potassic sedimentary rocks in Gale Crater, Mars as seen by ChemCam on Curiosity. *J. Geophys. Res. Planets*, DOI: 10.1002/2015JE00498.
46. N. Mangold, L. Thompson, O. Forni, Williams, **C. Fabre**, L. Le Deit, R.C. Wiens, R. Williams, R. Anderson, D. Blaney, F. Calef, A. Cousin, S. Clegg, G. Dromart, W. Dietreich, K. Edgett, M. Fisk, O. Gasnault, R. Gellert, J. Grotzinger, L. Kah, S. Le Mouélic, S. Mc Lennan, S. Maurice, P.Y. Meslin, H. Newsom, M. Palucis, W. Rapin, V. Sautter, L. Siebach, K. Stack, D. Sumner, A. Yingst (2016), Composition of conglomerates analyzed by the Curiosity rover: Implications for Gale crater crust and sediment sources, *J. Geophys. Res. Planets*, DOI: 10.1002/2015JE00
47. S. Maurice, Clegg, S. M., Wiens, R. C., Gasnault, O., Rapin, W., Forni, O., ... & Vasavada, A. R. (2016). ChemCam activities and discoveries during the nominal mission of the Mars Science Laboratory in Gale crater, Mars. *Journal of Analytical Atomic Spectrometry*, 31(4), 863-889.
48. J. Lasue, S. Clegg, O. Forni, A. Cousin, R.C. Wiens, N. Lanza, N. Mangold, L. Le Deit, O. Gasnault, S. Maurice, J.A. Berger, K. Stack, D. Blaney, **C. Fabre**, W. Goetz, J. Johnson, S. Le Mouélic, M. Nachon, V. Payré, W. Rapin, D.Y. Sumner (2016). Observation of > 5 wt% zinc at the Kimberley outcrop, Gale crater, Mars, *J. Geophys. Res. Planets*. 10.1002/2015JE004946
49. V. Sautter, M.J. Toplis, A. Cousin, R.C. Wiens, **C. Fabre**, O. Gasnault, O. Forni, S. Maurice, E.M. Stolper, A. Ollila, M. Fisk, N. Mangold, P.-Y. Meslin, P. Beck, J. Lasue, P. Pinet, L. Le Deit, W. Rapin, J. Blank, D. Dyar, N. Lanza, S. Le Mouélic, J.C. Bridges, S. Clegg and D. Vaniman (2015). Granodiorite and alkaline suite at Gale: continental crust on Early Mars? *Nature Geosciences*. DOI: 10.1038/NGEO2474
50. N. Mangold, O. Forni, G. Dromart, K. Stack, R.C. Wiens, O. Gasnault, D. Y. Sumner, M. Nachon, P.-Y. Meslin, R. B. Anderson, B. Barraclough, J.F. Bell III, G. Berger, D. L. Blaney, J. C. Bridges, F. Calef, B. Clark, S. M. Clegg, A. Cousin, L. Edgar, K. Edgett, B. Ehlmann, **C. Fabre**, M. Fisk, J. Grotzinger, S.

- Gupta, K. E. Herkenhoff, J. Hurowitz, J. R. Johnson, L. C. Kah, N. Lanza, J. Lasue, S. Le Mouélic, R. Lèveillé, E. Lewin, M. Malin, S. McLennan, S. Maurice, N. Melikechi, A. Mezzacappa, R. Milliken, H. Newsom, A. Ollila, S. K. Rowland, V. Sautter, K. L. Siebach, K. Stack, D. Sumner, A. Yingst (2016). Composition of conglomerates analyzed by the Curiosity rover: Implications for Gale crater crust and sediment sources, *J. Geophys. Res. Planets*, 121, 353-387, doi 2015JE004977
51. R.J Lèveillé, John Bridges, R. C. Wiens, N. Mangold, A. Cousin, N. Lanza, O. Forni, A. Ollila, J. Grotzinger, S. Clegg, K. Siebach, G. Berger, B. Clark, **C. Fabre**, R. Anderson, O. Gasnault, D. Blaney, L. Deflores, L. Leshin, S. Maurice (2014), Chemistry of fracture-filling raised ridges in Yellowknife Bay, Gale Crater: Window into past aqueous activity and habitability on Mars, *J. Geophys. Res. Planets*, 119.
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 53. A. Cousin, Meslin P.Y., Wiens R. C., Rapin W., Mangold N., **Fabre** C., Gasnault O., Forni O., Tokar R., Ollila A., Schröder S., Lasue J., Maurice S., Sautter V., Newsom H., Vaniman D., Le Mouélic S., Dyar D., Berger G., Blaney D., Nachon M., Dromart G., Lanza N., Clark B., Clegg S., Goetz W., Barraclough B., Delapp D., MSL Science Team (2014), Compositions of Coarse and Fine Particles in Martian Soils at Gale : A Window Into the Production of Soils, *Icarus*, doi: 10.1016/j.icarus.2014.04.052
 54. N. Melikechi, Mezzacappa A., Cousin A., Lanza N.L., Lasue J., Clegg S.M., Berger G., Wiens R.C., Maurice S., Tokar R.L., Bender S., Forni O., Breves E. A., Dyar M.D., Frydenvang J., Delapp D., Gasnault O., Newsom H., Ollila A.M., Lewin E., Clark B.C., Ehlmann B. L., Blaney D., **C. Fabre** and the MSL Science Team, Correcting for variable laser-target distances of LIBS measurements with ChemCam using emission lines of Martian dust spectra (2014), *Spectrochimica Acta Part B: Atomic Spectroscopy*, DOI: 10.1016/j.sab.2014.04.004
 55. **C. Fabre**, A. Cousin, R. Wiens, A. Ollila, S. Maurice, V. Sautter, O. Gasnault, O. Forni, J. Lasue, R. Tokar, D. Vaniman, N. Melikechi, In situ calibration using univariate analyses based on the onboard ChemCam targets: first prediction of Martian rock and soil compositions (2014), *Spectrochimica Acta Part B: Atomic Spectroscopy*, doi: 10.1016/j.sab.2014.03.014
 56. A. Ollila, Horton E. Newsom, B. Clark III, R. C. Wiens, A. Cousin, J. G. Blank, N. Mangold, V. Sautter, S. Maurice, S. M. Clegg, O. Gasnault, O. Forni, R. Tokar, E. Lewin, M. D. Dyar, J. Lasue, R. Anderson, S. M. McLennan, J. Bridges, D. Vaniman, N. Lanza, **C. Fabre**, N. Melikechi, G. M. Perrett, J. L. Campbell, P. L. King, , B. Barraclough, D. Delapp, S. Johnstone, P-Y. Meslin, A. Rosen-Gooding, J. Williams (2013), Trace Element Geochemistry (Li, Ba, Sr, and Rb) using Curiosity's ChemCam: Early Results for Gale Crater from Bradbury Landing Site to Rocknest. *Journal of Geophysical Research: Planets*, 119(1), 255-285.
 57. V. Sautter, **C. Fabre**, O. Forni, M. J. Toplis, A. Cousin, A. M. Ollila, P. Y. Meslin, S. Maurice, R. C. Wiens, D. Baratoux, N. Mangold, S. Le Mouélic, O. Gasnault, G. Berger, J. Lasue, R. A. Anderson, E. Lewin, M. Schmidt, D. Dyar, B. L. Ehlmann, J. Bridges, B. Clark and P. Pinet (2013). Igneous mineralogy at Bradbury rise: the first ChemCam campaign at Gale crater, *J. Geophys. Res. Planets*
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