# TextureCam: Onboard Image Analysis for Rapid Astrobiology Surveys

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PDS ID 1N134591492EFF1000P1803L0M1

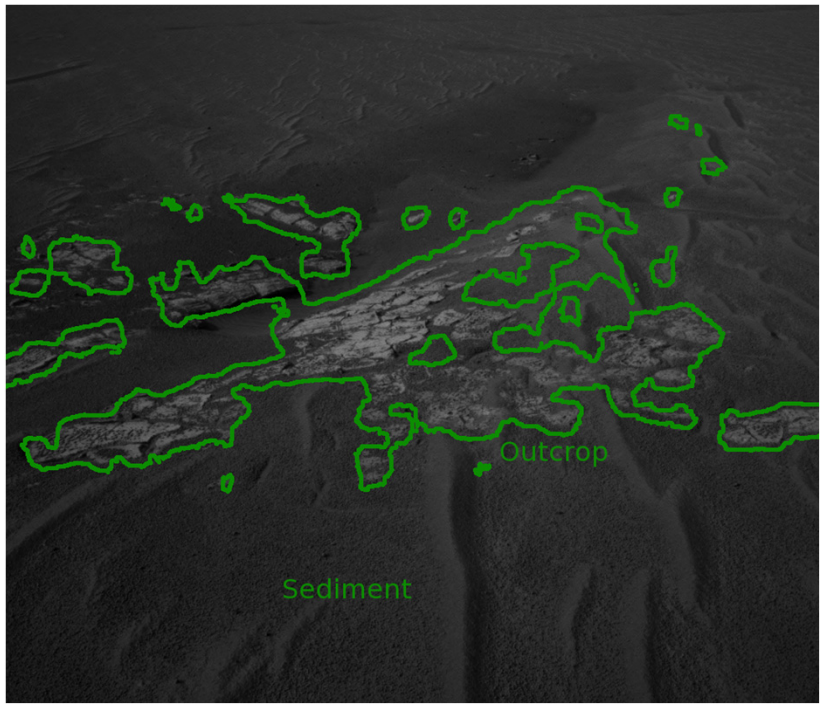
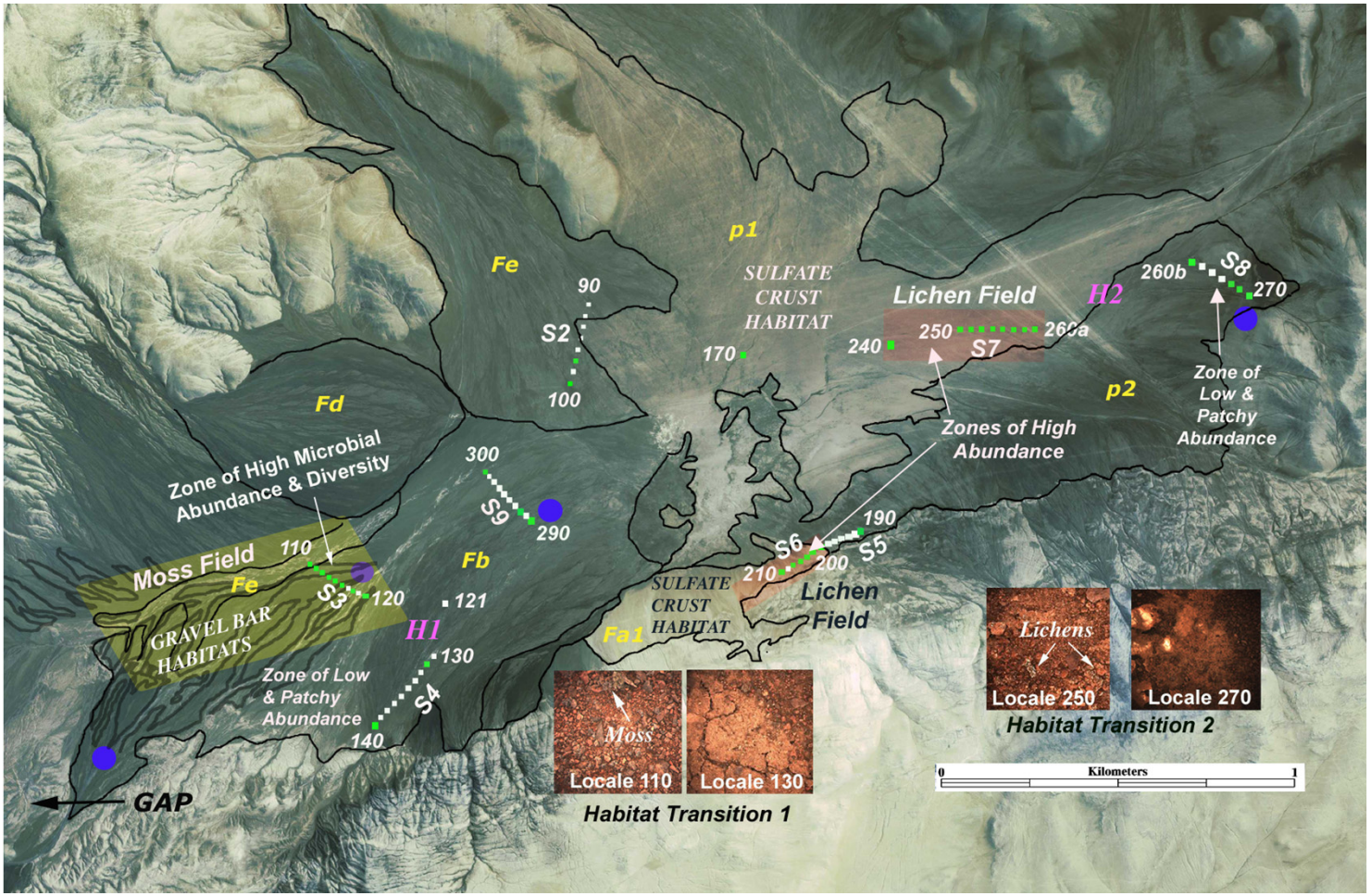



Image Credit: Caltech / NASA / JPL

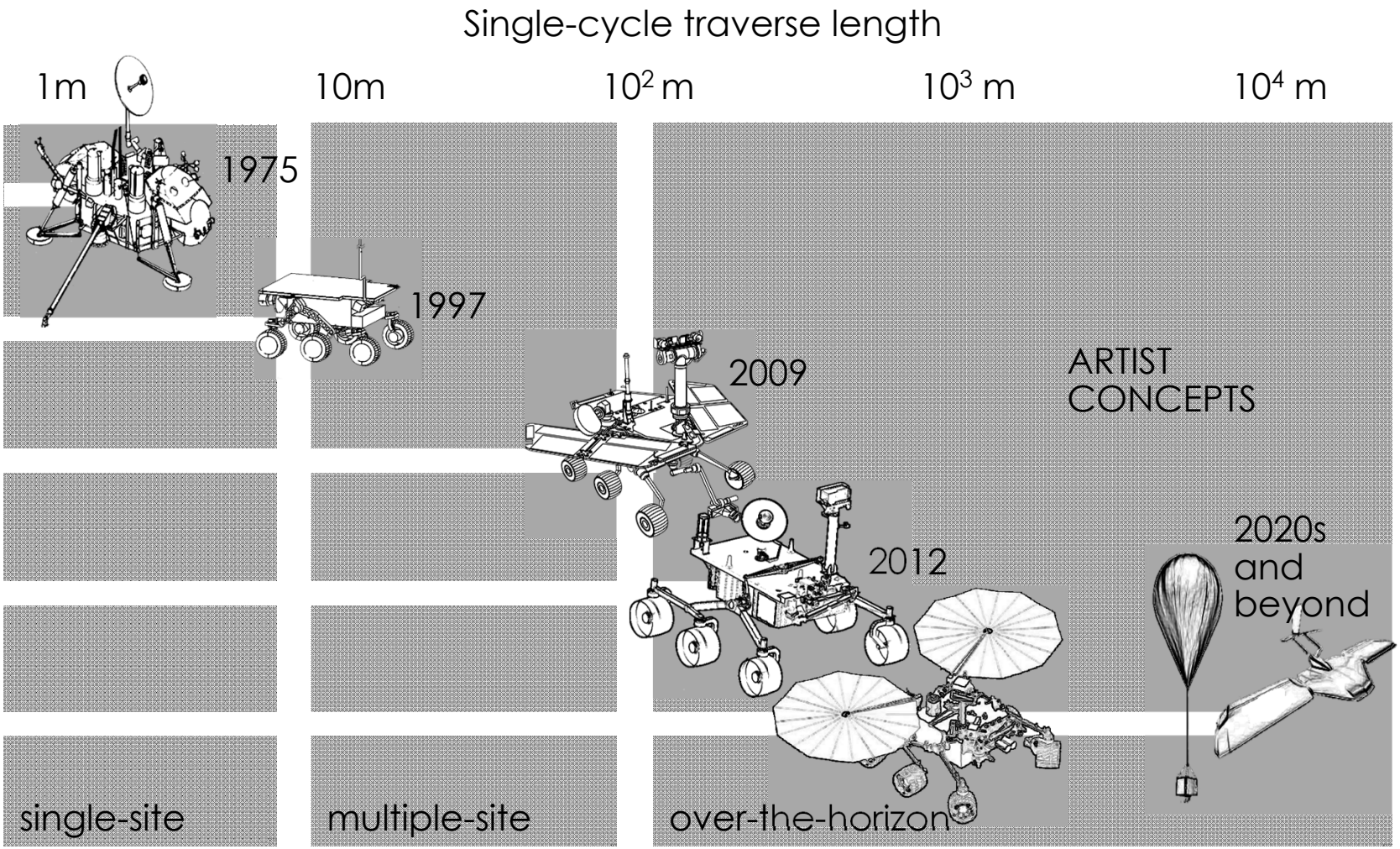
**TextureCam is funded by the NASA Astrobiology Science and Technology Instrument Development program (NNH10ZDA001N-ASTID).** **This presentation copyright 2012 California Institute of Technology. All Rights Reserved.**

# Extremophile habitat can be sparse

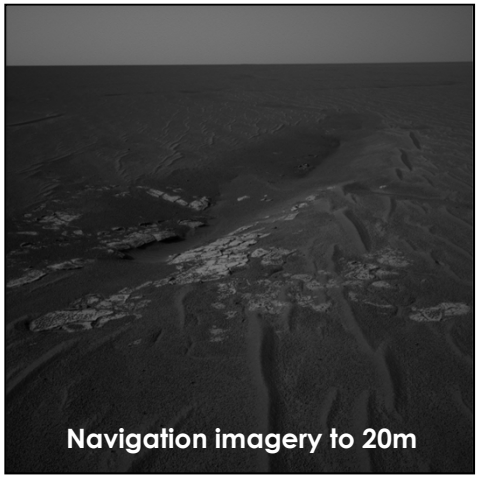



Atacama Desert, Chile [Warren-Rhodes et al., JGR 2007]

# Mobility permits fast reconnaissance



# Multiple scales for a smart camera




Images: Caltech / NASA / JPL / Alliance Space Systems

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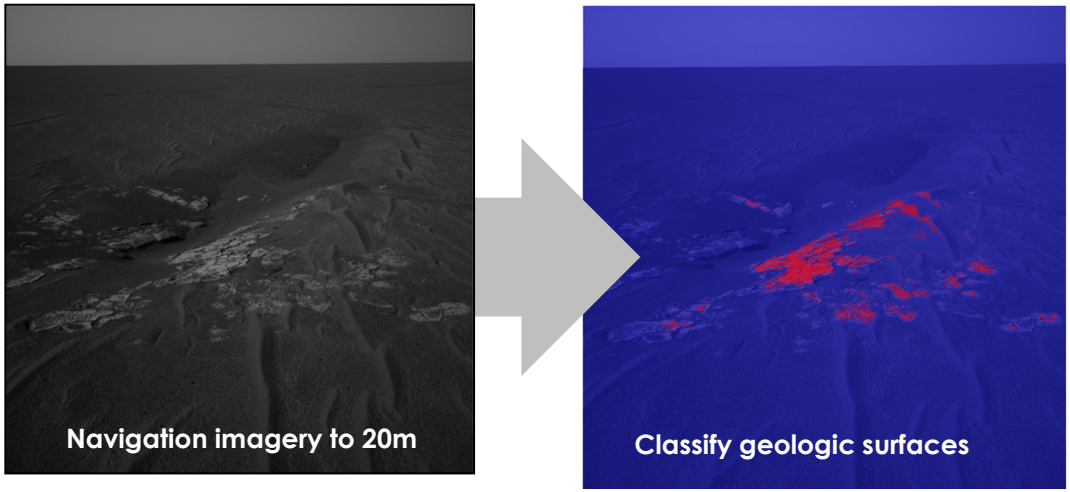


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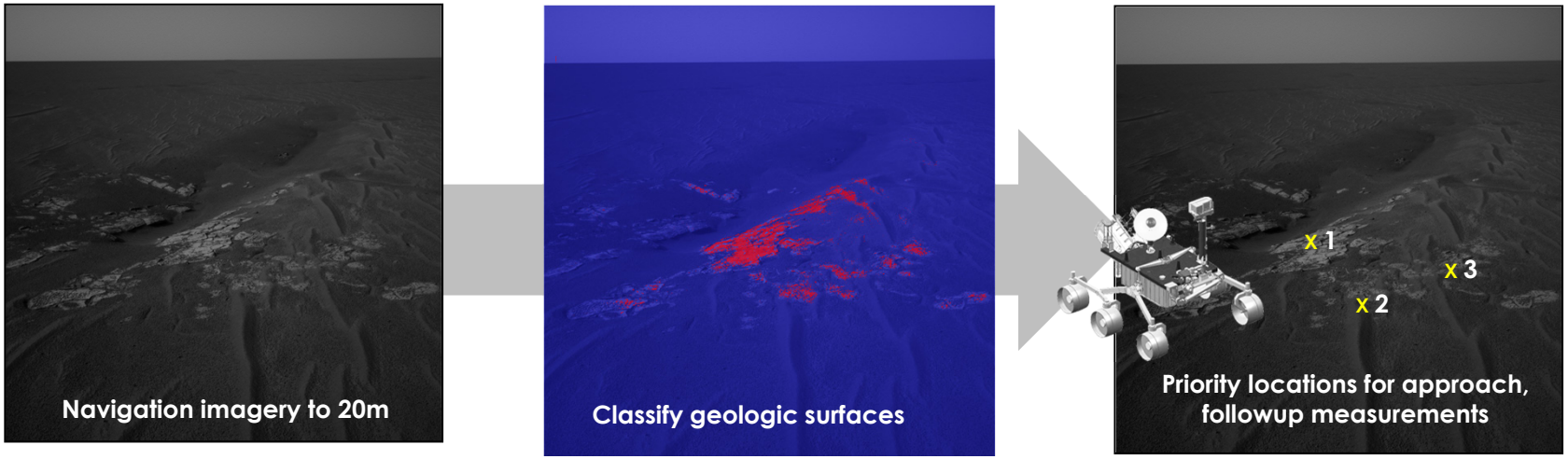


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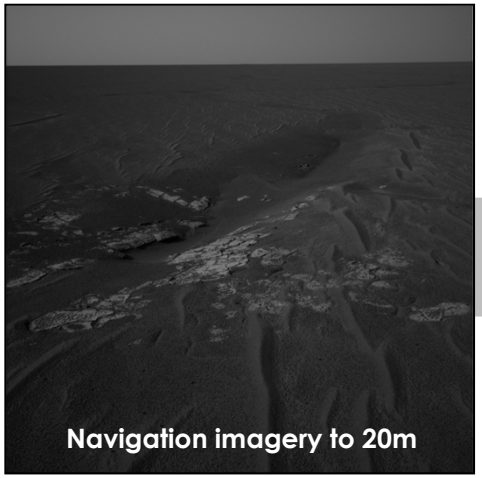


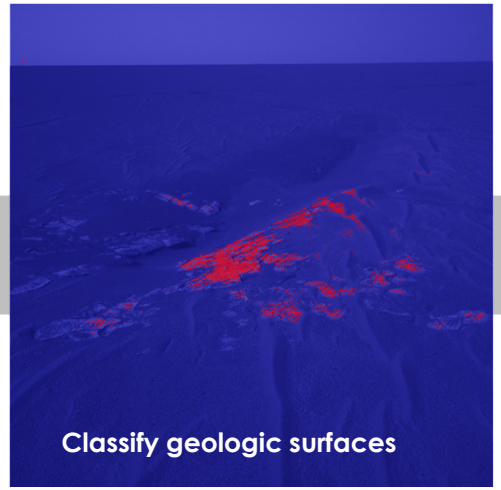


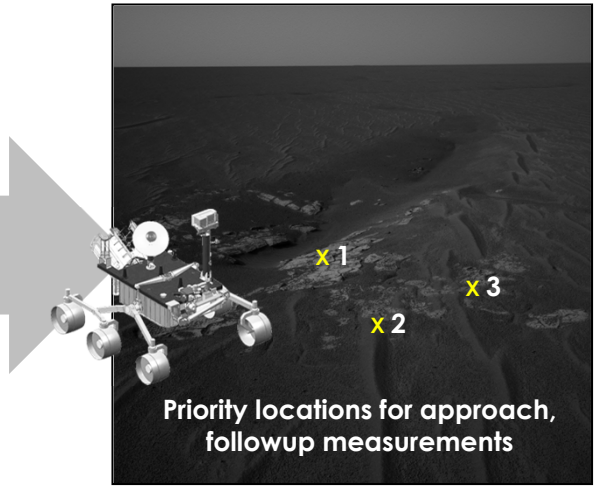


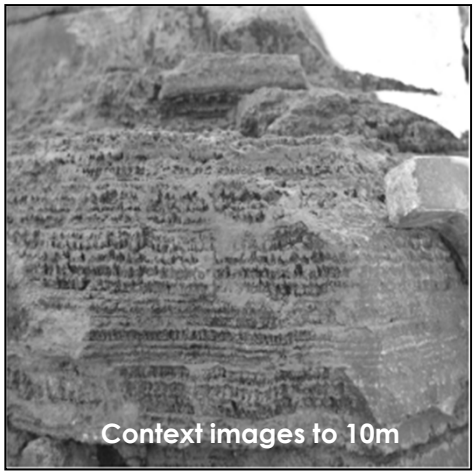


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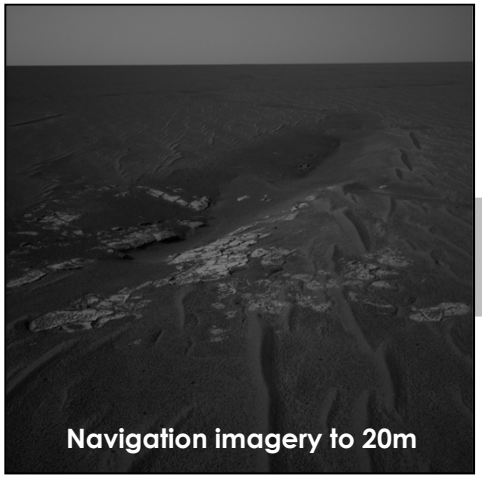


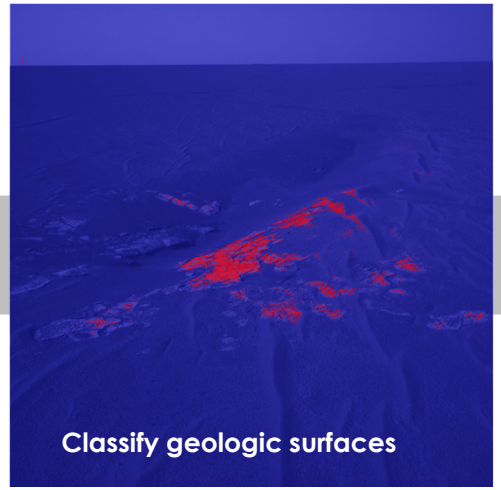


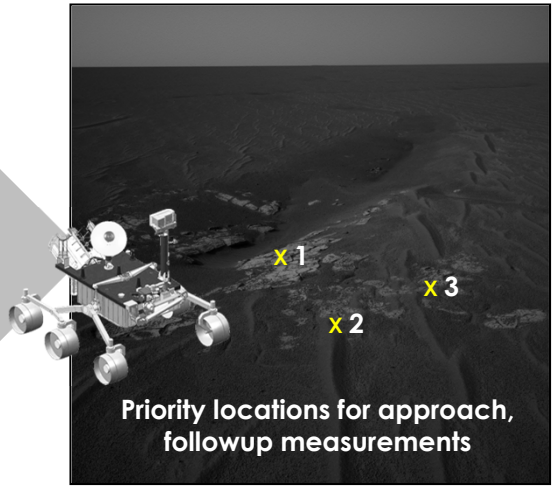


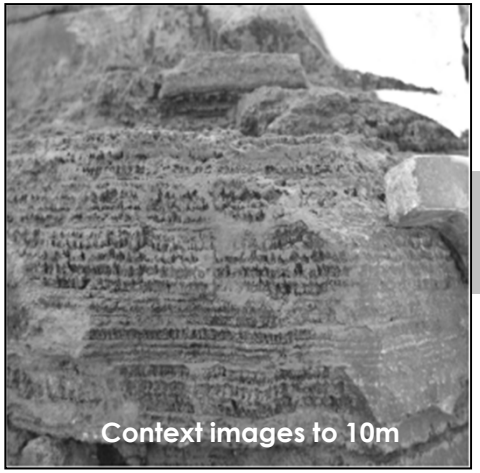


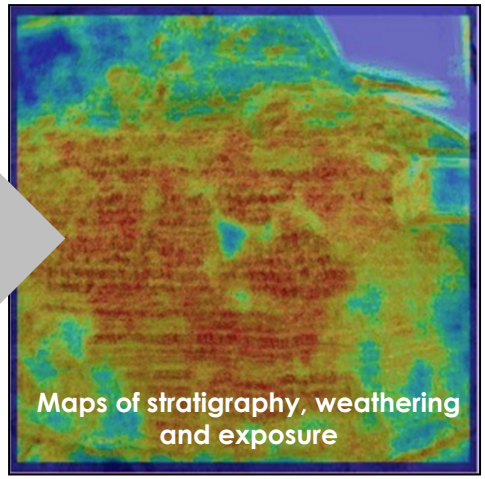


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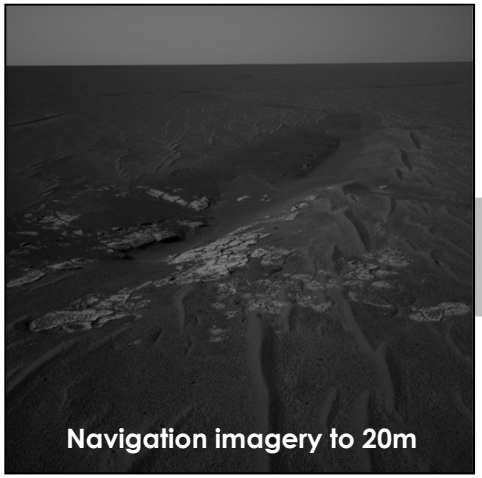
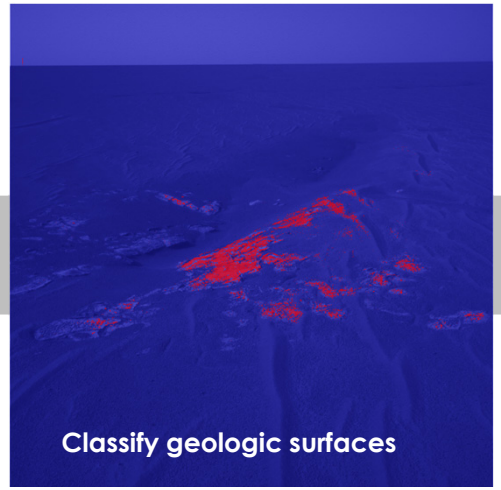
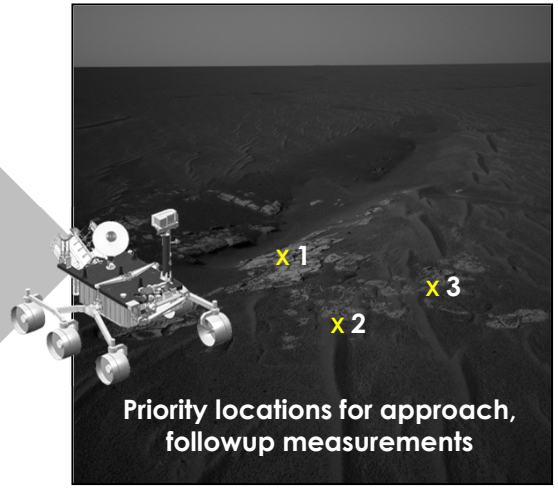
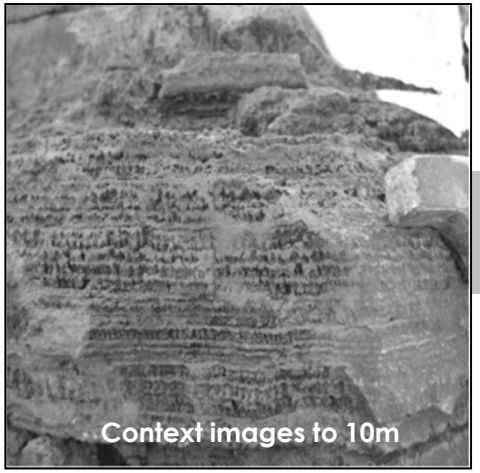
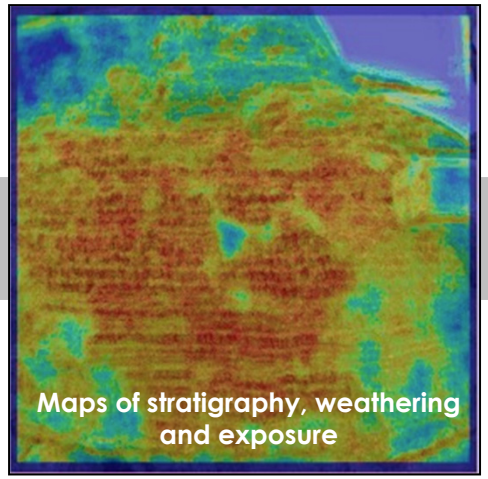
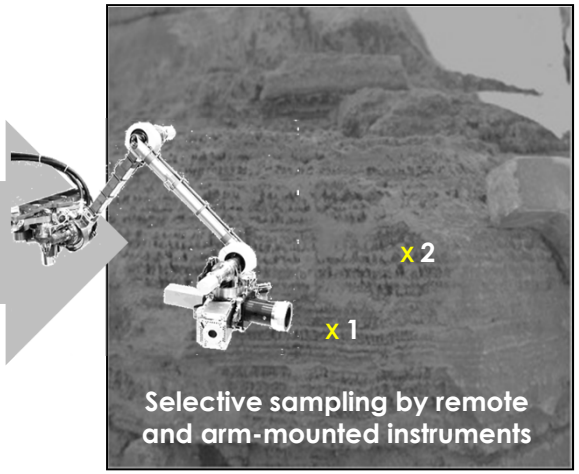


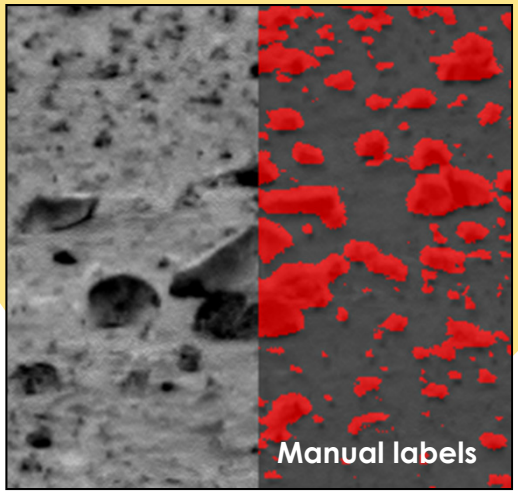




Images: Caltech / NASA / JPL / Alliance Space Systems

# How it works

## A. In advance

**Build statistical models of geologic surface appearance**




**Original image: NASA/JPL/Caltech/Cornell**

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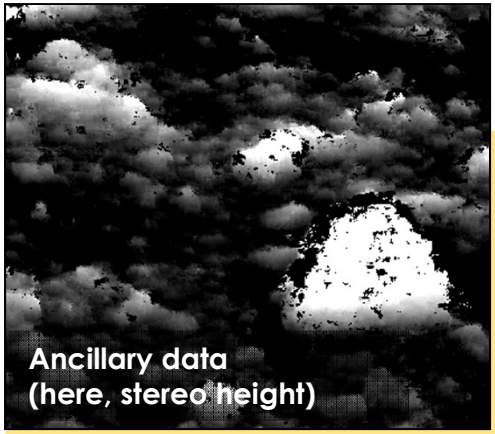

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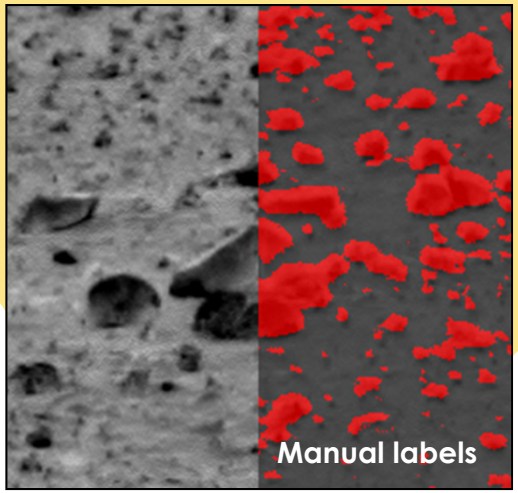


## B. Online

**Classify new image pixels**

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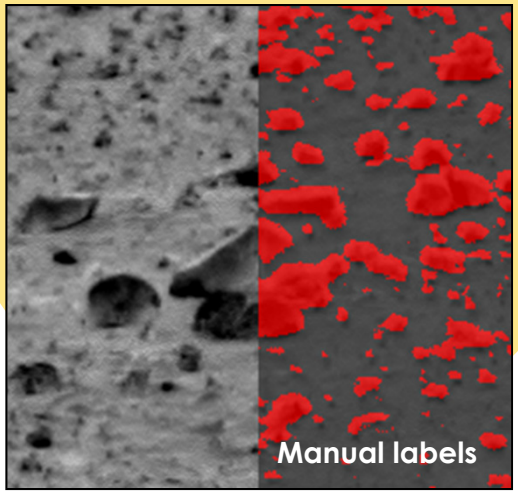


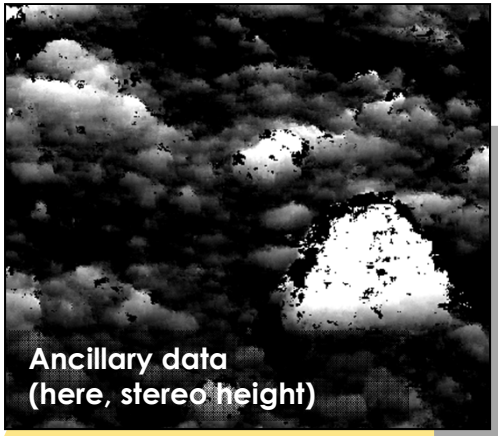

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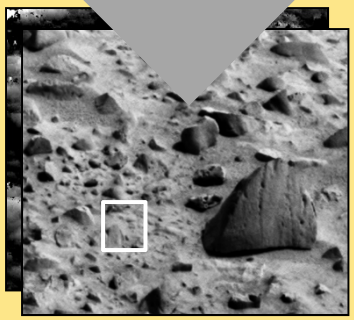

**Analyze local patterns**

**Original image: NASA/JPL/Caltech/Cornell**

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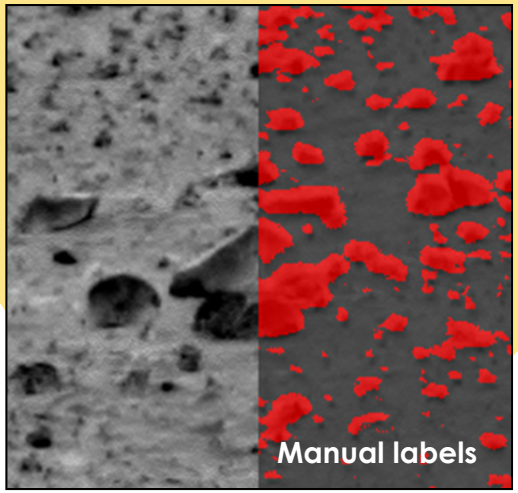


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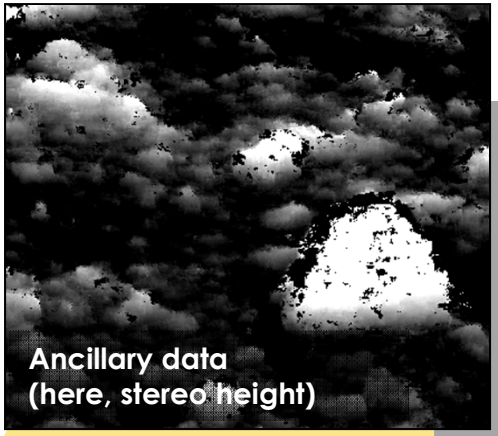

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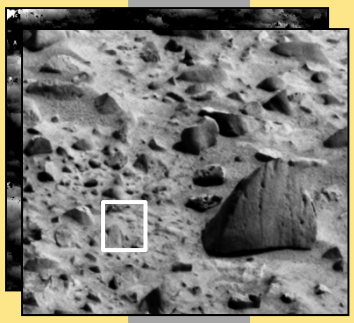

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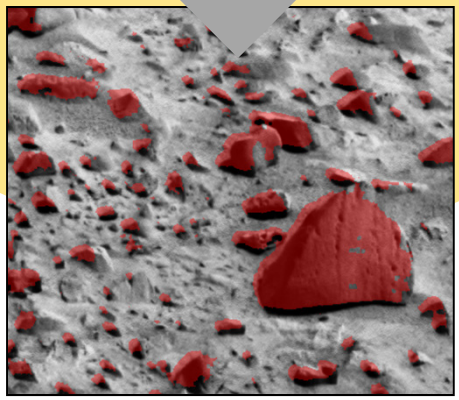
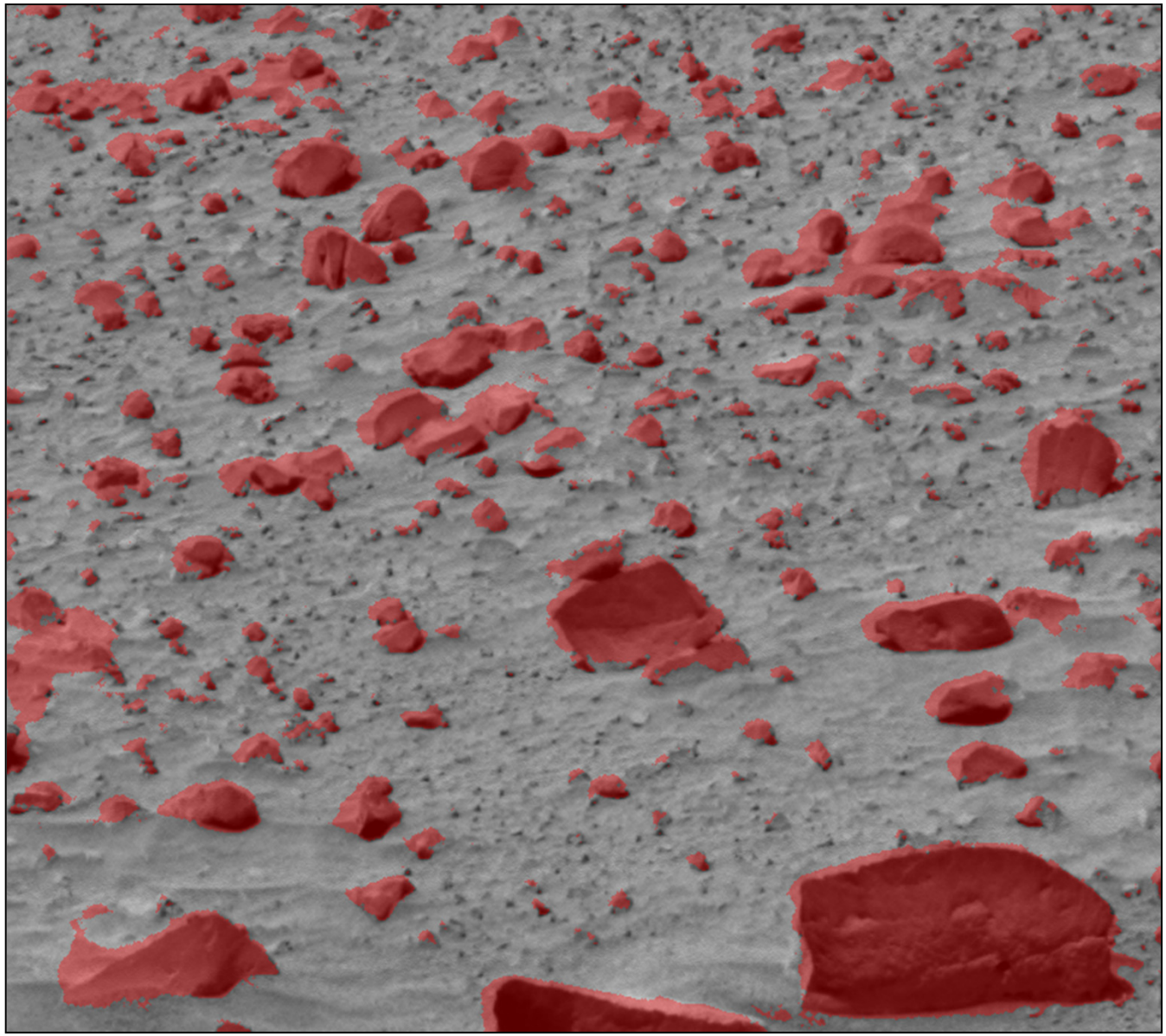


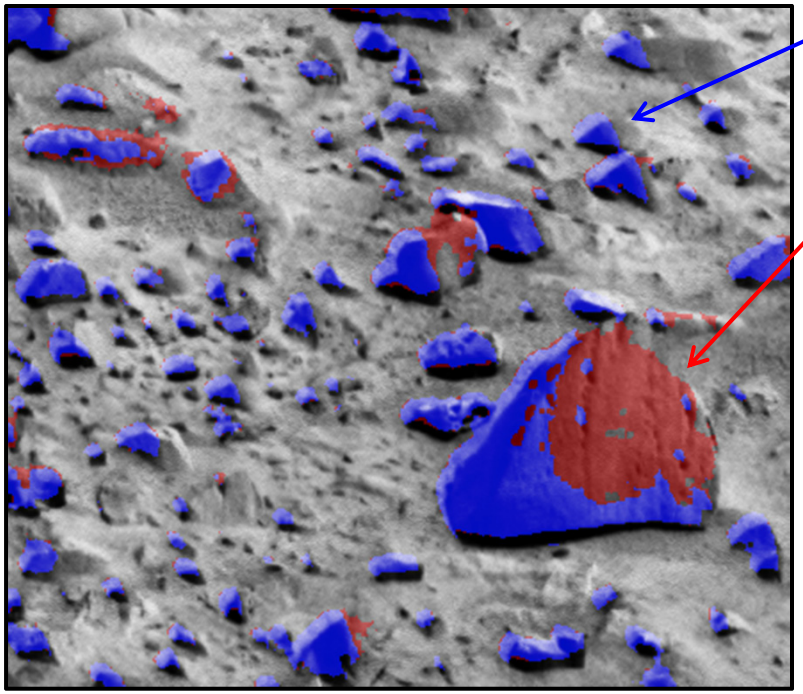
**Surface classification for new scene**

# Typica
# l result



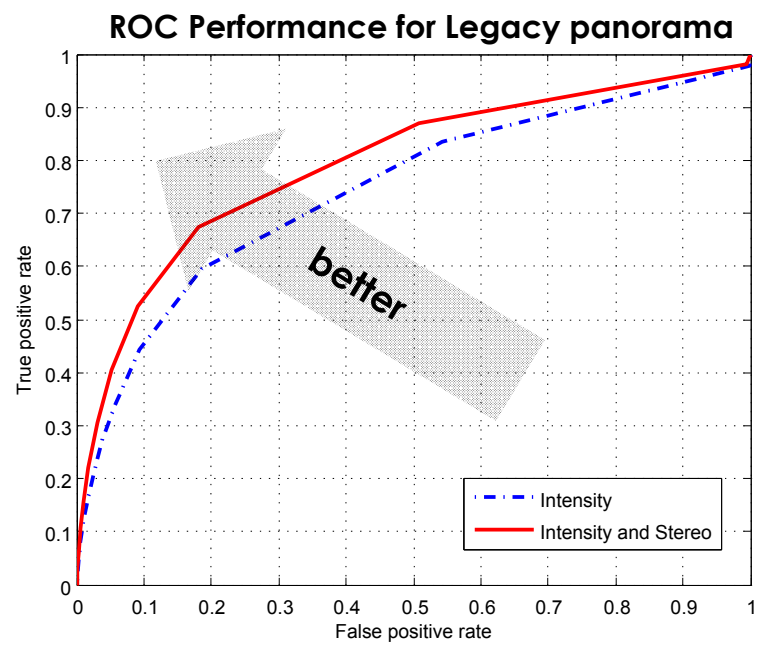
**Original image: NASA/JPL/Caltech/Corn ell**

# Classification exploits any available input data



Classification based on pixel intensity data only

Classification incorporating stereo data (most important for large protruding rocks)

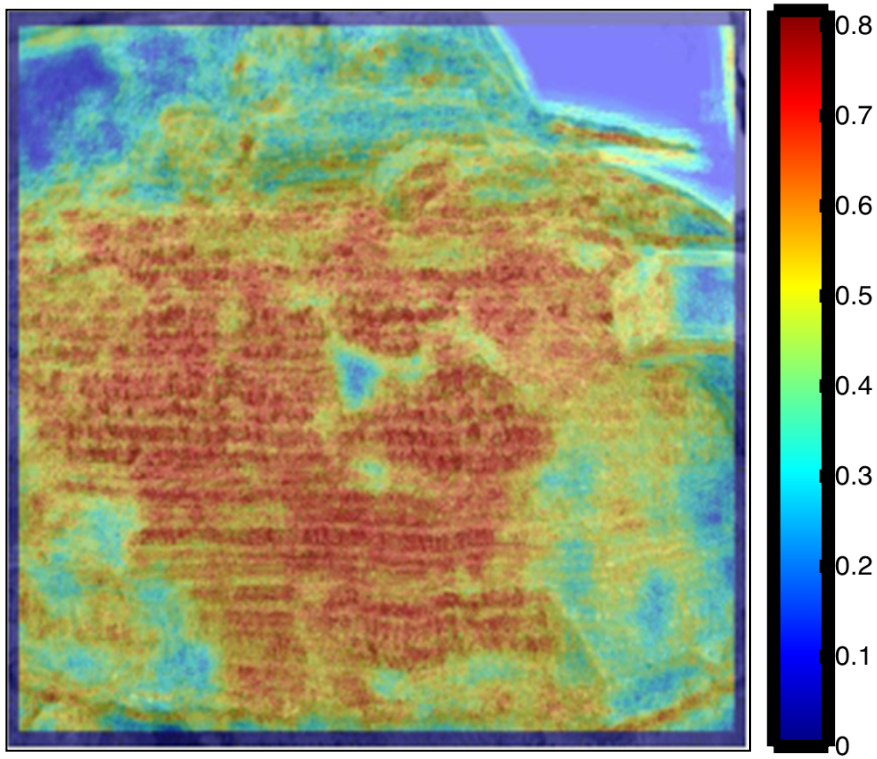



[Thompson et al., iSAIRAS 2012, submitted]

# Probability maps

**Confidence scores add flexibility, reduce risk**

**Stromatolite**
**Western Australia**



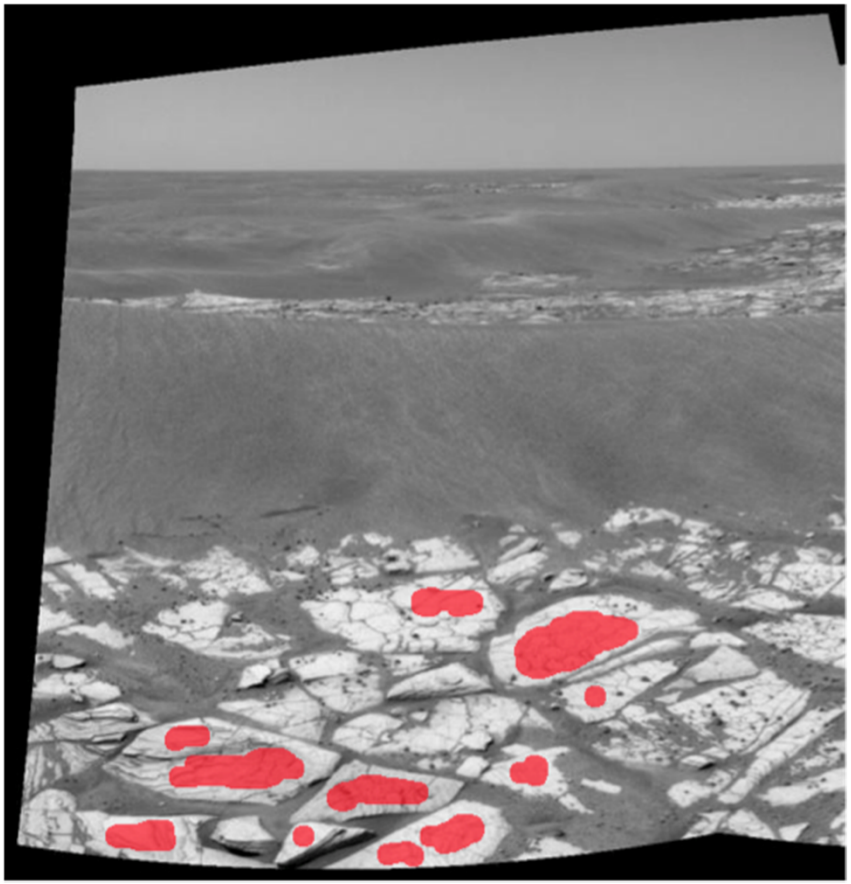

**Stratigraphy probability**
**[Thompson et al., LPSC 2012]**

Mars Images: Caltech / NASA / JPL

# This study: a sampling "exposure index"

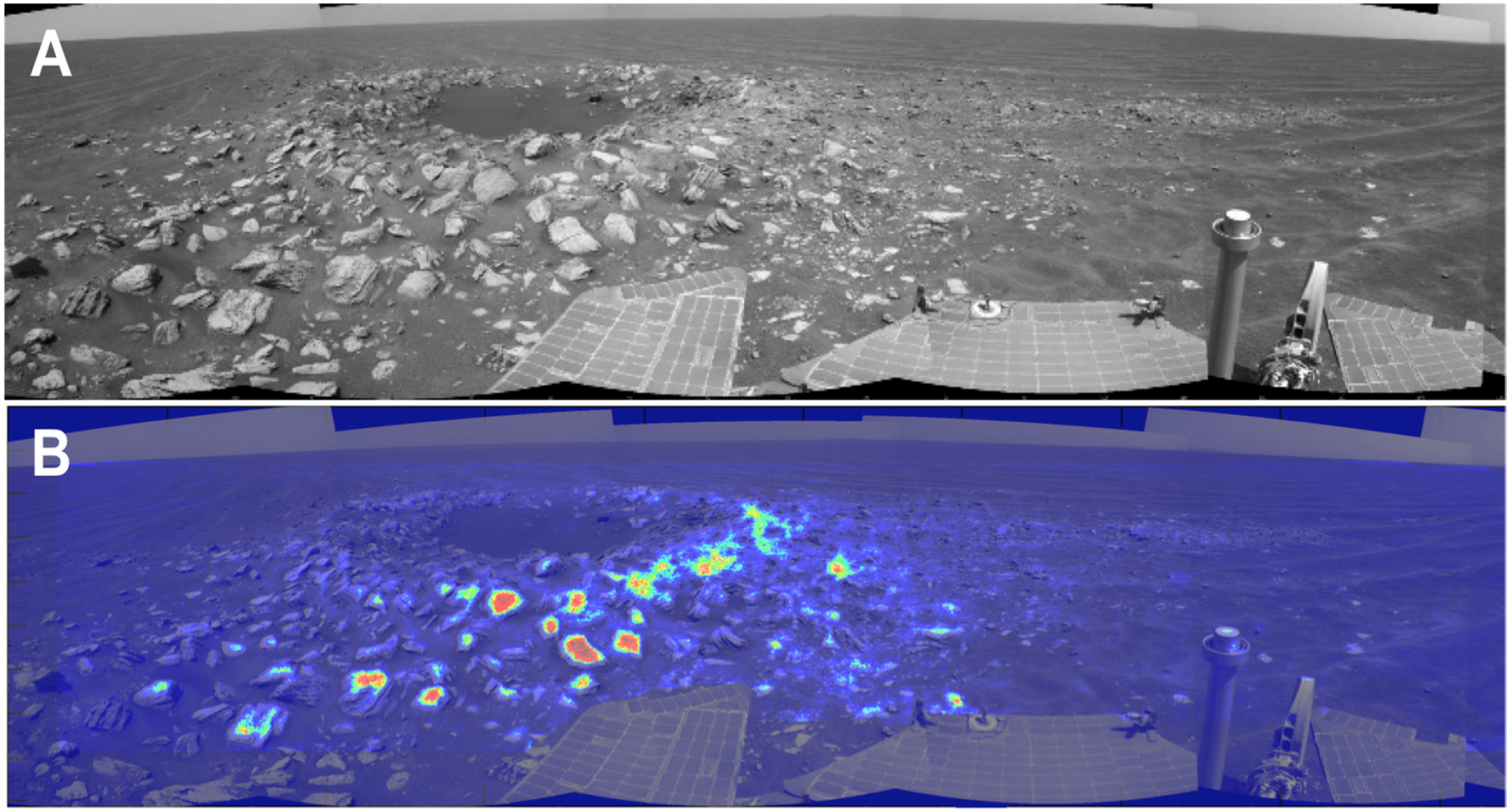
1. No significant dust deposition
2. Smooth, fracture-free

- Labeled good surfaces on a single training image, along with some examples of sediment
- Image space only



Mars Images: Caltech / NASA / JPL

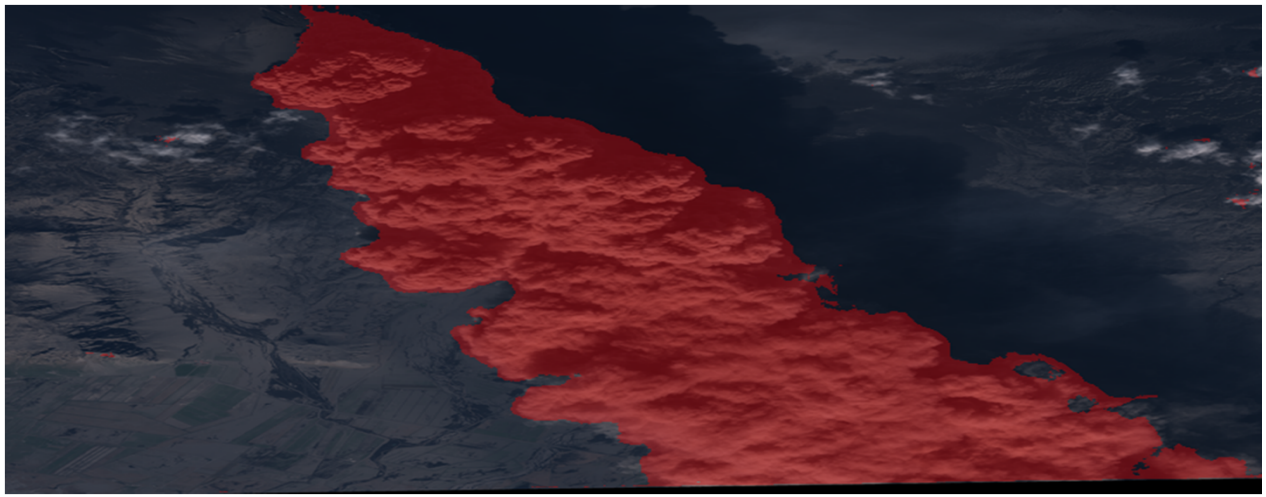
# Result on PIA-014132




Mars Images: Cornell / Caltech / NASA / JPL

# Other applications

- Volcanic Plume detection [McLaren et al., SPIE 2012]
- Rock detection [Thompson et al. i-SAIRAS 2012]
- Layer detection
- Morphology analyses for Primitive Bodies Exploration



**Plume detection for height analysis, Eyjafjallajökull volcano**

Mars Images: Cornell / Caltech / NASA / JPL

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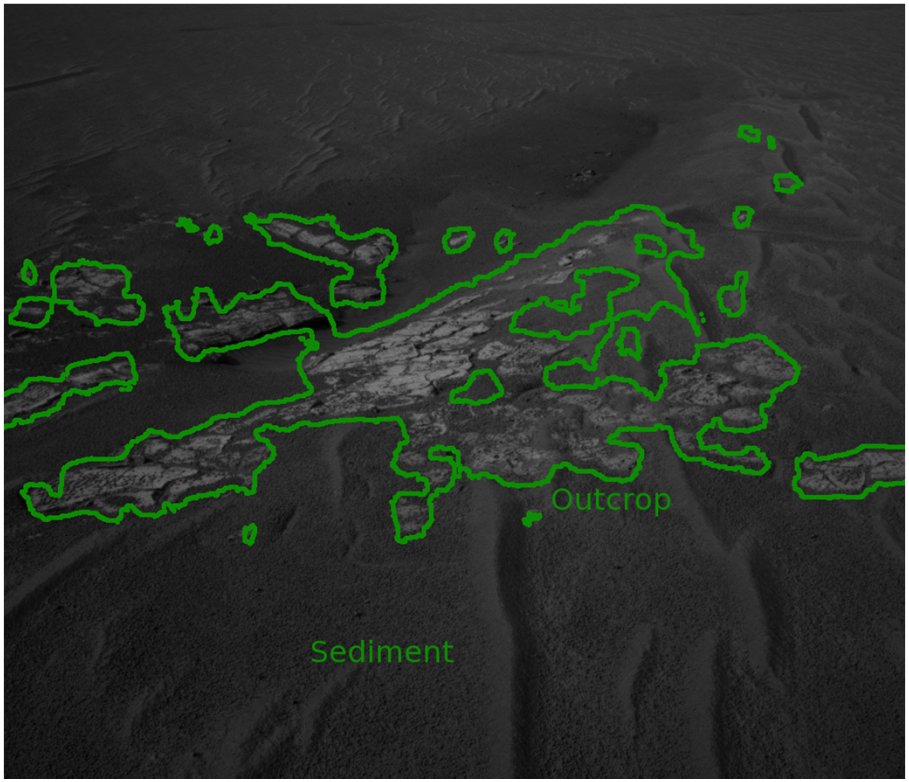


Image Credit: Caltech / NASA / JPL

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