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# Expected first results from the SuperCam microphone onboard the NASA Perseverance rover

**Nina Lanza**[1], Baptiste Chide[2,3], David Mimoun[2], Cesar Alvarez[4], Stanley Angel[5], Pernelle Bernardi[6], Olivier Beyssac[7], Bruno Bousquet[8], Alexandre Cadu[2], Elise Clave[8], Olivier Forni[3], Thierry Fouchet[6], Olivier Gasnault[3], Xavier Jacob[9], Gaetan Lacombe[3], Javier Laserna[4], Jeremie Lasue[3], Ralph Lorenz[10], Pierre-Yves Meslin[3], Franck Montmessin[11], and the SuperCam Acoustics Working Group[*]

[1]Los Alamos National Laboratory, Los Alamos, NM, U.S.A. (nlanza@lanl.gov)
[2]ISAE-SUPAERO, Toulouse, France
[3]IRAP-CNRS, Toulouse, France
[4]Universidad de Malaga, Malaga, Spain
[5]University of South Carolina, SC, U.S.A.
[6]LESIA, Meudon, France
[7]IMPMC, Paris, France
[8]CELIA, Bordeaux, France
[9]IMFT, Toulouse, France
[10]Applied Physics Laboratory, MD, USA
[11]LATMOS, Guyancourt, France
[*]A full list of authors appears at the end of the abstract

The NASA Perseverance rover will land on Mars in February 2021, bringing with it a new suite of analytical instruments with which to explore its landing site in Jezero crater. The primary goal of this new mission is to assess the geology and past habitability in order to identify and cache samples with a high likelihood of preserving biosignatures, in preparation for a future sample return mission [1]. As part of its instrument payload, Perseverance will carry the SuperCam instrument [2-3]. SuperCam combines a number of analytical techniques, notably a laser-induced breakdown spectroscopy (LIBS) instrument for chemical analysis that is coupled with a microphone for acoustic studies. The SuperCam microphone is a commercial of-the-shelf electret (based on Knowles EK-23132) and is designed to record sounds in the audible range, from 100 Hz to 10 kHz, during the surface mission. There are three main science investigations of interest for the SuperCam microphone: 1) Analysis of the LIBS acoustic signal; 2) study of atmospheric phenomena; and 3) examination of rover mechanical sounds. Since the atmosphere will be the source of acoustic signals, the microphone may be used to better understand the nature of the atmosphere and related phenomena such as thermal gradient and convective behavior in the rover's vicinity [4], the behavior of dust devils [5], and to refine current atmospheric attenuation models for Mars [6]. Under atmosphere, LIBS analysis produces an acoustic signal due to the creation of a shock wave during laser ablation of a target. This acoustic signal can provide critical information about a target's hardness and ablation depth [7-8] and whether there are coatings or

thin layers present [9]. Mechanisms on the rover itself will also provide a source of acoustic signal that may be examined by the SuperCam microphone, notably sounds produced by the Mars Oxygen ISRU Experiment (MOXIE, [10]) instrument pumps during oxygen production. By the time of the conference, the SuperCam microphone should have acquired the first sounds on Mars; we will report on these exciting initial results and compare them to our prelanding expectations.

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**SuperCam Acoustics Working Group**: N.L. Lanza (1), B. Chide (2,3), C. Alvarez (4), S. M. Angel (5), P. Bernardi (6), O. Beyssac (7), B. Bousquet (8), A. Cadu (2), E. Clavé (8), O. Forni (3), T. Fouchet (6), O. Gasnault (3), X. Jacob (9), G. Lacombe (3), J. Laserna (4), J. Lasue (3), R.D. Lorenz (10), P.-Y. Meslin (3), F. Montmessin (11), J. Moros (4), N. Murdoch (2), A. M. Ollila (1), P. Pilleri (3), P. Purohit (4), A. L. Reyes-Newell (1), S. Schröder (12), A. Stott (2), D. Vogt (12), S. Maurice (3), R. C. Wiens (1), D. Mimoun (2) --- 1) Los Alamos National Laboratory, NM, USA 2) ISAE-SUPAERO, Toulouse, France 3) IRAP-CNRS, Toulouse, France 4) Universidad de Malaga, Malaga, Spain 5) University of South Carolina, SC, USA 6) LESIA, Meudon, France 7) IMPMC, Paris, France 8) CELIA, Bordeaux, France 9) IMFT, Toulouse, France 10) APL, MD, USA 11) LATMOS, Guyancourt, France 12) DLR, Berlin, Germany