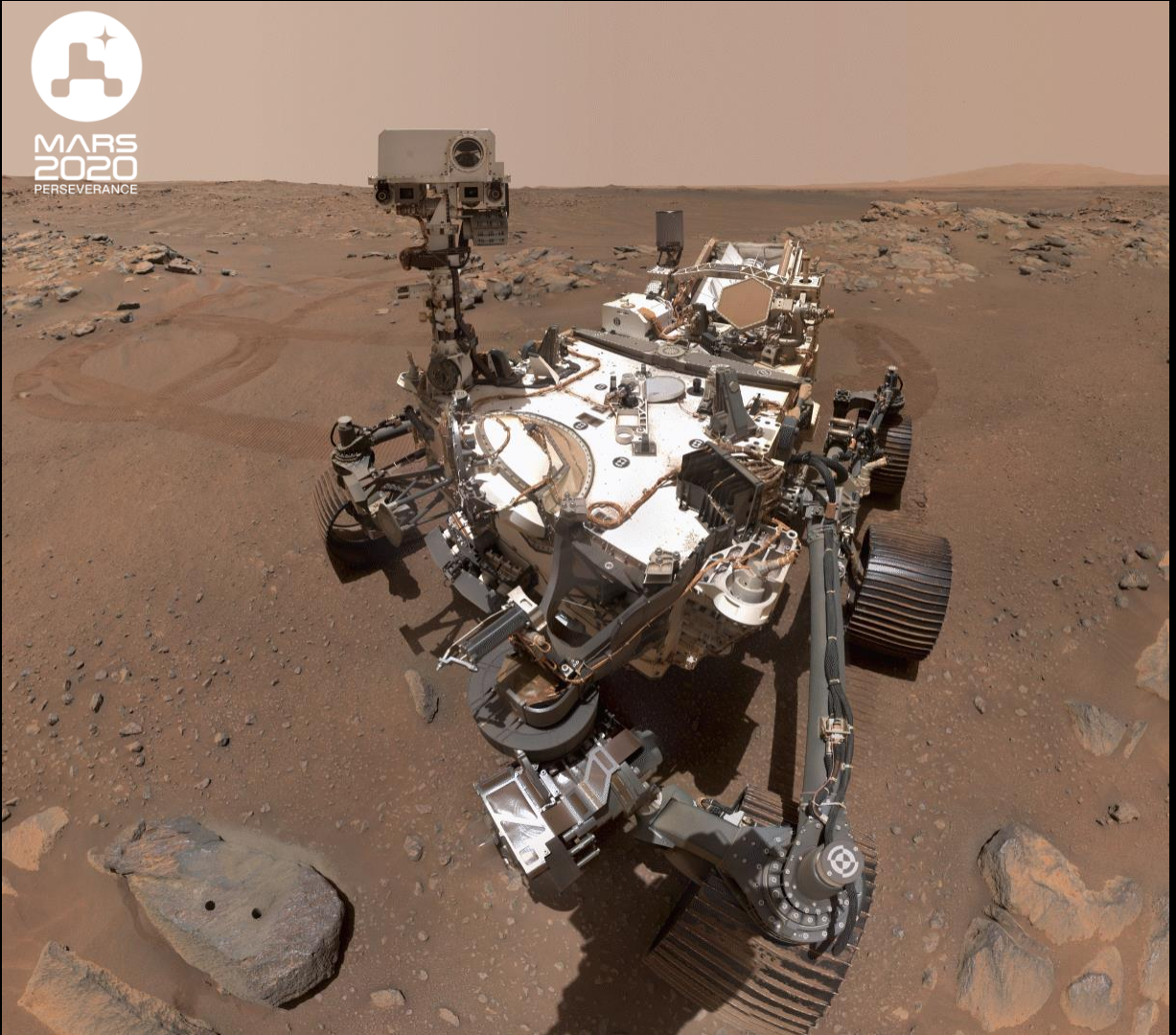



# Mars 2020 Perseverance Rover Status

Katie Stack Morgan, JPL
Mars 2020 Deputy Project Scientist

Ken Farley, Caltech
Mars 2020 Project Scientist

MEPAG VM #13
September 27, 2021

Jet Propulsion Laboratory
California Institute of Technology

© 2021 California Institute of Technology.
Government sponsorship acknowledged.

# Mission Status

- Planning sol 216 on Mars, final conjunction preparation
- The rover is healthy and all science instruments are functioning with no significant issues
- 13 Ingenuity helicopter flights
- Total mission odometry: 2607 m (as of sol 209)
- Abrasions: 3
- Sample Tubes Sealed: 4
    - 2 rock cores collected
    - 1 atmospheric sample
    - 1 witness tube
- First delivery to the PDS on August 20, 2021

# PDS Delivery Metrics for Mars 2020 Archives, Release 1, August 20, 2021

| Bundle | Curating Node | Number of data products delivered | Number of megabytes delivered |
|---|---|---|---|
| urn:nasa:pds:mars2020_meda | ATM | 3,907 | 21,908.60 |
| urn:nasa:pds:mars2020_moxie | ATM | 31 | 66.10 |
| urn:nasa:pds:mars2020_pixl | GEO | 482 | 112.64 |
| urn:nasa:pds:mars2020_rimfax | GEO | 2,422 | 3,655.68 |
| urn:nasa:pds:mars2020_sherloc | GEO | 3,450 | 6,502.40 |
| urn:nasa:pds:mars2020_supercam | GEO | 4,415 | 12,390.40 |
| urn:nasa:pds:mars2020_rover | GEO | - | - |
| urn:nasa:pds:mars2020_mission | GEO | 640 | 8,161.28 |
| urn:nasa:pds:mars2020_ecam | CIS | 52,498 | 82,784.00 |
| urn:nasa:pds:mars2020_edlcam | CIS | 3,135 | 1,535.00 |
| urn:nasa:pds:mars2020_helicam | CIS | 3,590 | 17,275.00 |
| urn:nasa:pds:mars2020_mastcamz | CIS | 395,993 | 1,082,702.00 |
| urn:nasa:pds:mars2020_imgops | CIS | 29,878 | 132,098.00 |
| urn:nasa:pds:mars2020.spice | NAIF | 43 | 553.00 |
| **Totals** | | **500,484** | **1,369,744.10** |

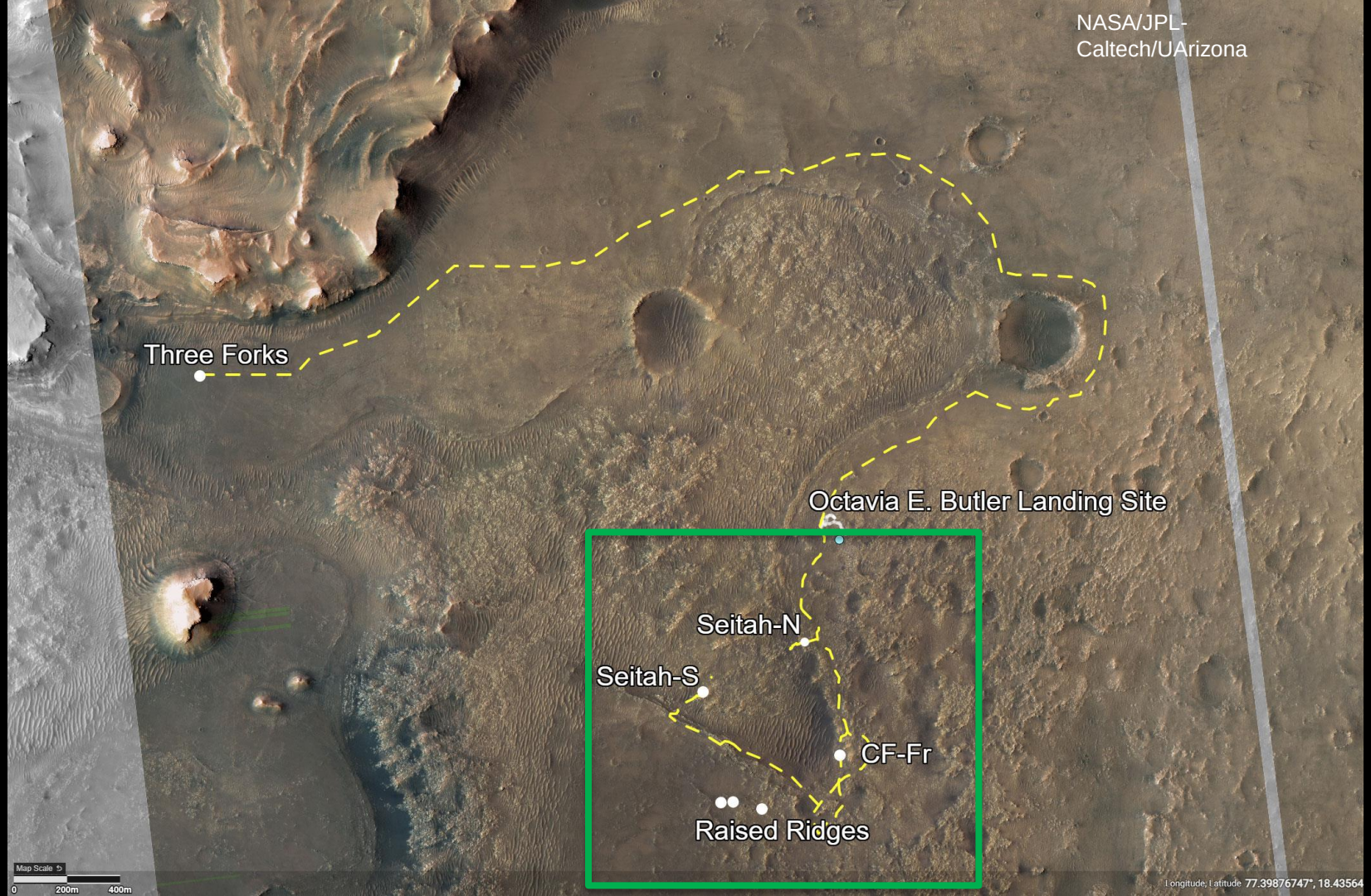
Compiled by Justin Maki

# Ingenuity Flights

- 13 flights as of Sept 27
- Technology demonstration complete
- Currently in operations demonstration phase
- Flights extended for foreseeable fu

NASA/JPL-Caltech/ASU/MSSS

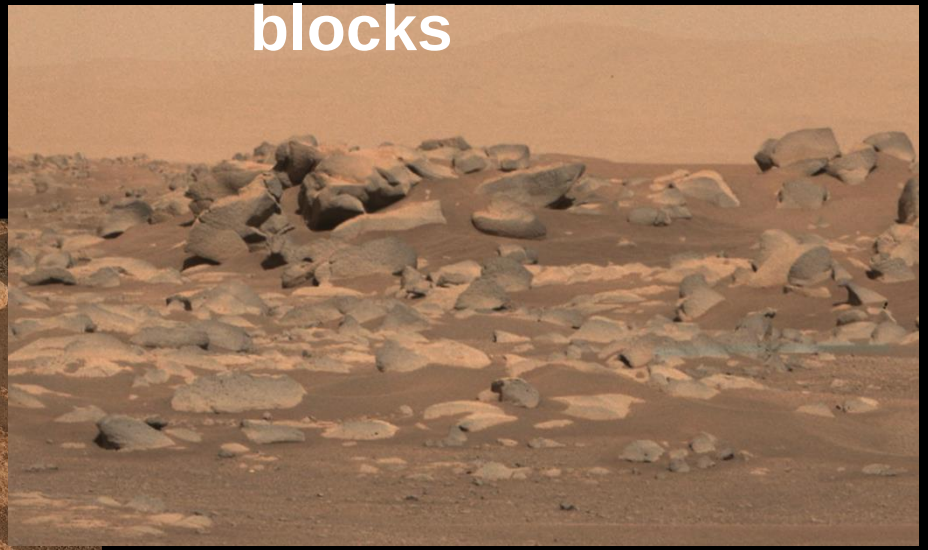
NASA/JPL-


NASA/JPL-
Caltech/UArizona
Three Forks
Octavia E. Butler Landing Site
Seitah-N
Seitah-S
CF-Fr
Raised Ridges
Map Scale
0
200m
400m
Longitude, Latitude 77.39876747°, 18.43564

Octavia E. Butler
Landing Site
Séítah
Perseverance
Ingenuity
0
200m
NASA/JPL-

Stack et al. (2020)
M2020 Science Team Map
Crater floor fractured rough
(Cf-fr)
Crater floor fractured 1
(Cf-f-1)
Perseverance
Ingenuity
0
200m

## Massive high-relief blocks



Mastcam-Z
Sol 4
Checkout Stereo Mosaic
NASA/JPL-Caltech/ASU/MSSS

## Low-relief "pavers"

Mastcam-Z
Sol 66
Workspace Mosaic
NASA/JPL-Caltech/ASU/MSSS

NASA/JPL-
Caltech/UArizona
Octavia E. Butler
Landing Site
Séítah
Perseverance
Ingenuity
0
200m
Roubion: 1st abrasion and sample attempt

# First Abrasion on Mars: Guillaumes

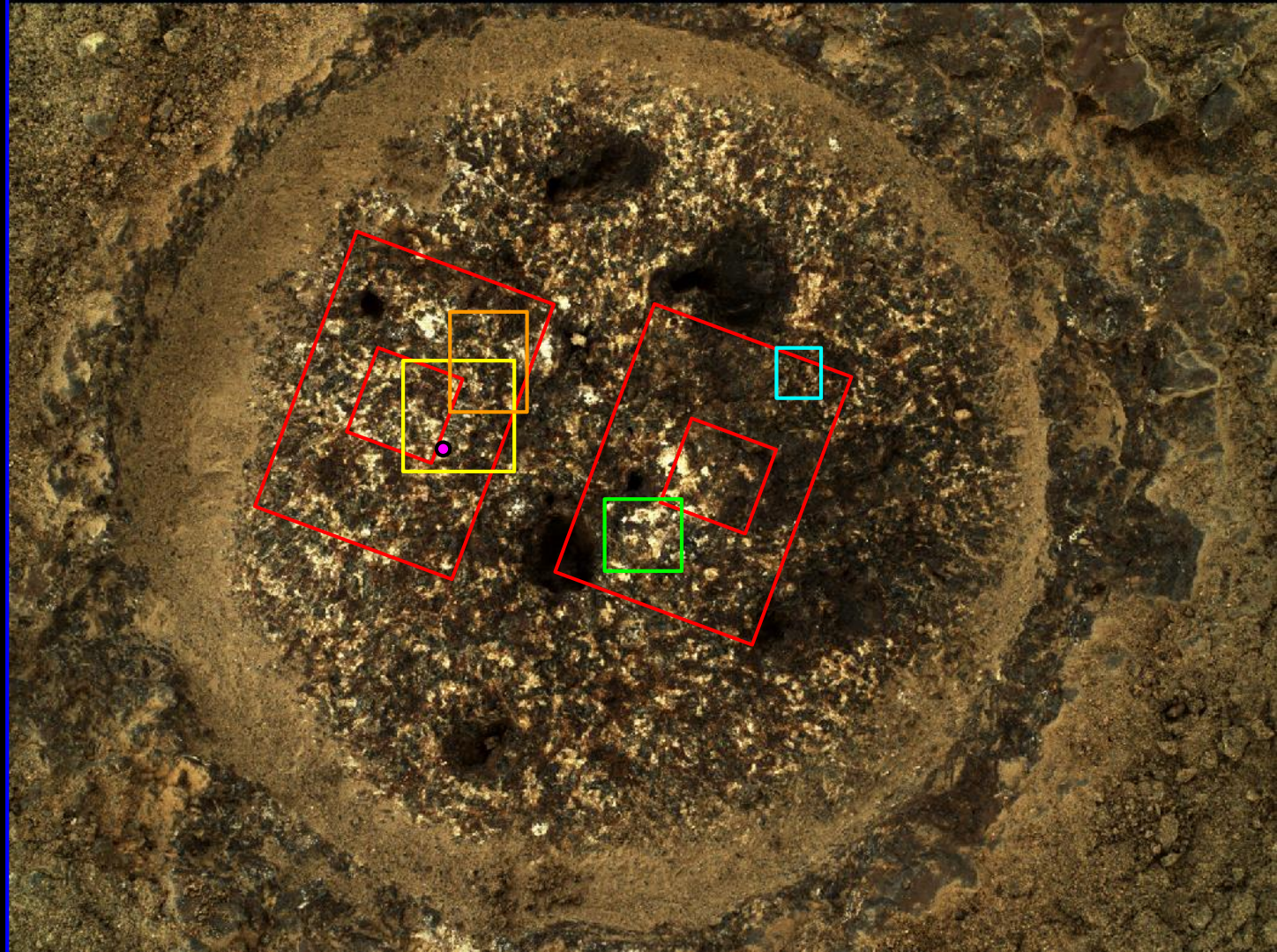
Mastcam-Z
Sol 157
Drill FTA Parking Location
NASA/JPL-Caltech/ASU/MSSS

NASA/JPL-Caltech/MSSS

# Guillaumes Observations

WATSON
SHERLOC
ACI+Spectroscopy
PIXL

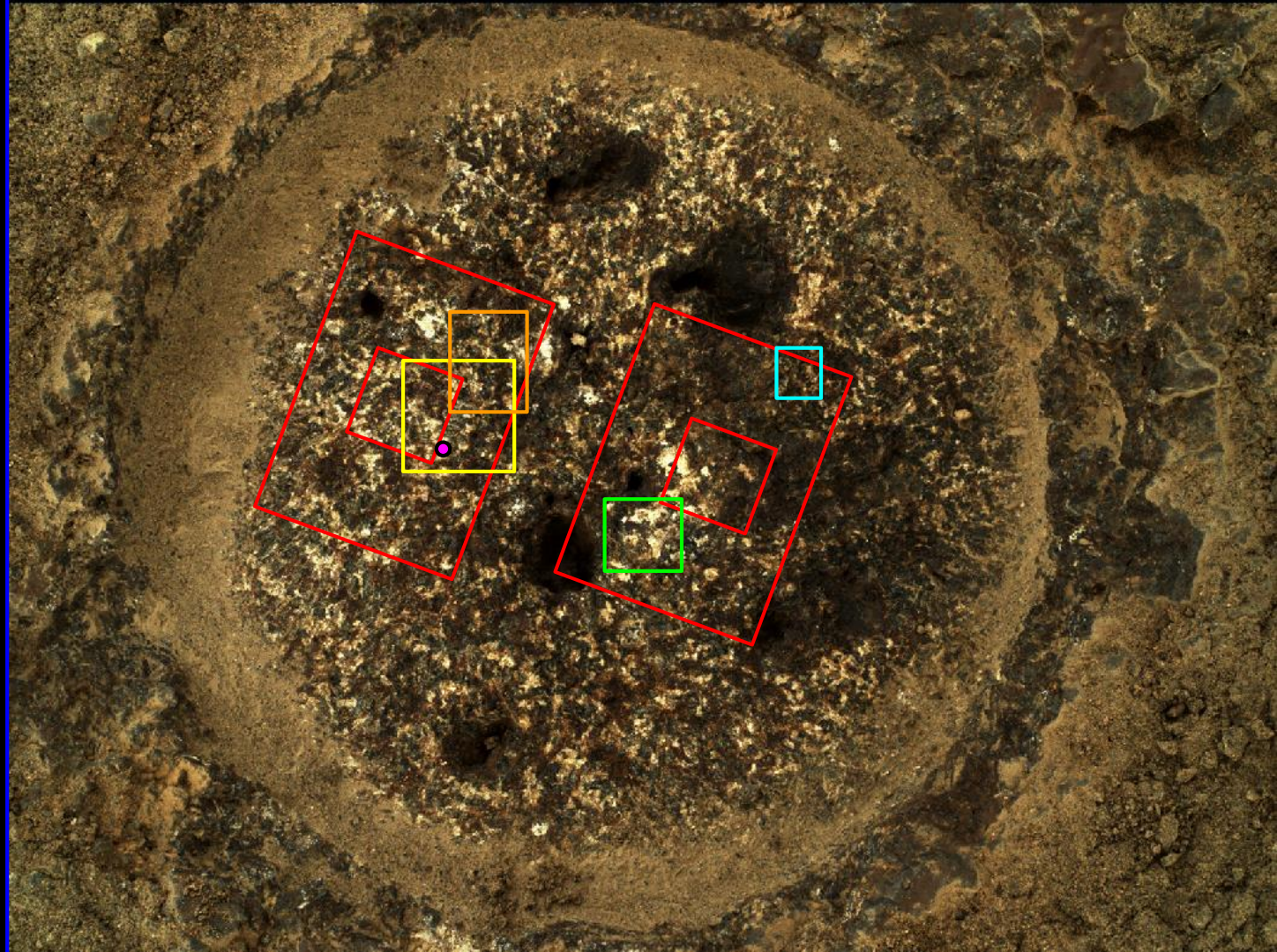
SCAM All Techniques
SCAM All Techniques
SCAM RAMAN/LIBS
feldspar
SCAM All Techniques



NASA/JPL-Caltech/MSSS

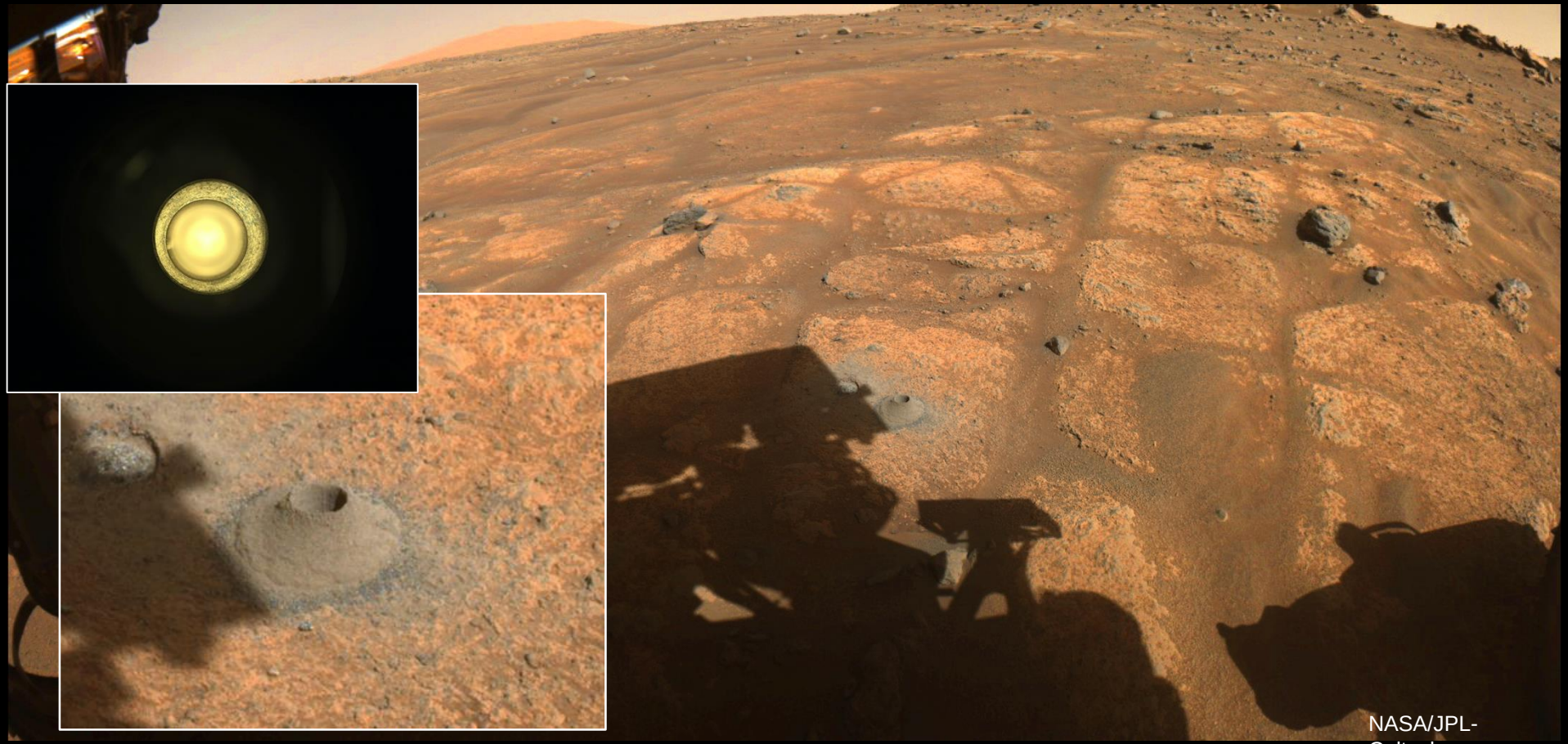
# Guillaumes Observations

- Mafic composition
- Salts: NaCl and $CaSO_4$
- Fe-oxides
- Silicates: plagioclase + pyroxene
- Other: apatite, possible Mg-carbonate

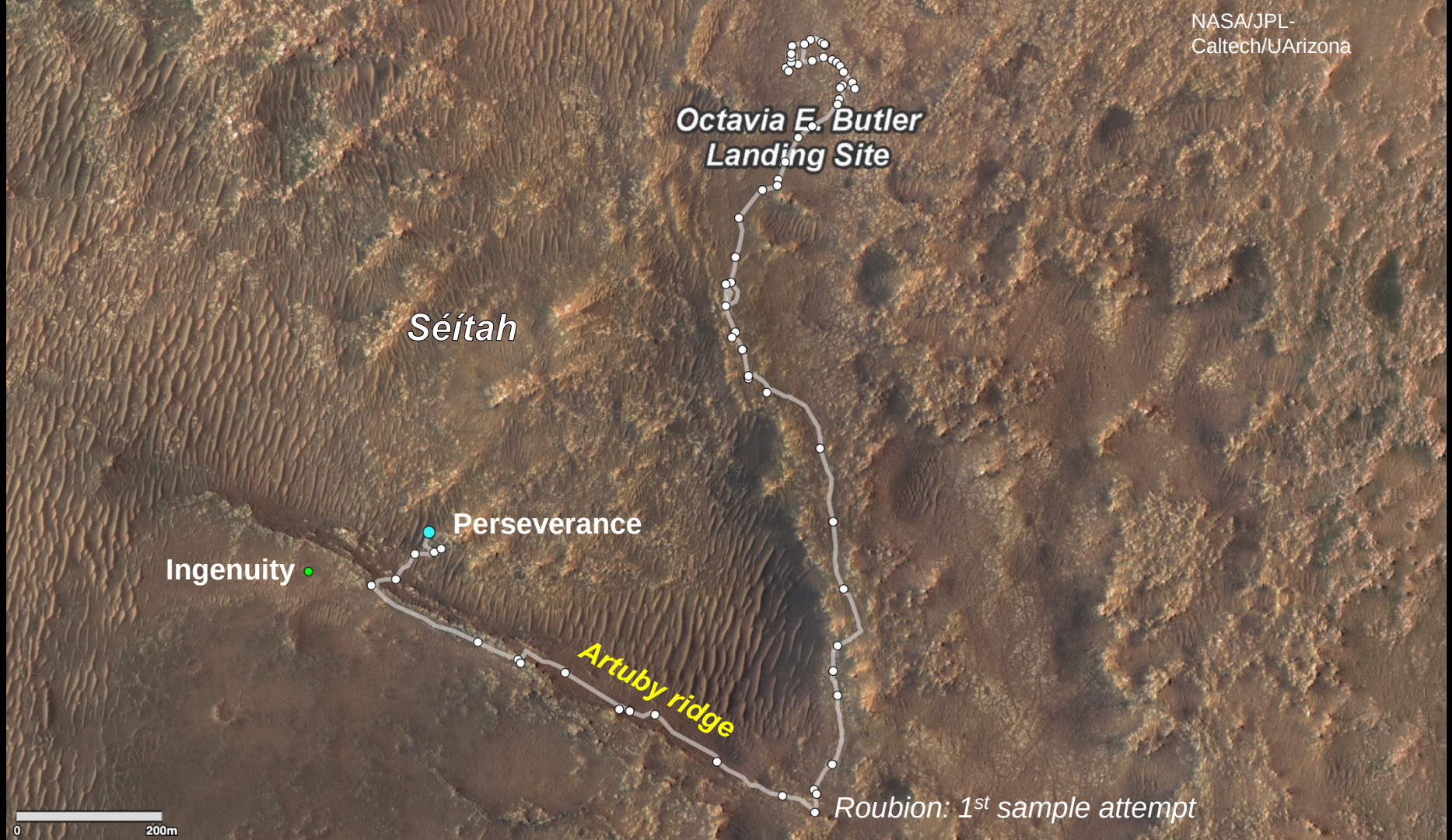


NASA/JPL-Caltech/MSSS

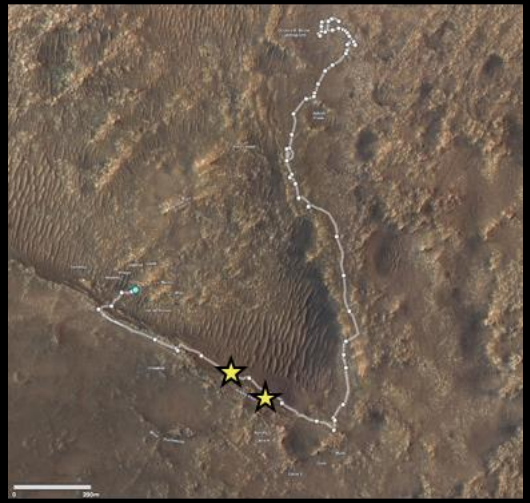
# Roubion Drill Attempt



NASA/JPL-Caltech

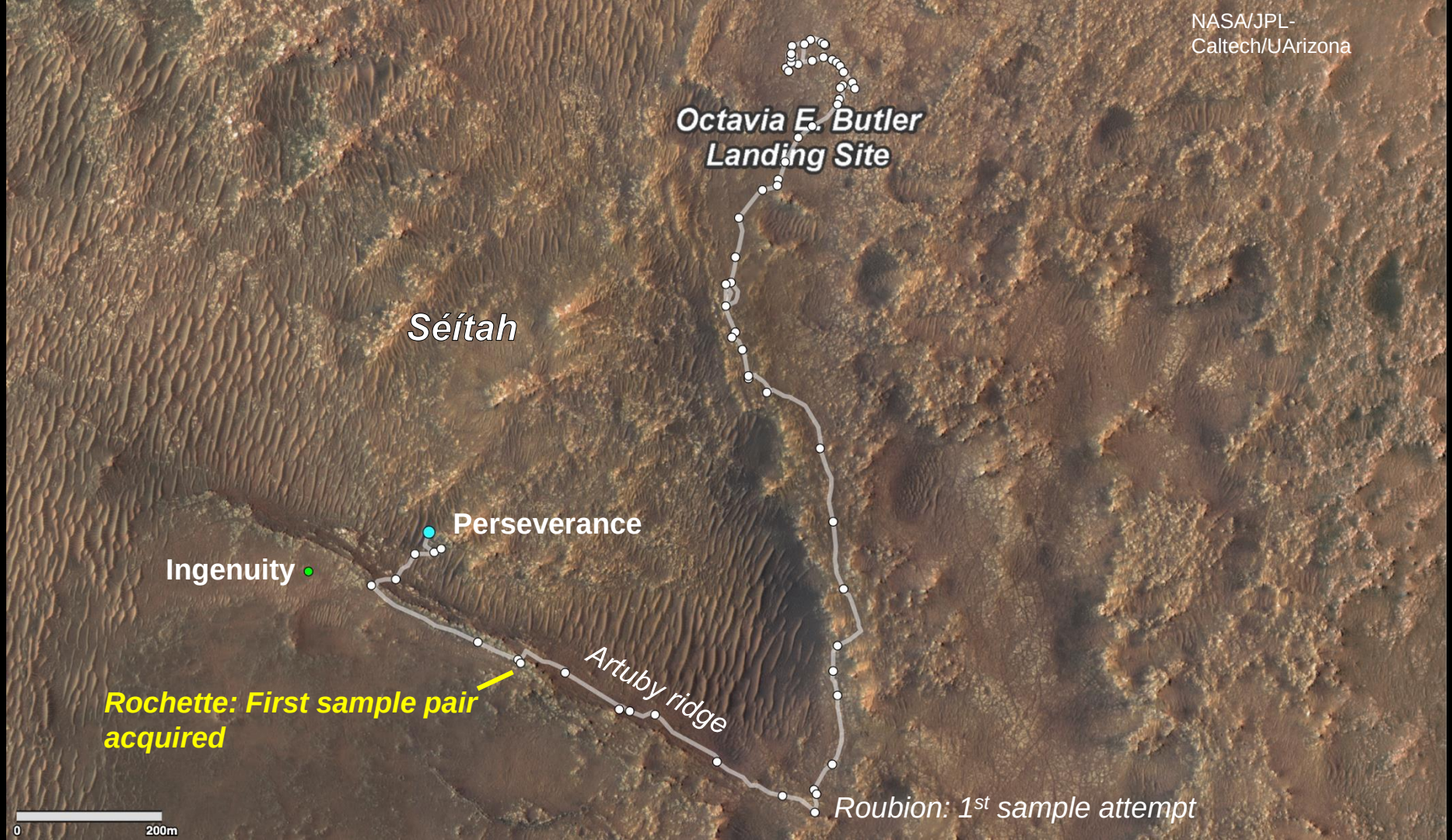

NASA/JPL-
Caltech/UArizona
Octavia E. Butler
Landing Site
Séítah
Perseverance
Ingenuity
Artuby ridge
Roubion: 1st sample attempt
0
200m

# Layered Rocks of Artuby Ridge



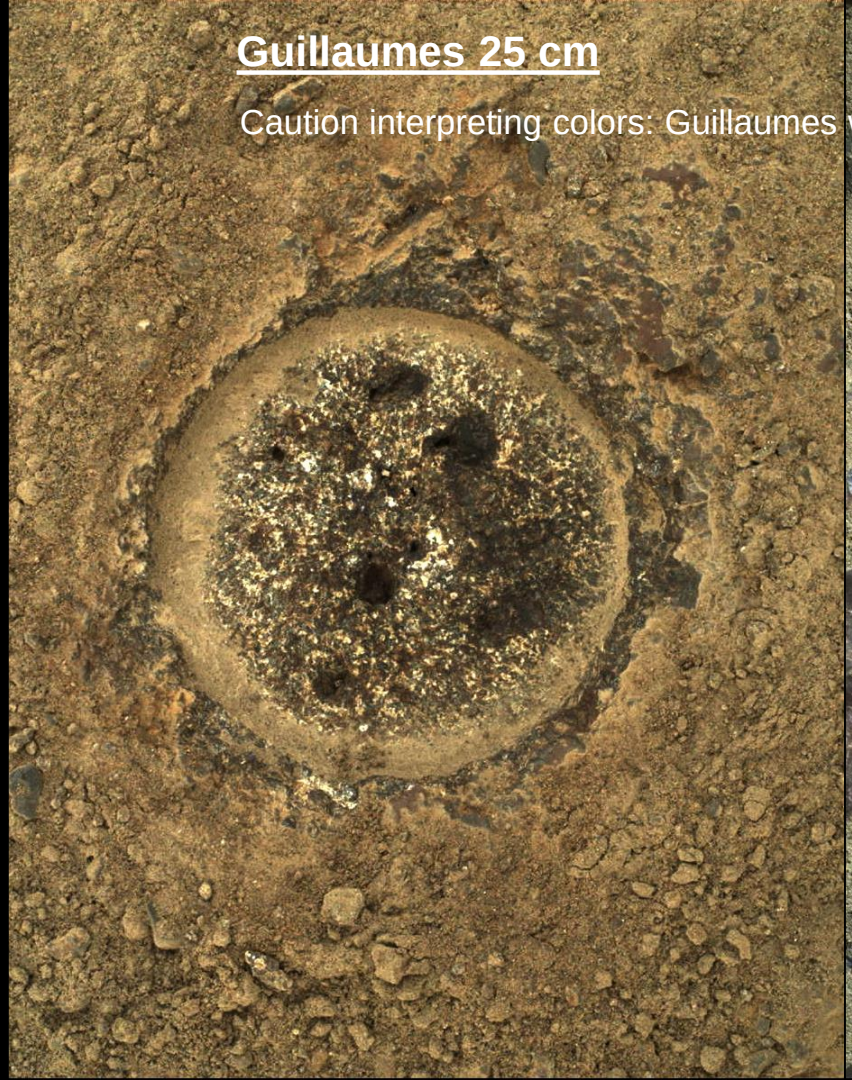
Navcam
Sol 175
Artuby “116”
NASA/JPL-Caltech

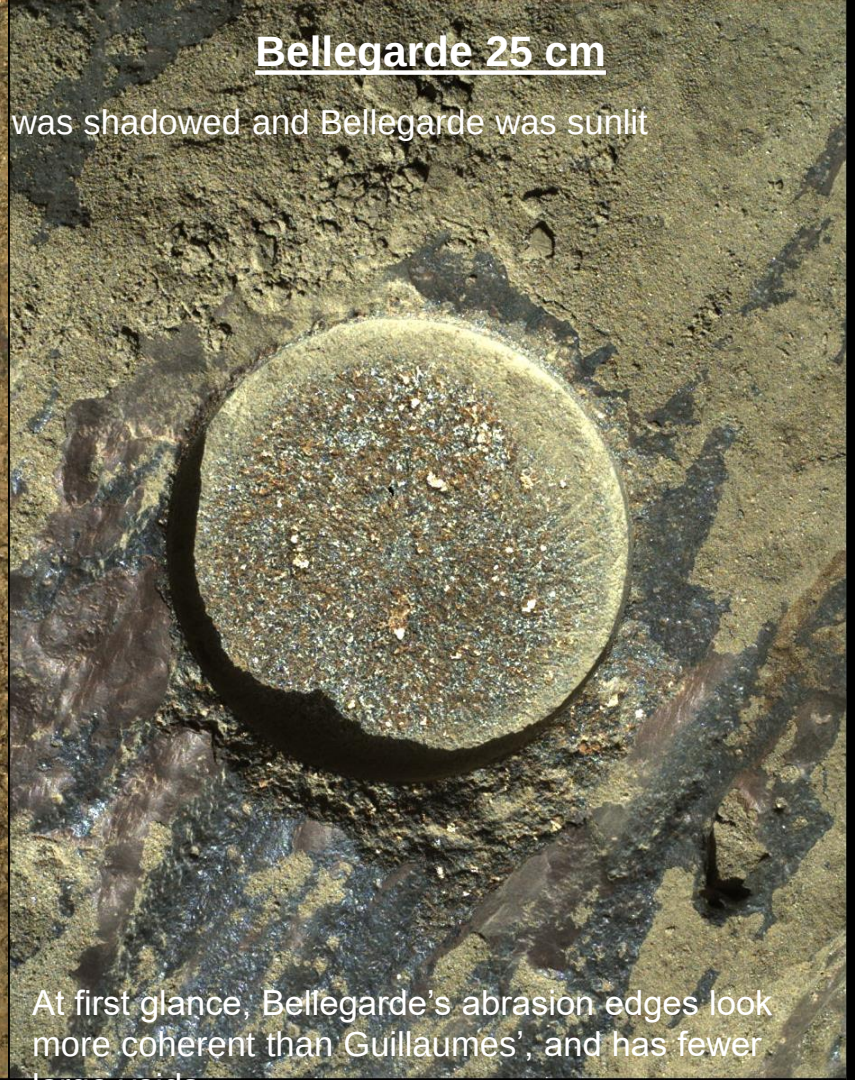
Mastcam-Z
Sol 173
Artuby
NASA/JPL-Caltech/ASU/MSSS


NASA/JPL-Caltech/UArizona
Octavia E. Butler Landing Site
Séítah
Perseverance
Ingenuity
Artuby ridge
Rochette: First sample pair acquired
Roubion: 1st sample attempt
0
200m

# Rochette

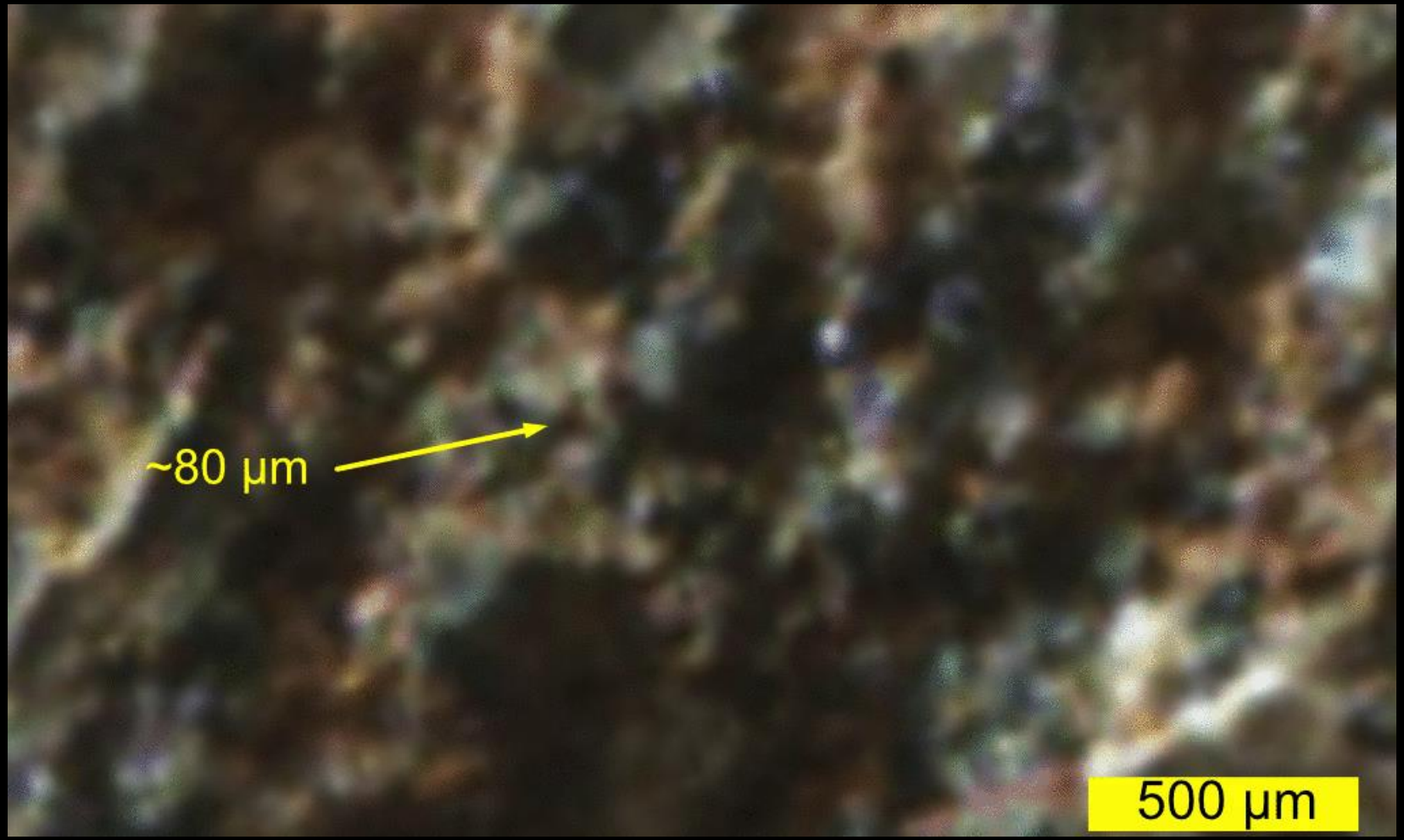
# Bellegarde abrasion on Rochette




Caution interpreting colors: Guillaumes was shadowed and Bellegarde was sunlit

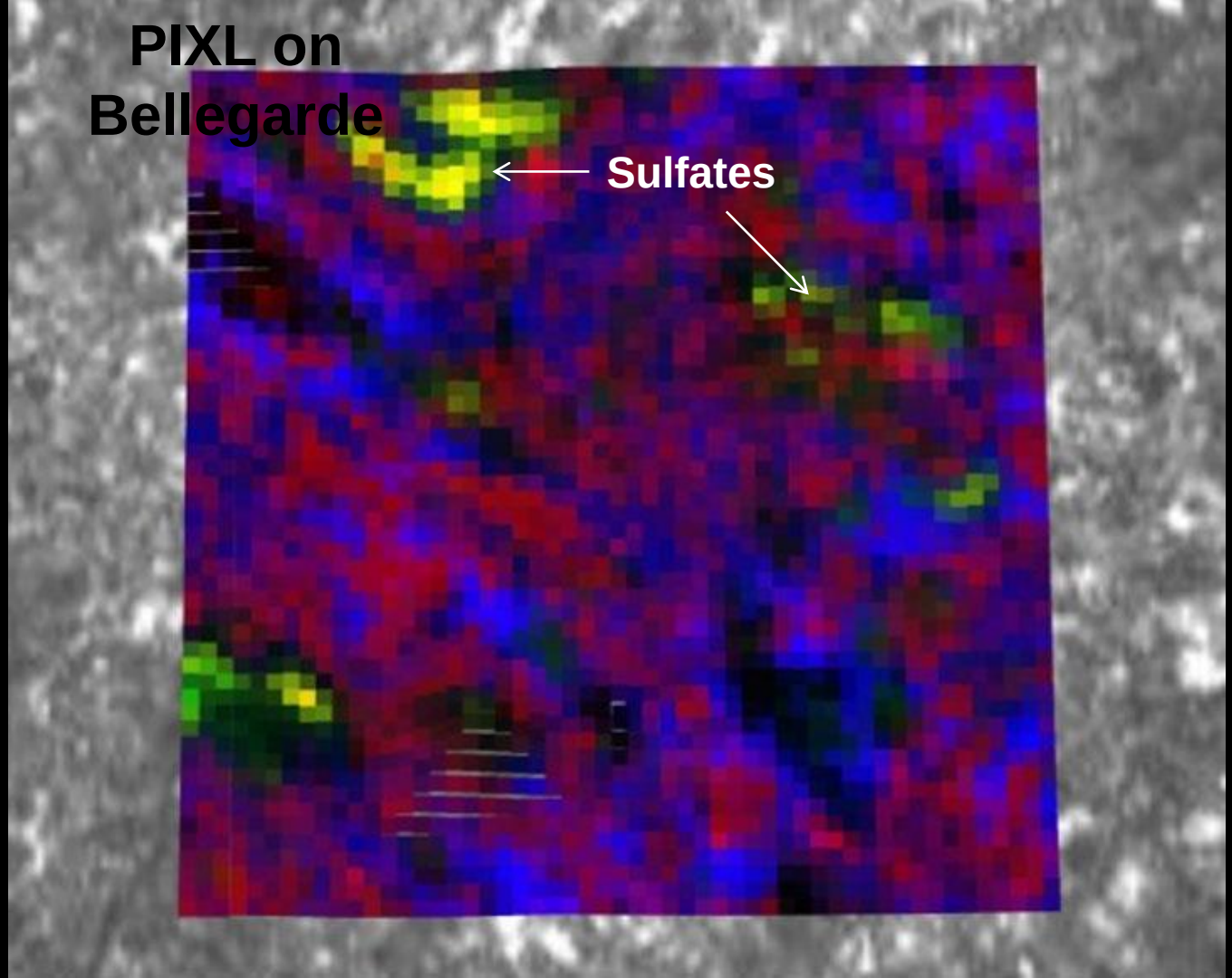
At first glance, Bellegarde's abrasion edges look more coherent than Guillaumes', and has fewer




Blink between SHERLOC ACI and WATSON focus merge

NASA/JPL-Caltech/MSSS

# PIXL on Bellegarde




NASA/JPL-Caltech/DTU/WSU/QUT

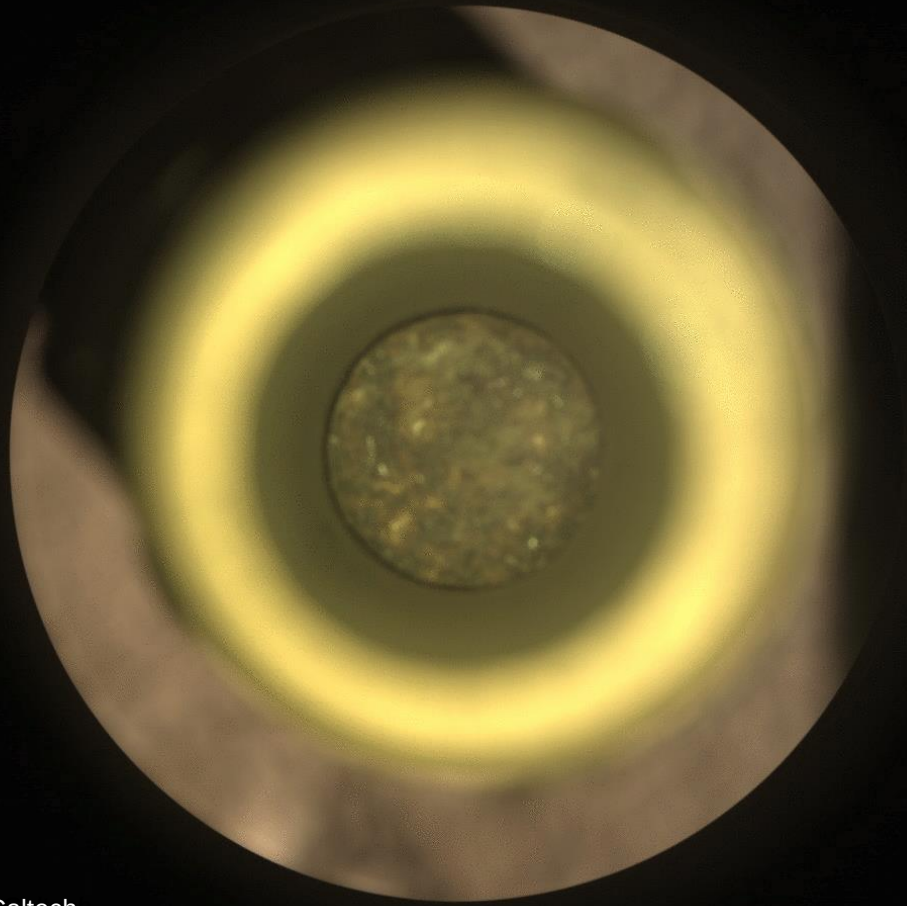
# Montdenier Drill

NASA/JPL-Caltech

# Montdenier Drill Success: First rock sample

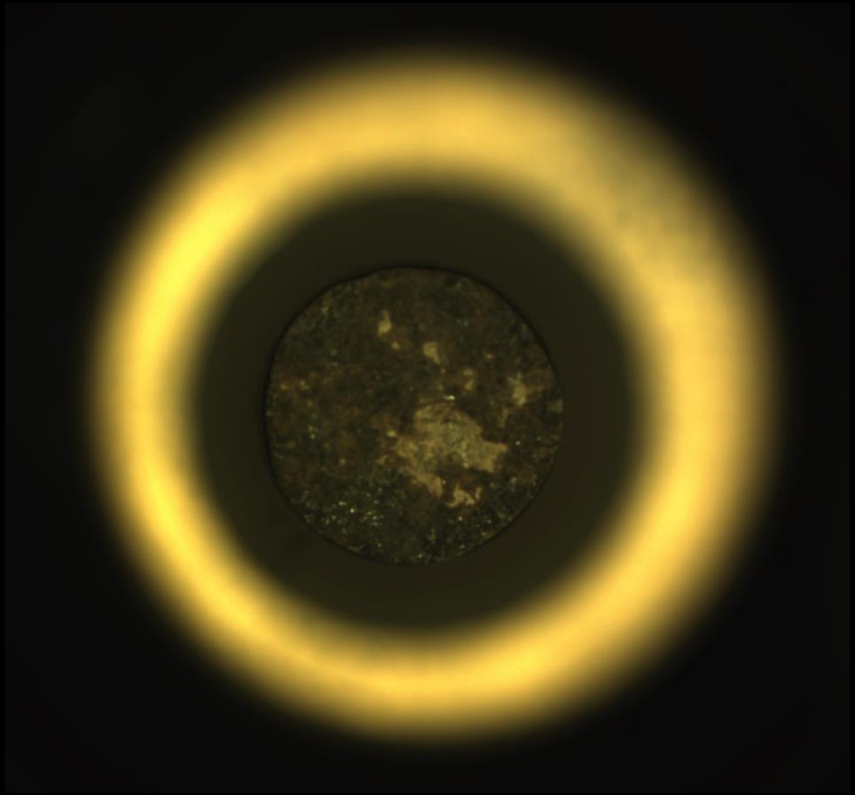
NASA/JPL-Caltech/ASU/MSSS

# First Mars Rock Sample is Sealed in Tube 266



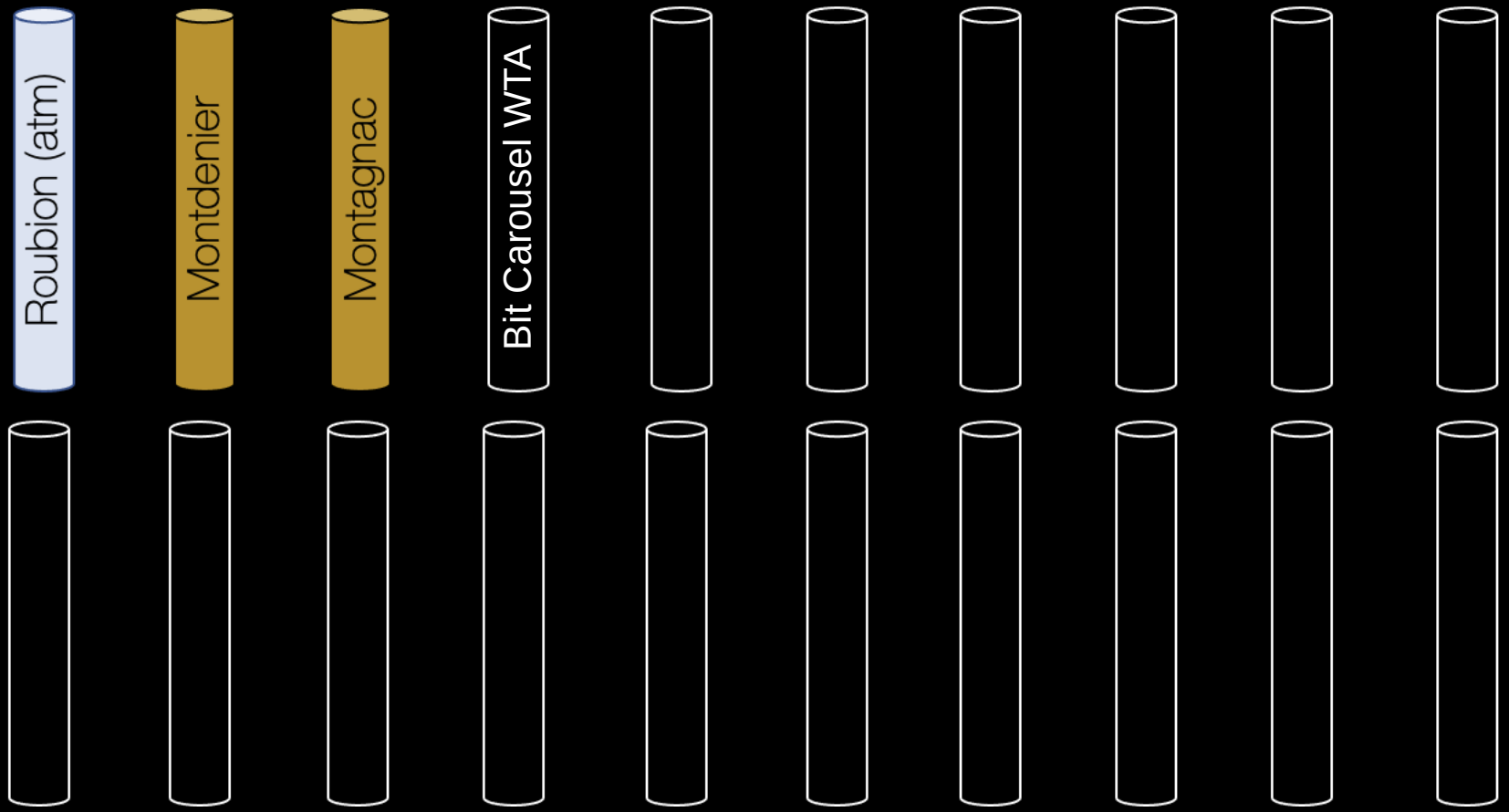
NASA/JPL-Caltech

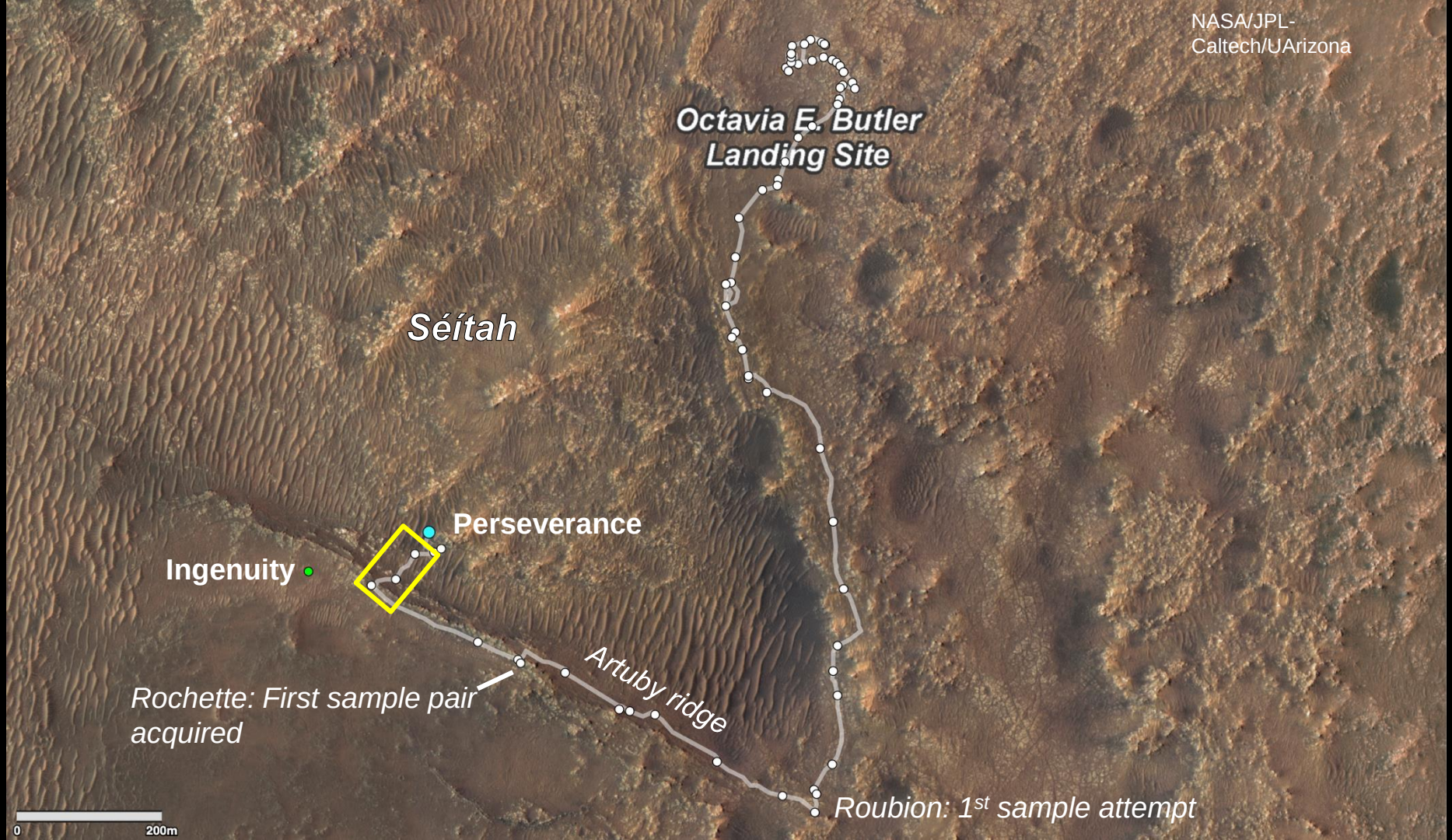
# Paired Sample Montagnac from Rochette



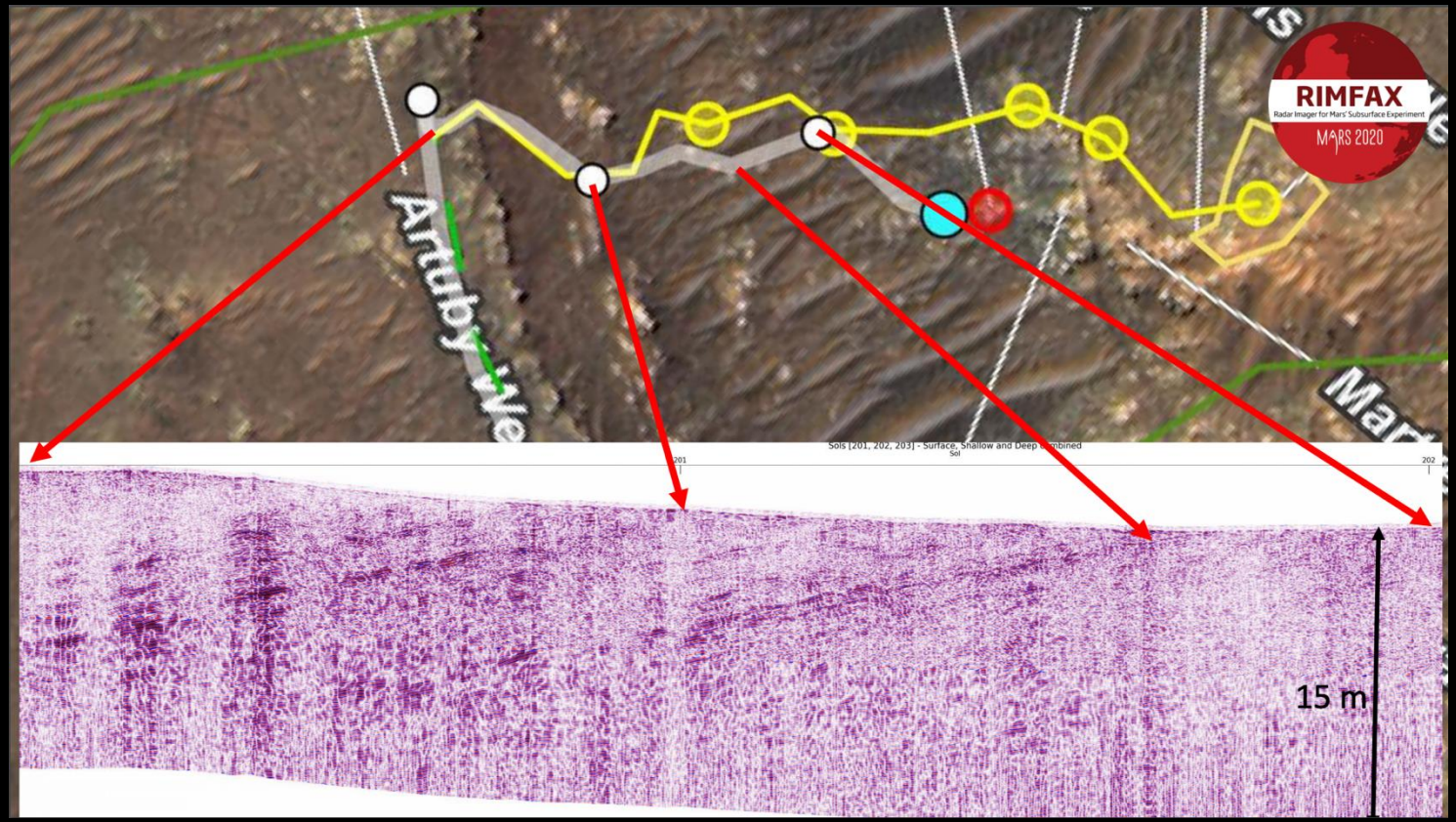
NASA/JPL-Caltech

# Perseverance's Jezero Sample Collection




NASA/JPL-Caltech/UArizona
Octavia E. Butler Landing Site
Séítah
Perseverance
Ingenuity
Artuby ridge
Rochette: First sample pair acquired
Roubion: 1st sample attempt
0
200m

# Subsurface structure observed with RIMFAX




NASA/JPL-Caltech/FFI/Svein-Erik Hamran

# Garde Abrasion in Séítah

SHERLOC WATSON
Sol 206
Garde
NASA/JPL-Caltech/MSSS/Edgett

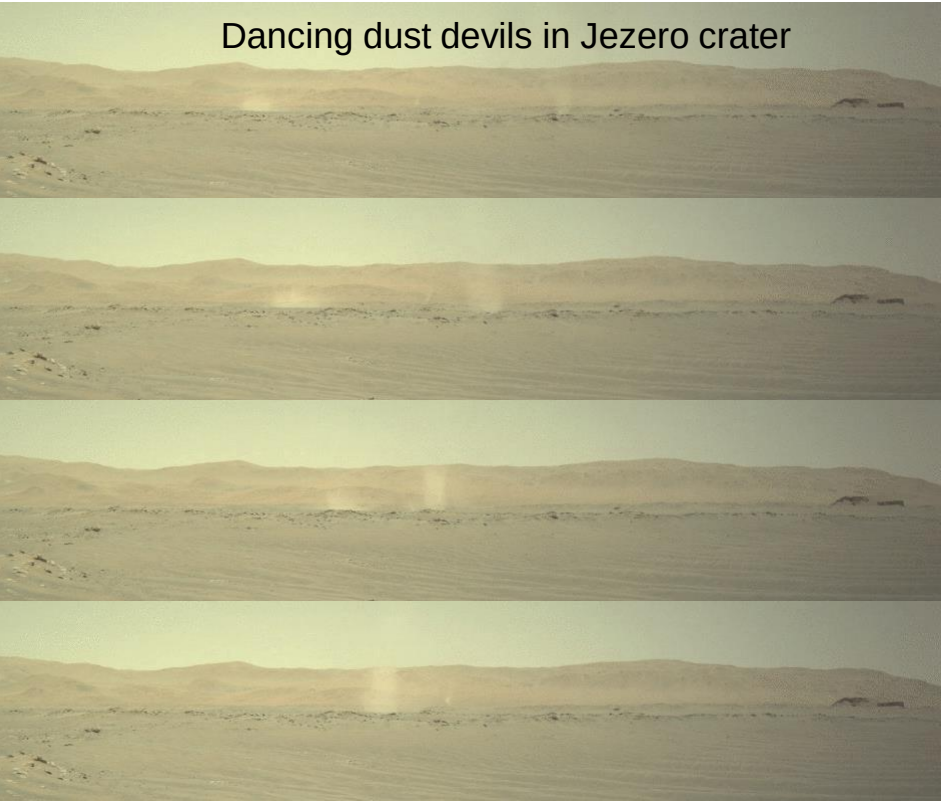
Mastcam-Z
Sol 204
Bastide
NASA/JPL-Caltech/ASU/MSSS

# Summary of key atmospheric science results in the first 190 sols

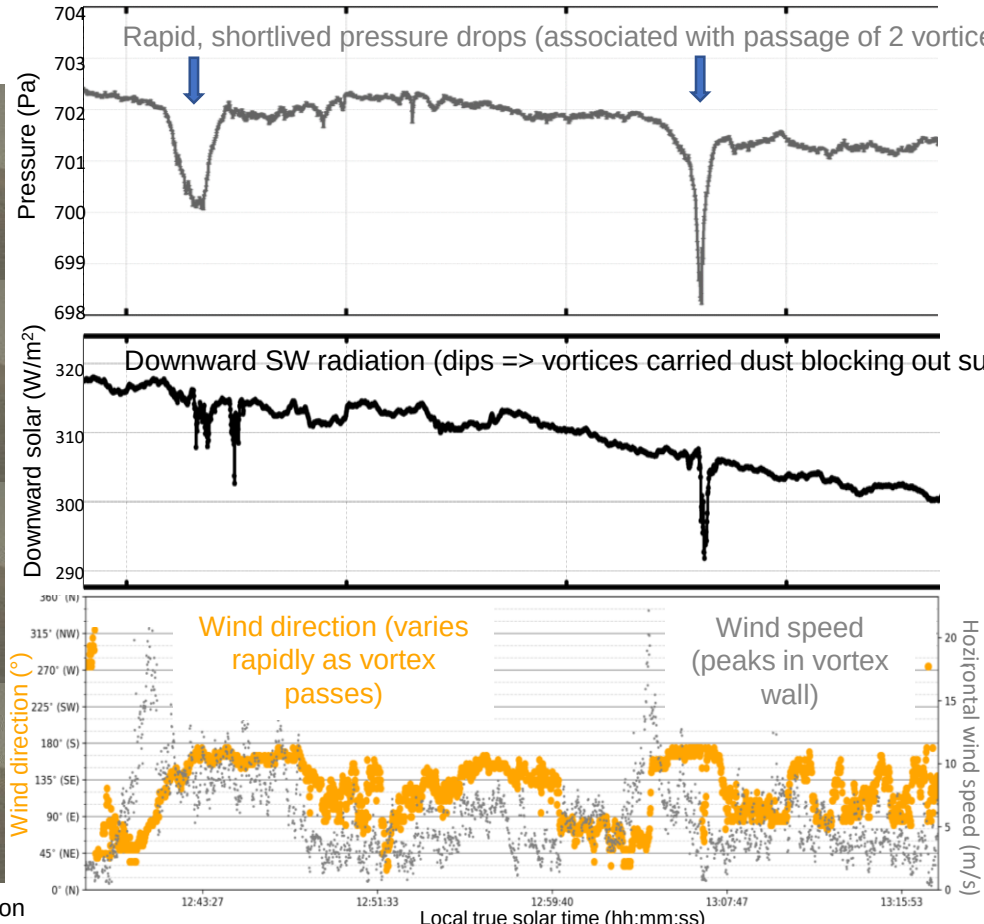
- Mars Environmental Dynamics Analyzer (MEDA):
  - Numerous convective vortices identified and (new!) identified as clear or dusty using MEDA thermal and solar radiation sensors => insight into causes of convection and dust lifting
  - Variation of daily pressure cycle with season allowing comparisons with climate models
  - Daily cycle of wind data => dominance of Isidis basin slope flows, moderated by global circulation
  - Pressure cycle fluctuations => links to north polar cap baroclinic wave activity seen from orbit
- SuperCam microphone provides information on turbulence and gustiness (new!)
- Mastcam-Z provides more accurate column opacity and other aerosol properties, plus images and video of atmospheric phenomena (clouds, dust devils, dust lifting) and surface changes:
  - Also captured dust lifting by Ingenuity helicopter => link to wind speeds generated by rotor blades
- Navcam provides imaging of atmospheric phenomena and surface changes:
  - Many dust devils => link characteristics (height, dust content, motion) to environmental

# A highly dynamic atmospheric and aeolian environment

## Connecting dust lifting to the properties of vortices




Mars Environmental Dynamics Analyzer (MEDA) sensor d

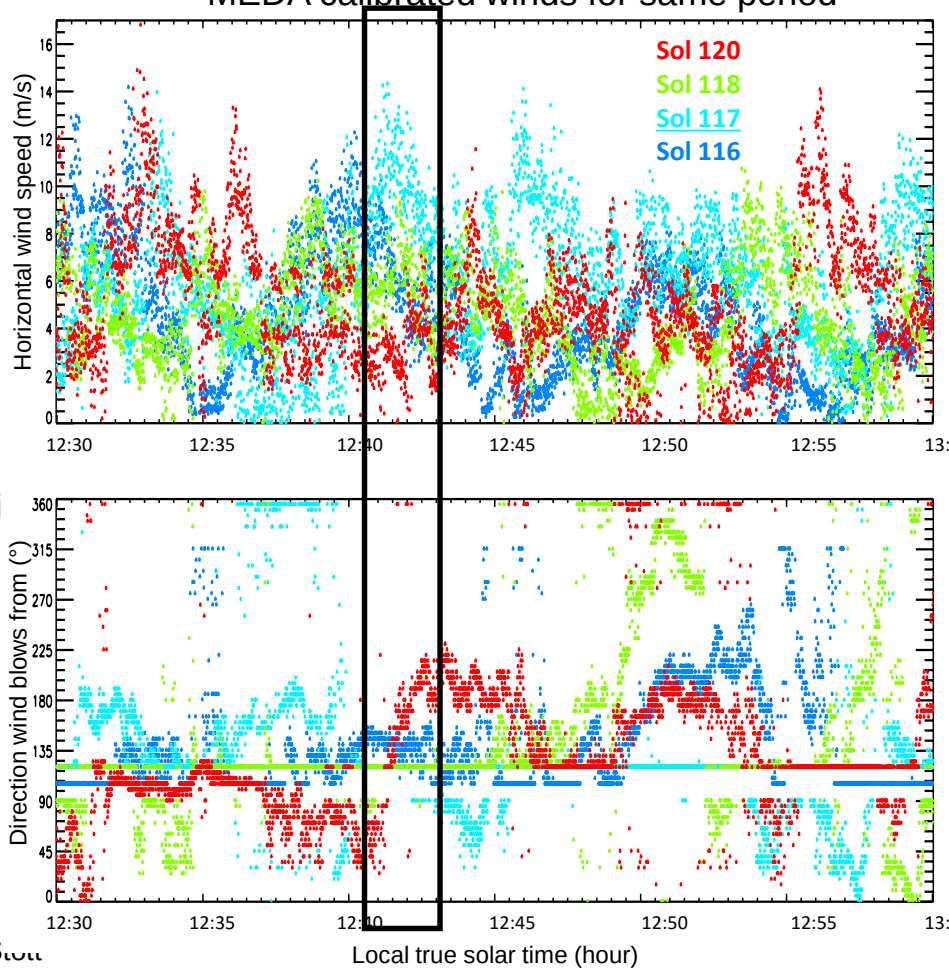



Figures and enhanced images courtesy Ricardo Hueso, Asier Munguira, & Mark Lemmon

# A highly dynamic atmospheric and aeolian environment

## Connecting dust lifting to measured winds and gustiness

MEDA calibrated winds for same period




SuperCam microphone recordings during same peri

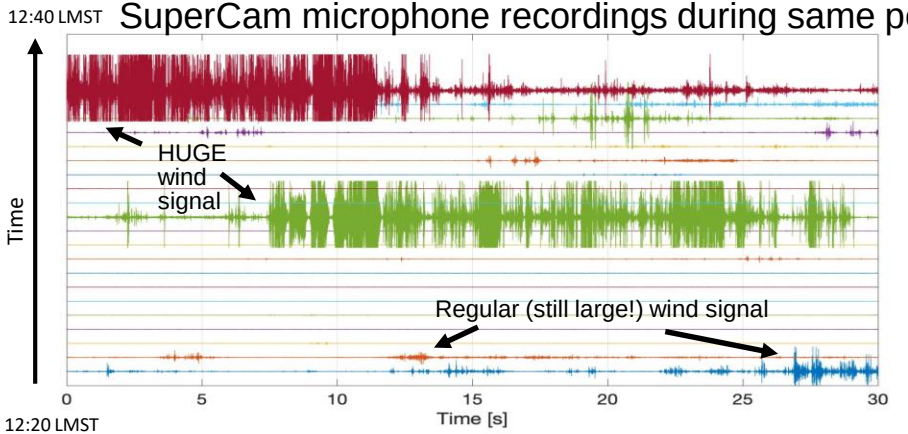



Figure courtesy Naomi Murdoch, David Mimoun, and Alex Stott

# First Look at the Jezero Delta

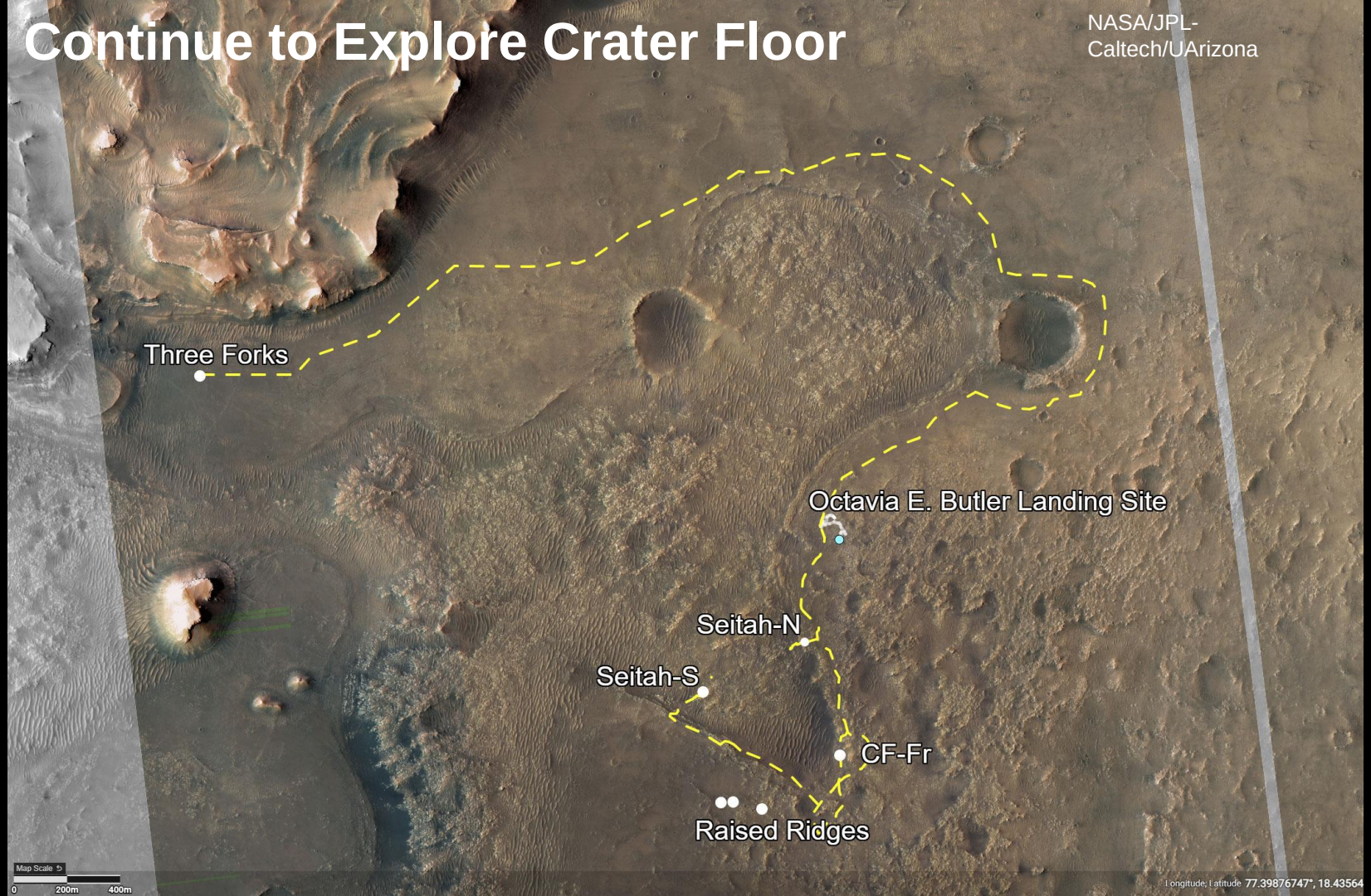
NASA/JPL-Caltech/LANL/CNES/CNR

NASA/JPL-Caltech/ASU/MSSS

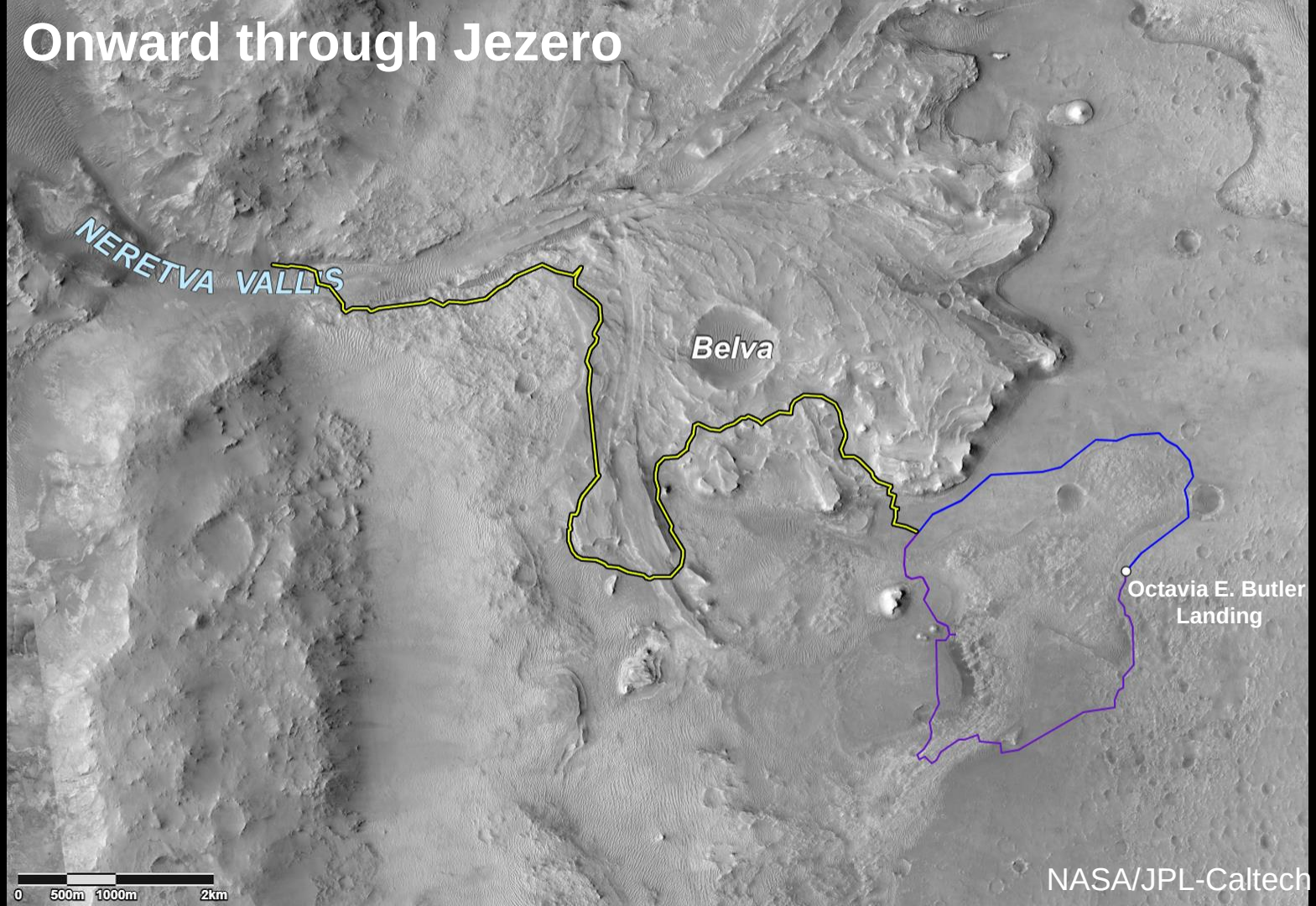
Mangold, Gupta, et al.
Accepted to *Science*

# Continue to Explore Crater Floor

NASA/JPL-Caltech/UArizona



# Onward through Jezero




NASA/JPL-Caltech

Jet Propulsion Laboratory
California Institute of Technology

jpl.nasa.gov

mars.nasa.gov/perseverance

@NASAPersevere