

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Science, Instruments and Technologies (3B)

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BURYING SEIS TETHER - A VERY UNIQUE OPERATION, FROM DESIGN TO REALIZATION ON
MARS**Abstract**

InSight has yield unprecedented scientific data about Mars internal structure during its nominal mission lifetime in Elysium Planitia (2019-2020). When it was decided to extend the mission for two more years, science and engineering teams investigated what could be improved in the seismic signals recorded by SEIS. In an attempt to achieve more and reach performance far beyond the science objectives initially set, it was decided to work on how parasite “glitches” observed in SEIS raw data could be tackled. The science team suspected the cause of these glitches could be thermoelastic effects involving the tether (linking the instrument to the lander) and the underlying regolith. It was decided in early 2021 to take the shot on burying SEIS tether under martian regolith. The intent was to create some thermal insulation that would flatten the temperature cycle the tether is experiencing during each sol. To do that, JPL would act on the robotic arm to collect regolith with the scoop it is fitted with and perform the dumps on the tether. CNES would design the covering strategy and select each dump target. The whole process spanned from February 2021 to May 2021, rushed by the perspective of seeing the power resources drastically drop due to the imminence of Mars’ aphelion. This paper will present the preparation work that was done on

testbed, in CNES facilities to come up with a plan that would take benefit of scarce resources (energy, time, available regolith). Many challenges were on the way, from dumping close to the Wind and Thermal Shield protecting SEIS, to ensuring the operation would not alter an already well-performing instrument. The very pragmatic and experimental approach of this work is one of its most remarkable aspect, along with the very simple and modern tools to support it (3d-printing, webcam video recording, and more). The paper will also present the dumps actually performed on Mars and address the iterative improvement of the process, involving JPL, CNES and science team in a short closed loop. Results of the operation will be discussed, along with the unexpected science opportunities that emerged when performing this tether burial.