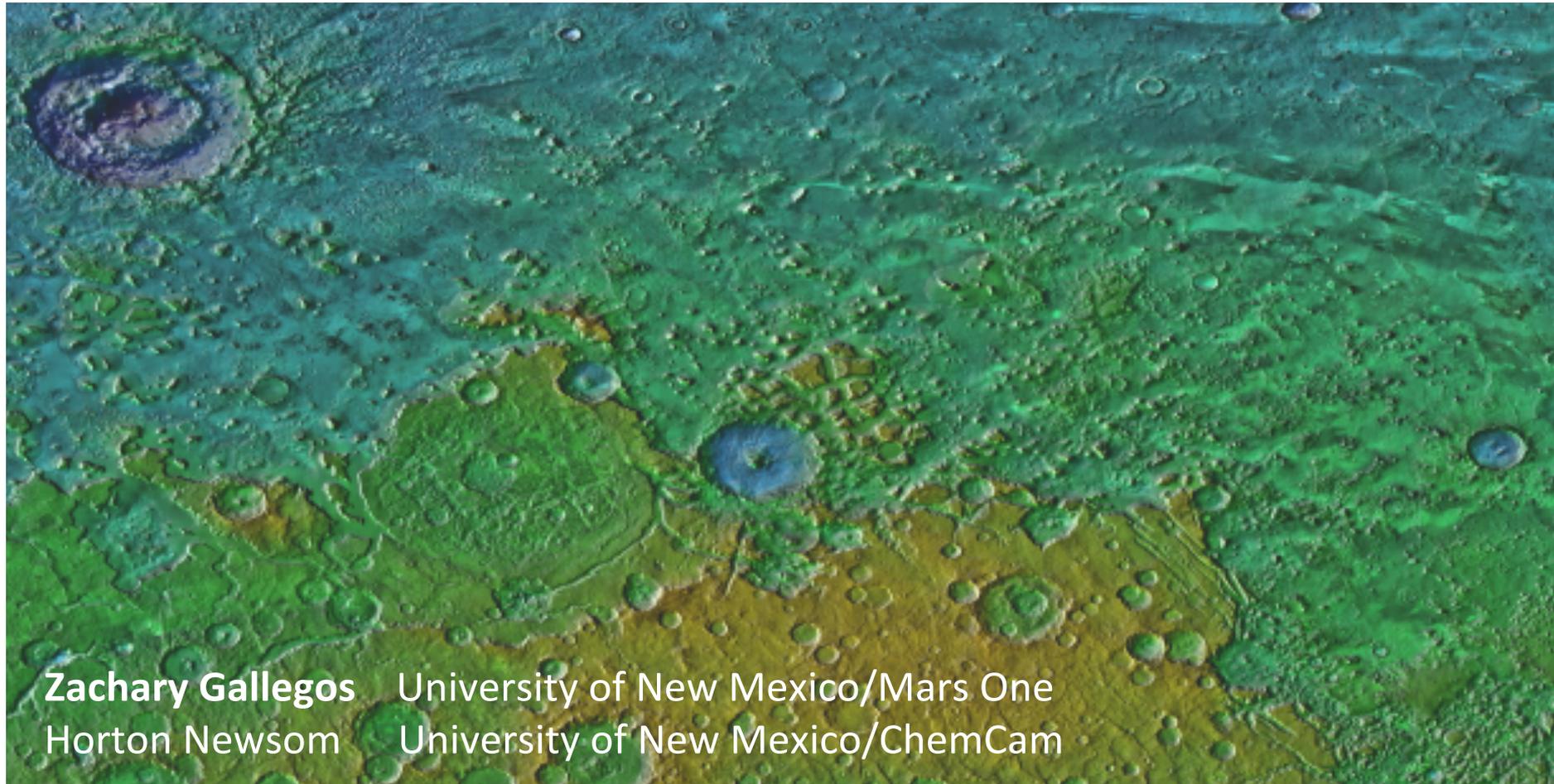


Protonilus Mensae



Abstract #1053

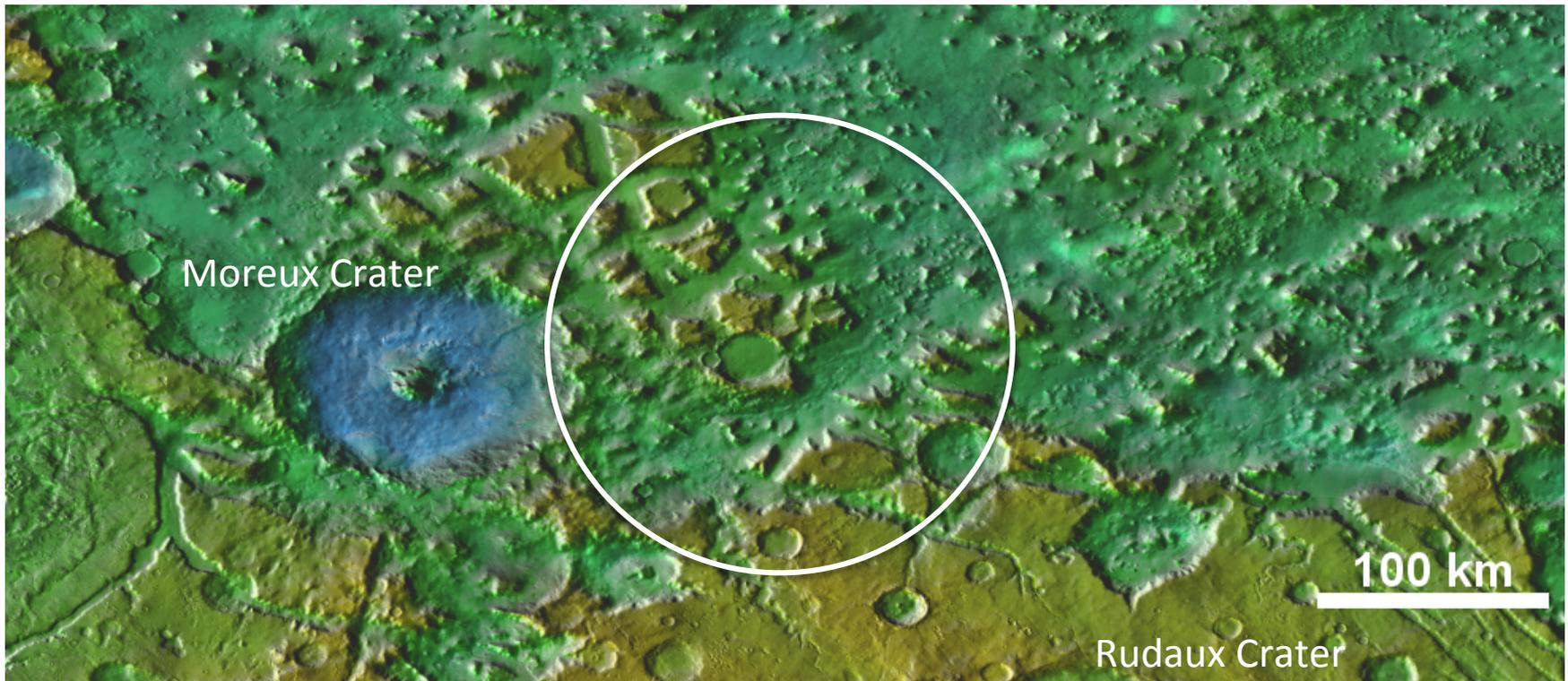
1st EZ Workshop for Human Missions to Mars



Zachary Gallegos University of New Mexico/Mars One
Horton Newsom University of New Mexico/ChemCam

Local Features

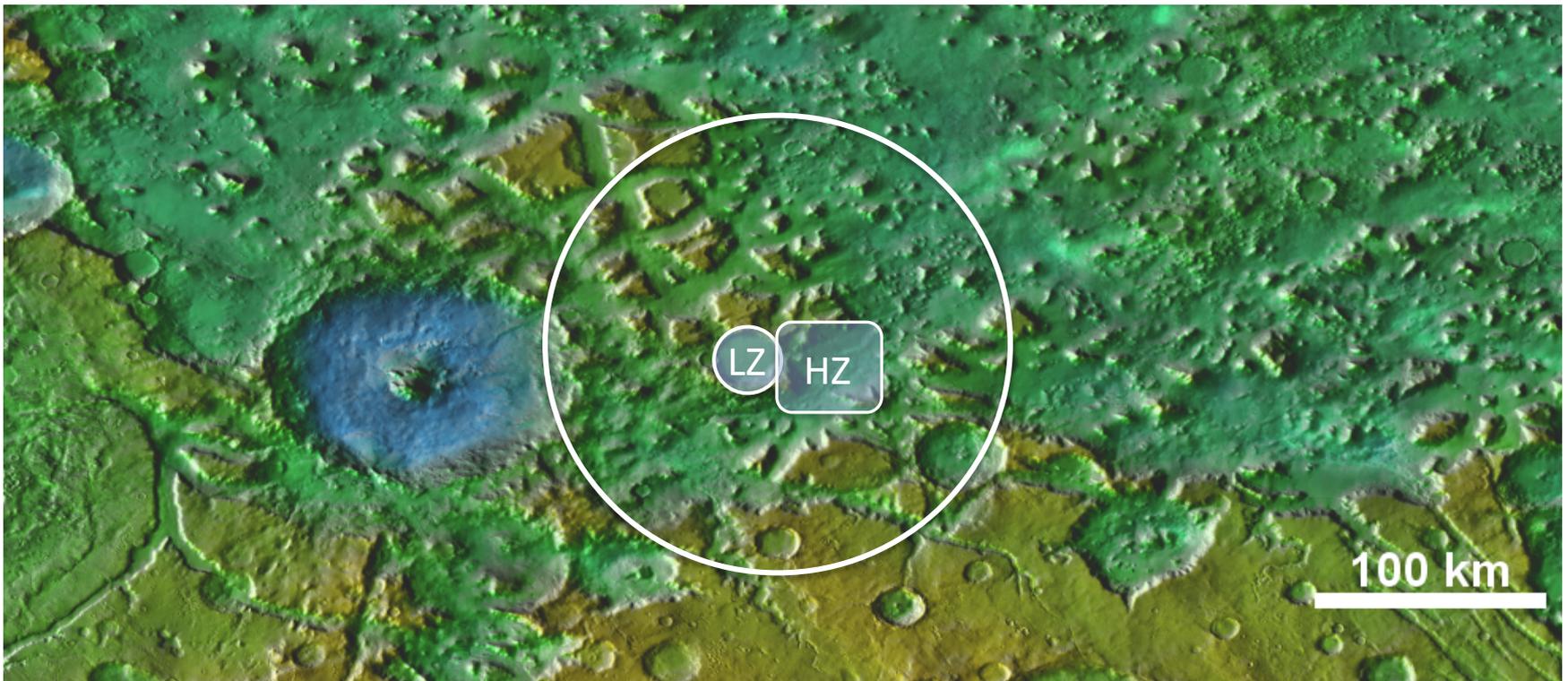
1st EZ Workshop for Human Missions to Mars



EZ Close-up

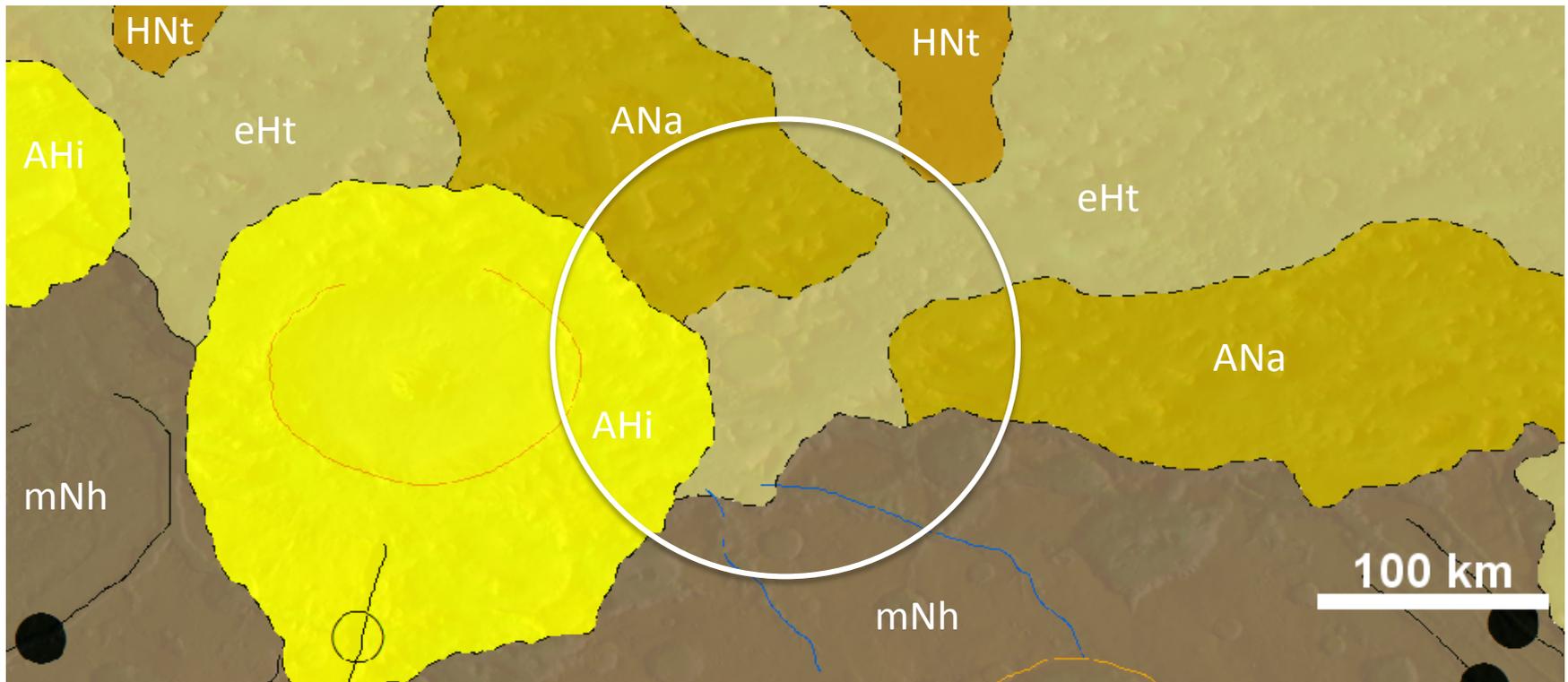
1st EZ Workshop for Human Missions to Mars

- 48.062E, 42.187N



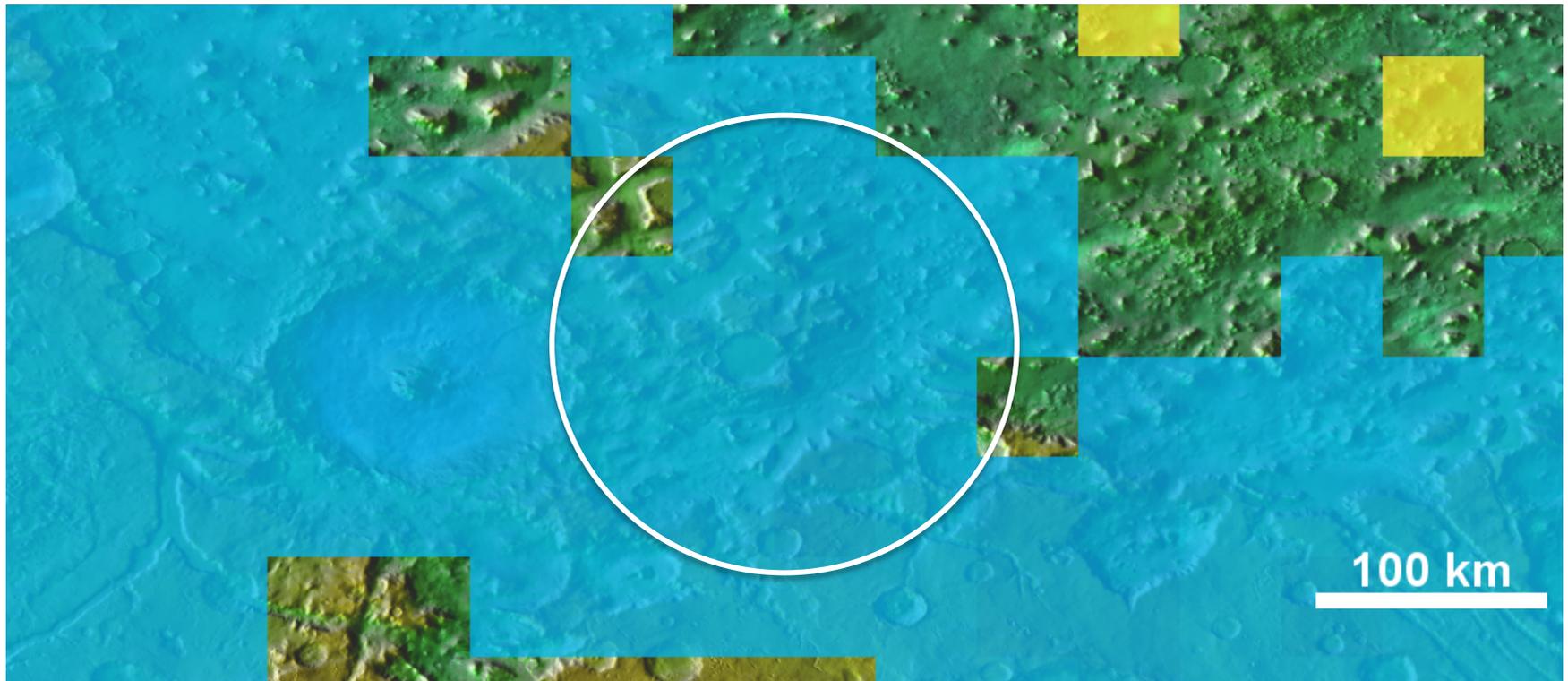
Geologic Context

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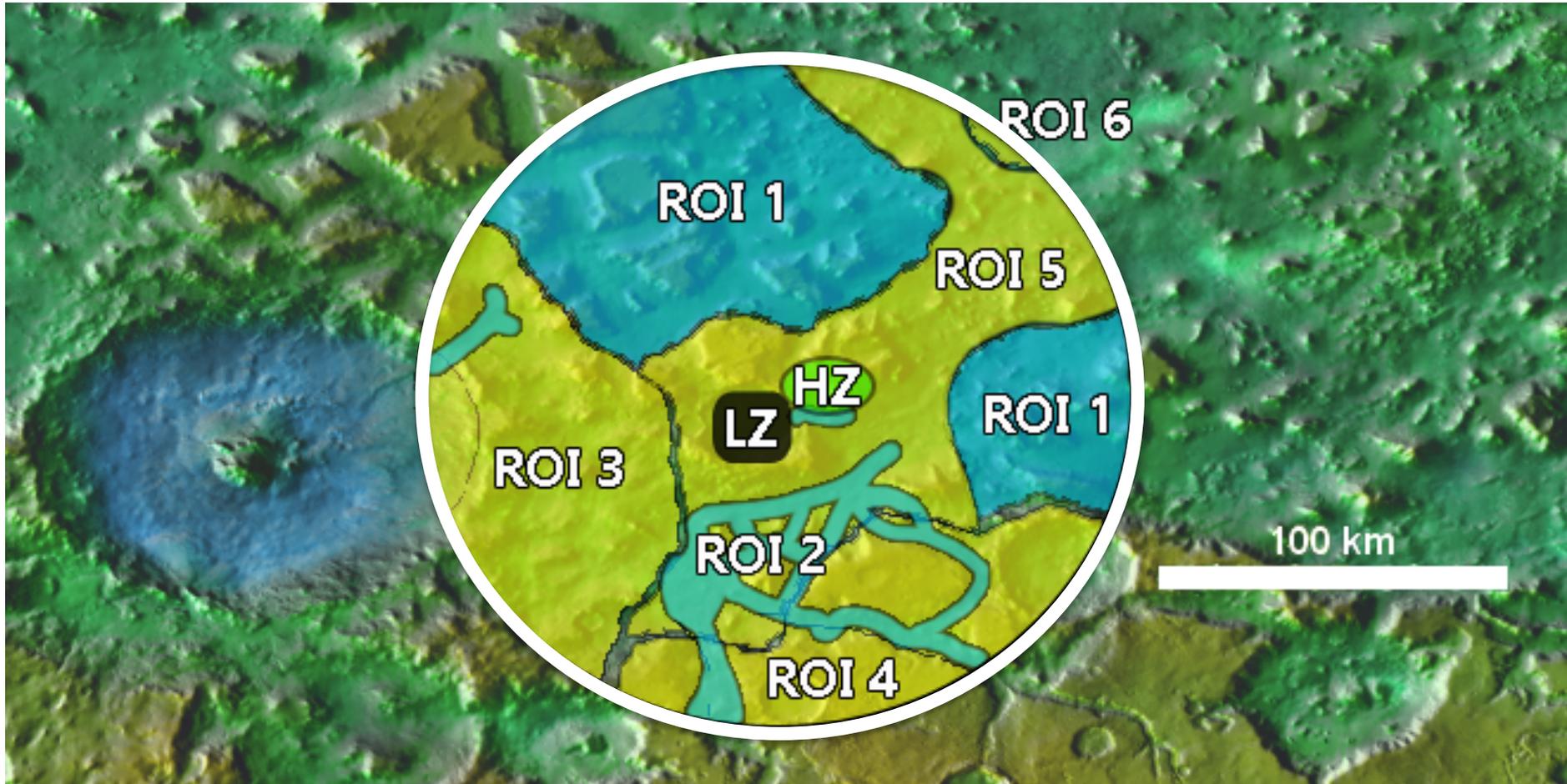
Remnant Magnetism

1st EZ Workshop for Human Missions to Mars



Exploration Zone Map

1st EZ Workshop for Human Missions to Mars

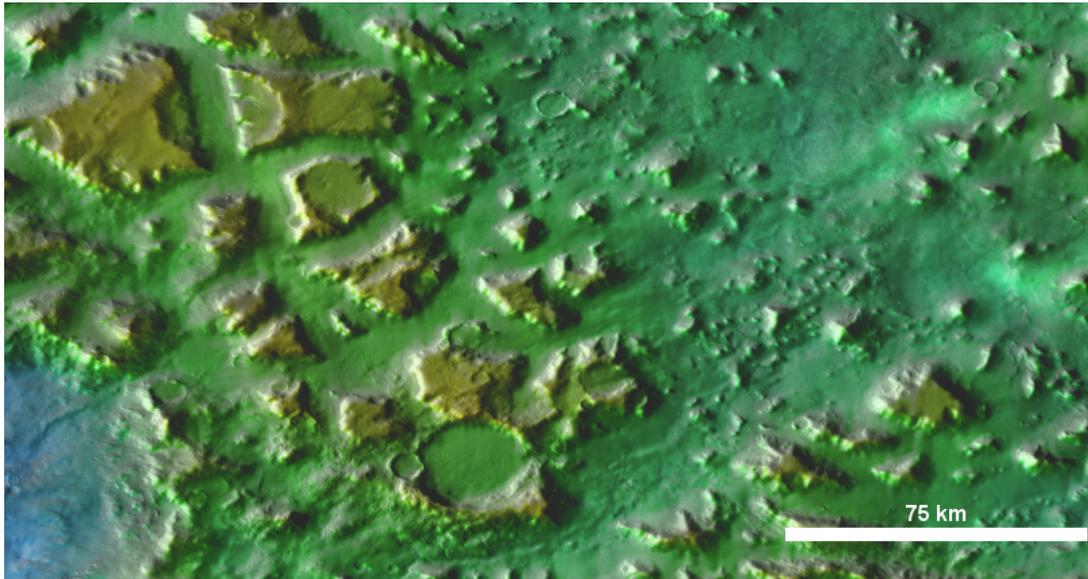


SCIENCE ROI_s

Science ROI1

1st EZ Workshop for Human Missions to Mars

Amazonian-Noachian apron unit (ANa)



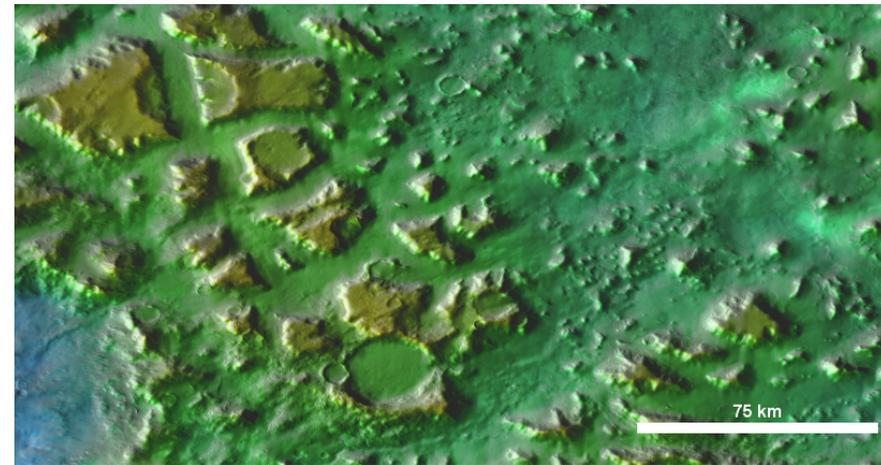
- 46.961E, 43.555
- 50.141E, 42.109
- Fretted terrain
- Amazonian water ice
- Noachian bedrock

Science ROI1 Rubric

1st EZ Workshop for Human Missions to Mars

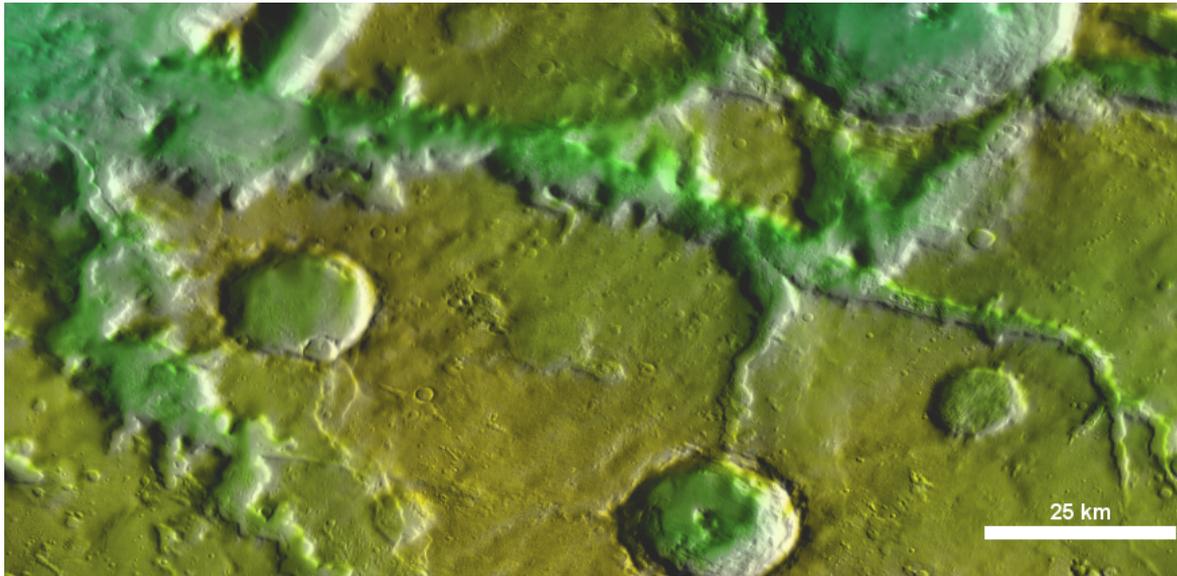


Science Site Criteria				Site Factors	SROI1
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	●
				Potential for present habitability/refugia	●
		Qualifying	Potential for organic matter, w/ surface exposure		?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Meteorological diversity in space and time		●
		Qualifying	High likelihood of surface-atmosphere exchange		●
			Amazonian subsurface or high-latitude ice or sediment		●
			High likelihood of active trace gas sources		?
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		●
Noachian or pre-Noachian bedrock units			●		
Outcrops with remnant magnetization			●		
Primary, secondary, and basin-forming impact deposits			●		
Structural features with regional or global context			●		
		Diversity of aeolian sediments and/or landforms		?	



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Outflow channels



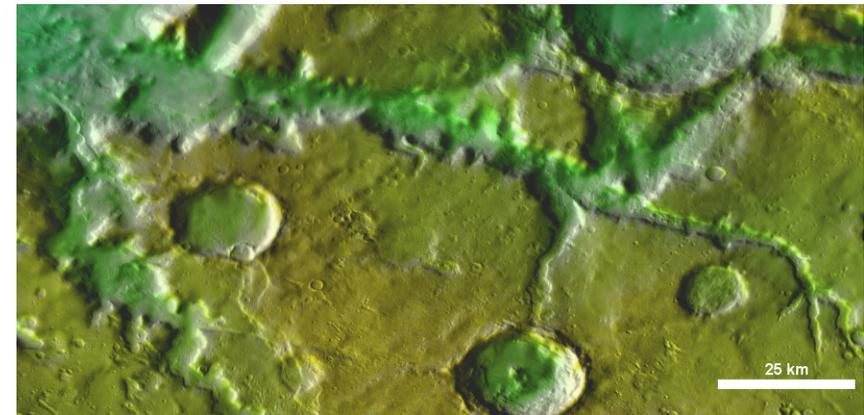
- 47.527E, 40.305
- 49.336E, 40.32
- Aqueous processes
- Past habitability
- Water ice

Science ROI2 Rubric

1st EZ Workshop for Human Missions to Mars

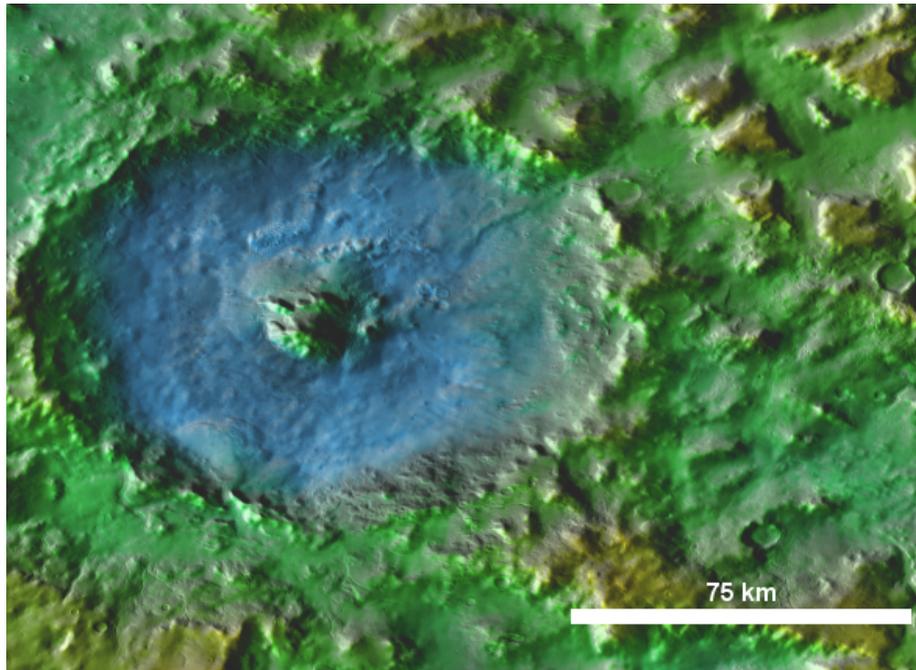


Site Factors				SROI2	
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	●
				Potential for present habitability/refugia	●
		Qualifying	Potential for organic matter, w/ surface exposure		?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Qualifying	Meteorological diversity in space and time	
		High likelihood of surface-atmosphere exchange		●	
		Amazonian subsurface or high-latitude ice or sediment		●	
		High likelihood of active trace gas sources		?	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		●
			Noachian or pre-Noachian bedrock units		●
Outcrops with remnant magnetization			●		
Primary, secondary, and basin-forming impact deposits			●		
Structural features with regional or global context			●		
Diversity of aeolian sediments and/or landforms			?		



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Moreux Crater (AHi)



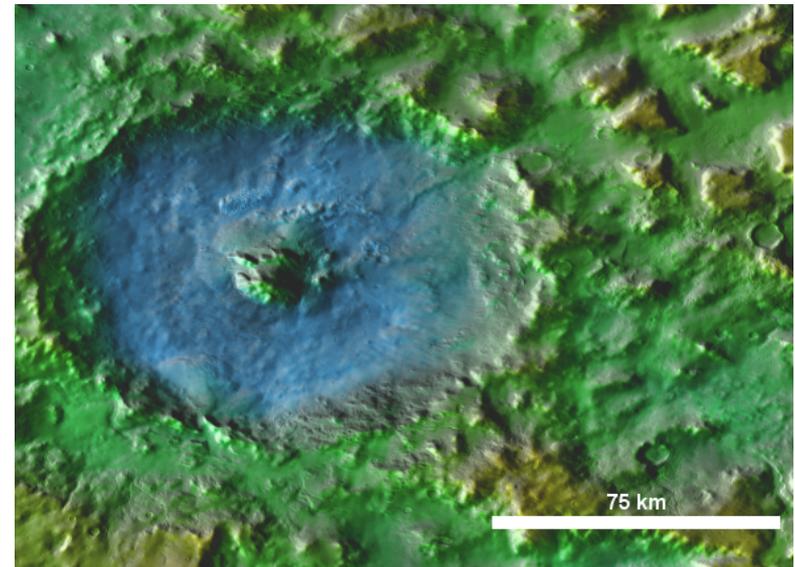
- 46.727E, 41.703
- Impact deposits
- Datable surfaces
- Trapped gasses
- Water ice

Science ROI3 Rubric

1st EZ Workshop for Human Missions to Mars



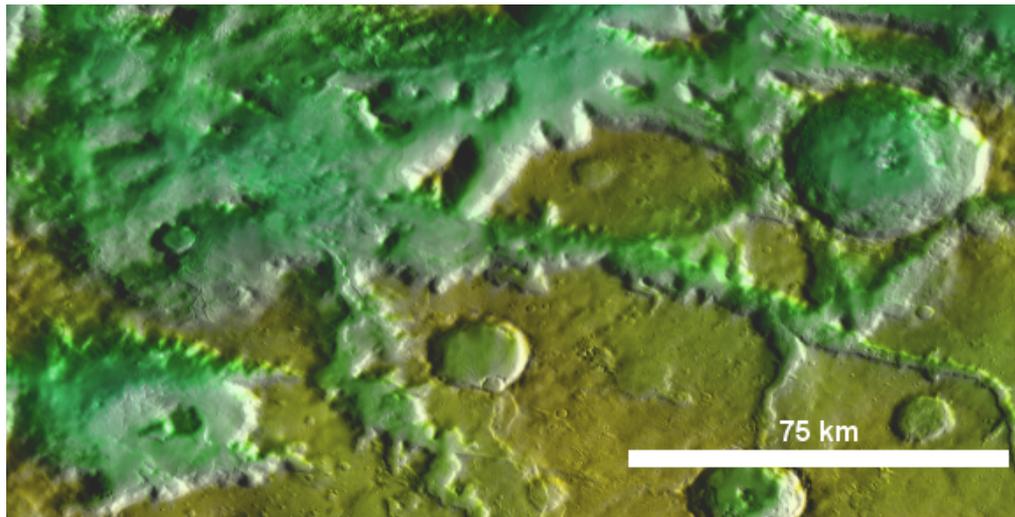
Site Factors				SROI3	
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	●
				Potential for present habitability/refugia	●
		Qualifying	Potential for organic matter, w/ surface exposure		?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Qualifying	Meteorological diversity in space and time	
		High likelihood of surface-atmosphere exchange		●	
		Amazonian subsurface or high-latitude ice or sediment		●	
		High likelihood of active trace gas sources		?	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		●
			Noachian or pre-Noachian bedrock units		●
Outcrops with remnant magnetization			●		
Primary, secondary, and basin-forming impact deposits			●		
Structural features with regional or global context			●		
Diversity of aeolian sediments and/or landforms			?		



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate



Noachian Highlands (mNh)



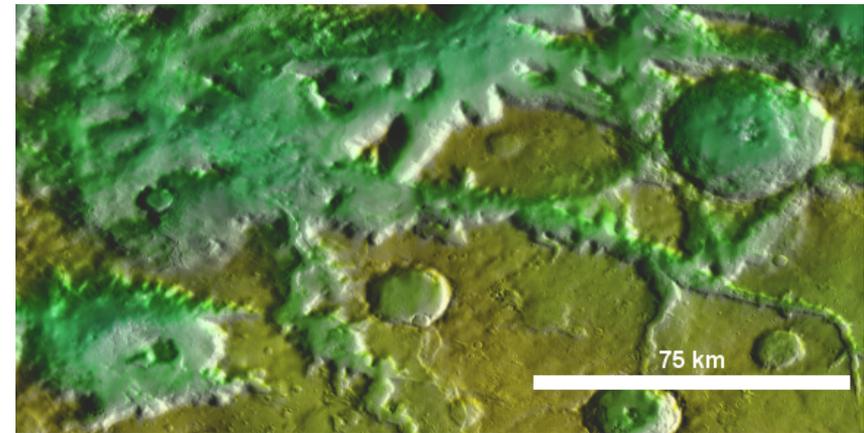
- 48.766E, 39.977
- Igneous rocks
- Datable surfaces
- Trapped gasses

Science ROI4 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors				SROI4	
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	
				Potential for present habitability/refugia	
		Qualifying	Potential for organic matter, w/ surface exposure		?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Meteorological diversity in space and time		
		Qualifying	High likelihood of surface-atmosphere exchange		
			Amazonian subsurface or high-latitude ice or sediment		
		High likelihood of active trace gas sources		?	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		
			Noachian or pre-Noachian bedrock units		●
Outcrops with remnant magnetization			●		
Primary, secondary, and basin-forming impact deposits			●		
Structural features with regional or global context			●		
Diversity of aeolian sediments and/or landforms			?		

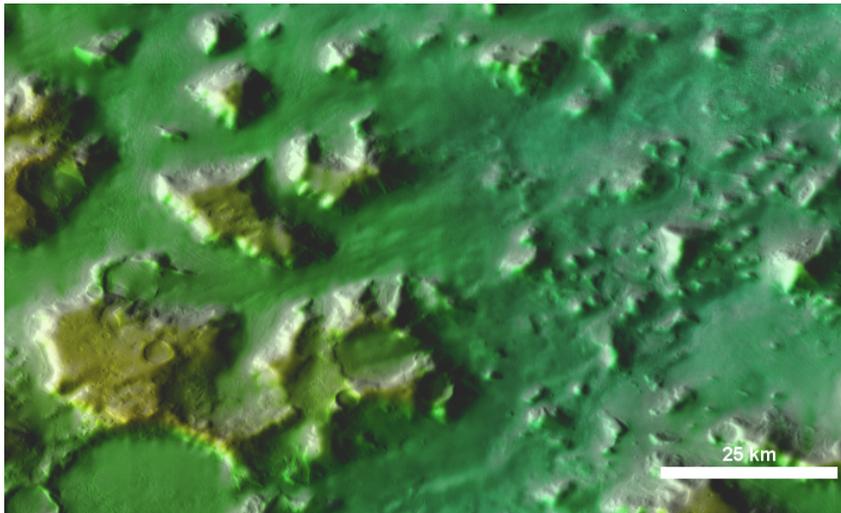


Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Science ROI5

1st EZ Workshop for Human Missions to Mars

Early Hesperian transition unit (eHt)



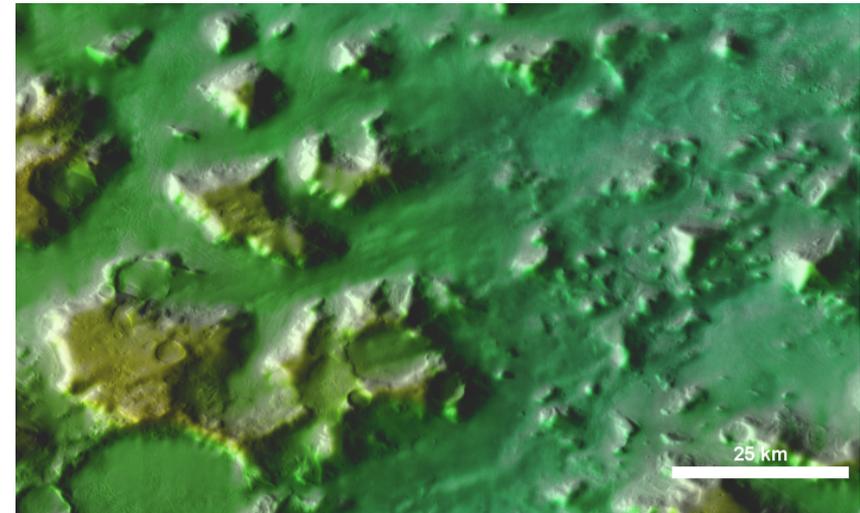
- 49.312E, 42.898
- Igneous rocks
- Datable surfaces
- Trapped gasses

Science ROI5 Rubric

1st EZ Workshop for Human Missions to Mars

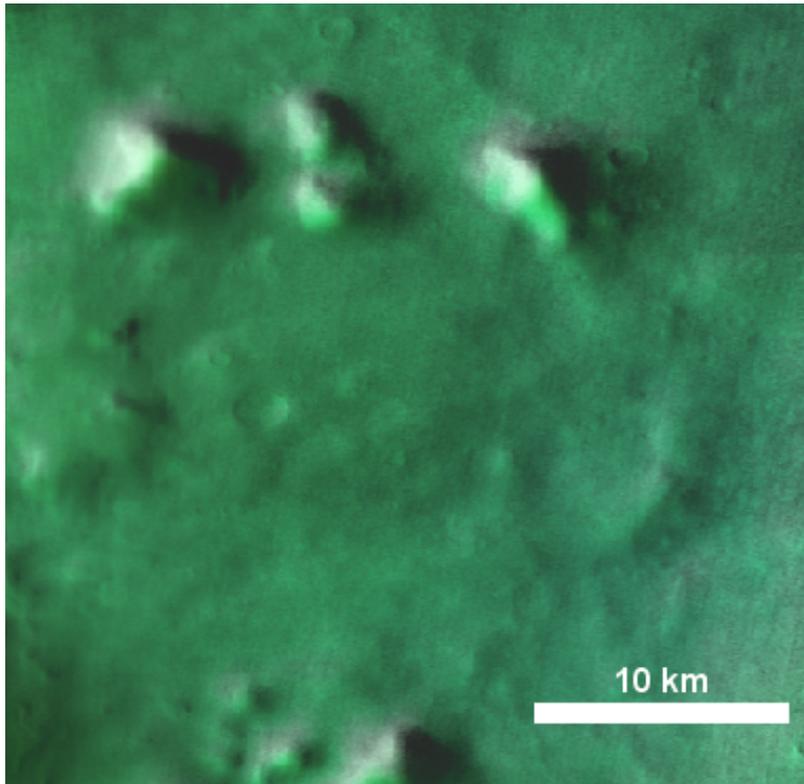


Site Factors				SROI5	
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	
				Potential for present habitability/refugia	
		Qualifying		Potential for organic matter, w/ surface exposure	?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Meteorological diversity in space and time		●
		Qualifying	High likelihood of surface-atmosphere exchange		●
			Amazonian subsurface or high-latitude ice or sediment		●
		High likelihood of active trace gas sources		?	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		●
			Noachian or pre-Noachian bedrock units		●
Outcrops with remnant magnetization			○		
Primary, secondary, and basin-forming impact deposits					
Structural features with regional or global context					
	Diversity of aeolian sediments and/or landforms		?		



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Hesperian and Noachian transition unit (HNt)



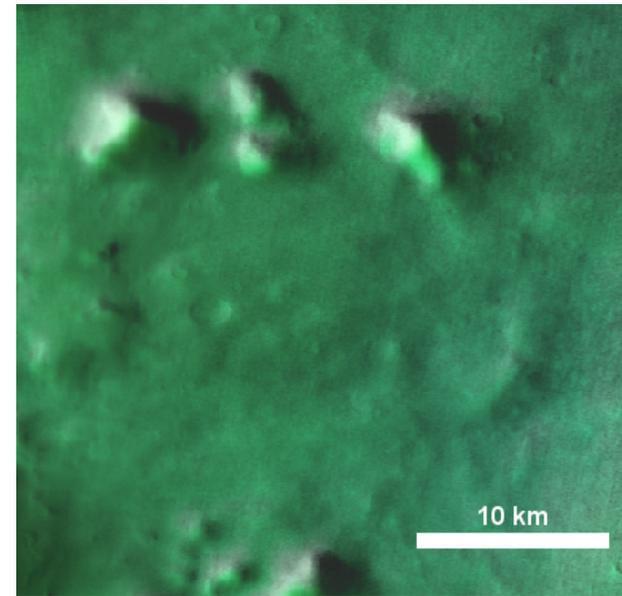
- 49.383E, 43.937
- Igneous rocks
- Datable surfaces
- Trapped gasses

Science ROI6 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors				SROI5	
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	
				Potential for present habitability/refugia	
		Qualifying	Potential for organic matter, w/ surface exposure		?
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●
			Meteorological diversity in space and time		
		Qualifying	High likelihood of surface-atmosphere exchange		
			Amazonian subsurface or high-latitude ice or sediment		●
		High likelihood of active trace gas sources		?	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●
			Evidence of aqueous processes		●
			Potential for interpreting relative ages		●
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●
			Near-surface ice, glacial or permafrost		●
			Noachian or pre-Noachian bedrock units		●
Outcrops with remnant magnetization			○		
Primary, secondary, and basin-forming impact deposits			●		
Structural features with regional or global context					
	Diversity of aeolian sediments and/or landforms		?		



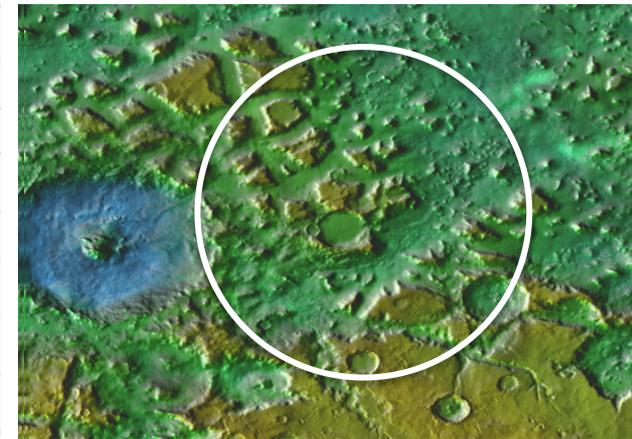
Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Science Rubrics

1st EZ Workshop for Human Missions to Mars



Site Factors				SROI1	SROI2	SROI3	SROI4	SROI5	SROI6	EZ SUM	
Astrobio	Threshold	AND/OR	Potential for past habitability	●	●	●				(3,0)	
			Potential for present habitability/refugia	●	●	●				(3,0)	
Astrobio	Qualifying		Potential for organic matter, w/ surface exposure	?	?	?	?	?	?		
Atmospheric Science	Threshold		Noachian/Hesperian rocks w/ trapped atmospheric gases	●	●	●	●	●	●	(6,0)	
			Meteorological diversity in space and time	●	●	●		●		(4,0)	
	Qualifying		High likelihood of surface-atmosphere exchange	●	●	●		●		(4,0)	
			Amazonian subsurface or high-latitude ice or sediment	●	●	●		●	●	(5,0)	
			High likelihood of active trace gas sources	?	?	?	?	?	?		
Geoscience	Threshold		Range of martian geologic time; datable surfaces	●	●	●	●	●	●	(6,0)	
			Evidence of aqueous processes	●	●	●	●	●	●	(6,0)	
			Potential for interpreting relative ages	●	●	●	●	●	●	(6,0)	
	Qualifying			Igneous Rocks tied to 1+ provinces or different times	●	●	●	●	●	●	(6,0)
				Near-surface ice, glacial or permafrost	●	●	●		●	●	(5,0)
				Noachian or pre-Noachian bedrock units	●	●	●	●		●	(5,0)
				Outcrops with remnant magnetization	●	●	●	●	○	○	(4,2)
				Primary, secondary, and basin-forming impact deposits	●	●	●	●		●	(5,0)
				Structural features with regional or global context	●	●	●	●			(4,0)
				Diversity of aeolian sediments and/or landforms	?	?	?	?	?	?	



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

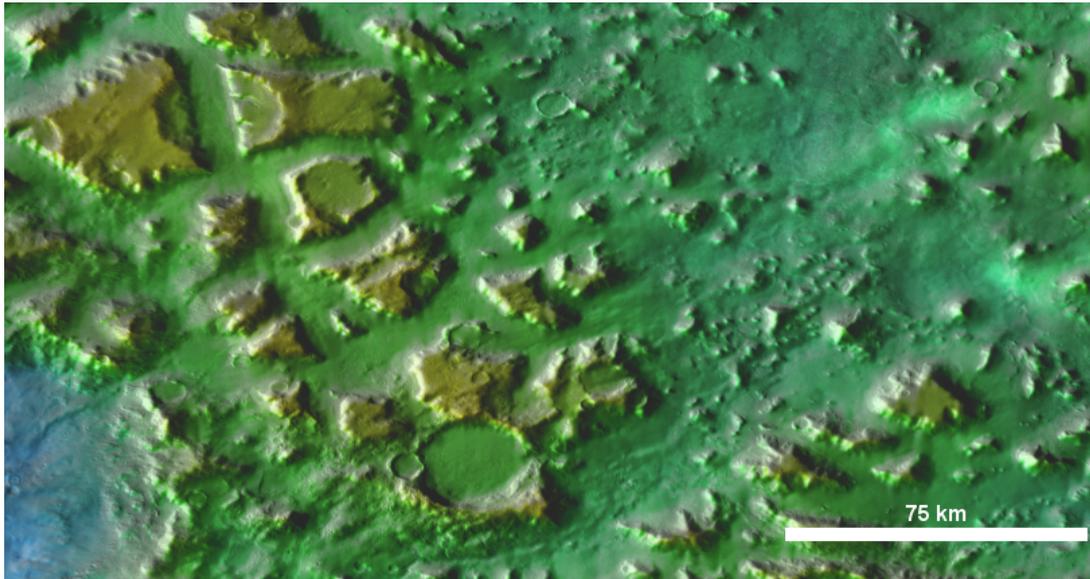
Science Site Criteria

RESOURCE ROIs

Resource ROI1

1st EZ Workshop for Human Missions to Mars

Amazonian-Noachian apron unit (ANa)



- 46.961E, 43.555
- 50.141E, 42.109

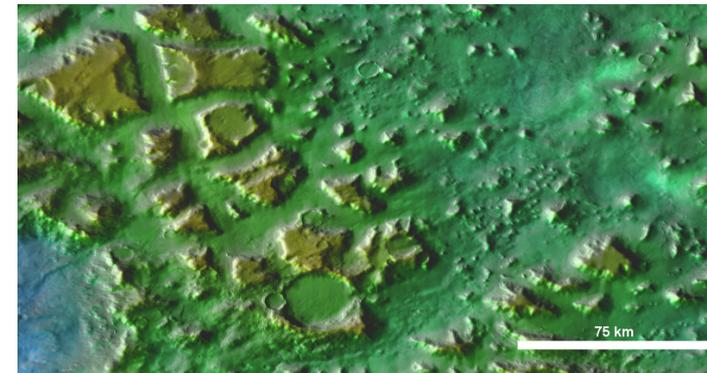
- Amazonian water ice

Resource ROI1 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI1	
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●	
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	●
			Potential for hydrated minerals	
			Quantity for substantial production	●
			Potential to be minable by highly automated systems	●
			Located less than 3 km from processing equipment site	○
			Located no more than 3 meters below the surface	○
			Accessible by automated systems	●
			Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals
	Distance to resource location can be >5 km	●		
	Route to resource location must be (plausibly) traversable	●		
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution	●
			1-10 km length scale: <10°	●
			Located within 5 km of landing site location	●
		Qualifying	Located in the northern hemisphere	
	Food Production	Qualifying	Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	○
			Utilitarian terrain features	●
			Low latitude	
			No local terrain feature(s) that could shadow light collection facilities	
	Metal/Silicon Resource	Threshold	Access to water	●
Access to dark, minimally altered basaltic sands				
Potential for metal/silicon				
Potential to be minable by highly automated systems				
Qualifying		Located less than 3 km from processing equipment site		
		Located no more than 3 meters below the surface		
		Accessible by automated systems		
		Potential for multiple sources of metals/silicon		
Qualifying	Distance to resource location can be >5 km			
	Route to resource location must be (plausibly) traversable			

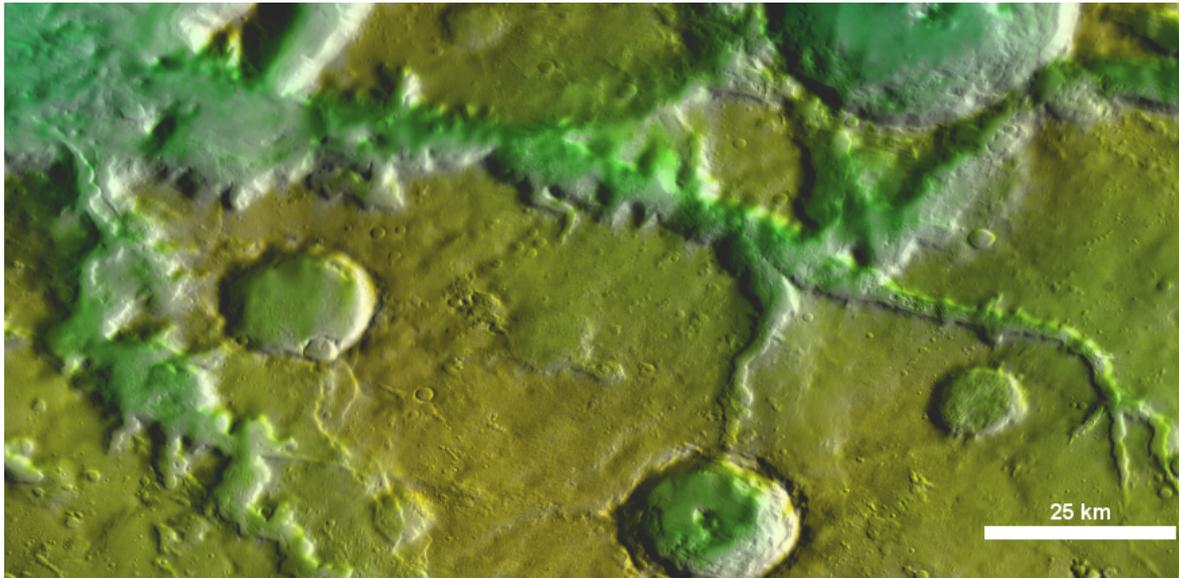


Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Resource ROI2

1st EZ Workshop for Human Missions to Mars

Outflow channels



- 47.527E, 40.305
- 49.336E, 40.32

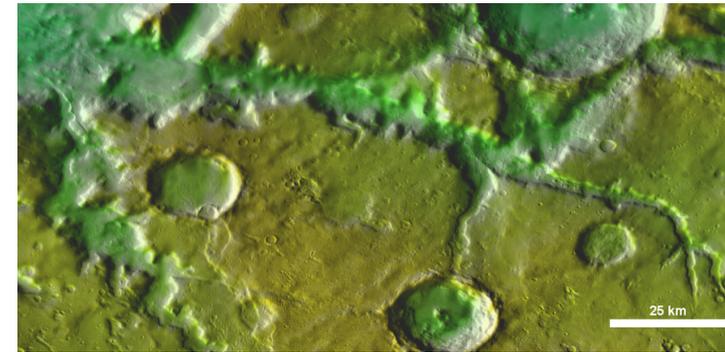
- Water ice
- Hydrated minerals

Resource ROI2 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI2	
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●	
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	●
			Potential for hydrated minerals	●
			Quantity for substantial production	●
			Potential to be minable by highly automated systems	●
			Located less than 3 km from processing equipment site	○
			Located no more than 3 meters below the surface	○
			Accessible by automated systems	●
			Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals
	Distance to resource location can be >5 km	●		
	Route to resource location must be (plausibly) traversable	●		
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution	
			1-10 km length scale: <10°	
			Located within 5 km of landing site location	
		Qualifying	Located in the northern hemisphere	
	Food Production	Qualifying	Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	●
			Utilitarian terrain features	●
			Low latitude	
			No local terrain feature(s) that could shadow light collection facilities	
	Metal/Silicon Resource	Threshold	Access to water	●
Access to dark, minimally altered basaltic sands				
Potential for metal/silicon				
Potential to be minable by highly automated systems				
Qualifying		Located less than 3 km from processing equipment site		
		Located no more than 3 meters below the surface		
		Accessible by automated systems		
		Potential for multiple sources of metals/silicon		
Qualifying	Distance to resource location can be >5 km			
	Route to resource location must be (plausibly) traversable			

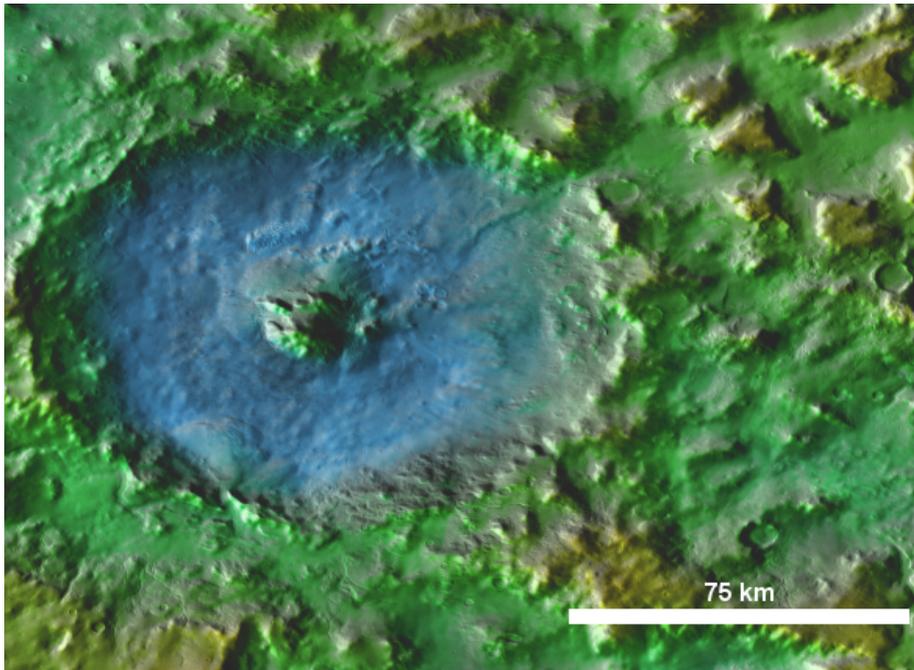


Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Resource ROI3

1st EZ Workshop for Human Missions to Mars

Moreux Crater (AHi)



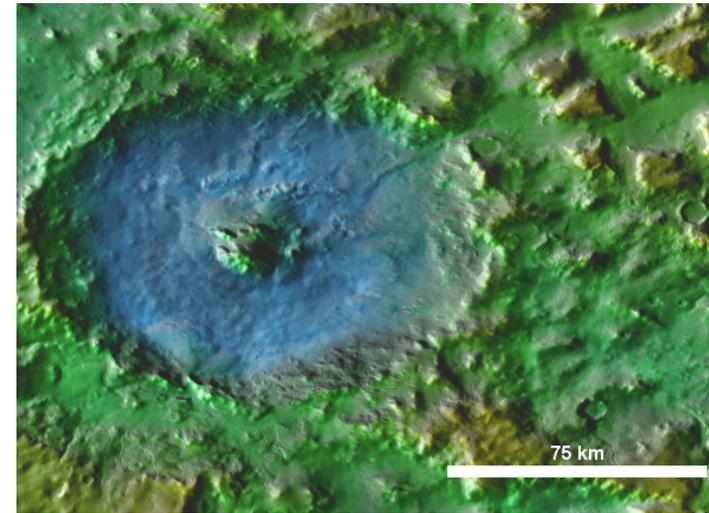
- 46.727E, 41.703
- Impact glass
- Water ice

Resource ROI3 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI3		
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●		
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	●	
			Potential for hydrated minerals	●	
			Quantity for substantial production	●	
			Potential to be minable by highly automated systems	●	
			Located less than 3 km from processing equipment site	○	
			Located no more than 3 meters below the surface	○	
			Accessible by automated systems	●	
			Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals	●
				Distance to resource location can be >5 km	●
				Route to resource location must be (plausibly) traversable	●
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution		
			1-10 km length scale: <10°		
			Located within 5 km of landing site location		
		Qualifying	Located in the northern hemisphere		
	Food Production	Qualifying	Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	●	
			Utilitarian terrain features		
			Low latitude		
			No local terrain feature(s) that could shadow light collection facilities		
	Metal/Silicon Resource	Threshold	Access to water	●	
			Access to dark, minimally altered basaltic sands		
			Potential for metal/silicon	●	
			Potential to be minable by highly automated systems	●	
			Located less than 3 km from processing equipment site	○	
		Qualifying	Located no more than 3 meters below the surface	○	
			Accessible by automated systems	●	
			Potential for multiple sources of metals/silicon	●	
Distance to resource location can be >5 km			●		
Route to resource location must be (plausibly) traversable			○		

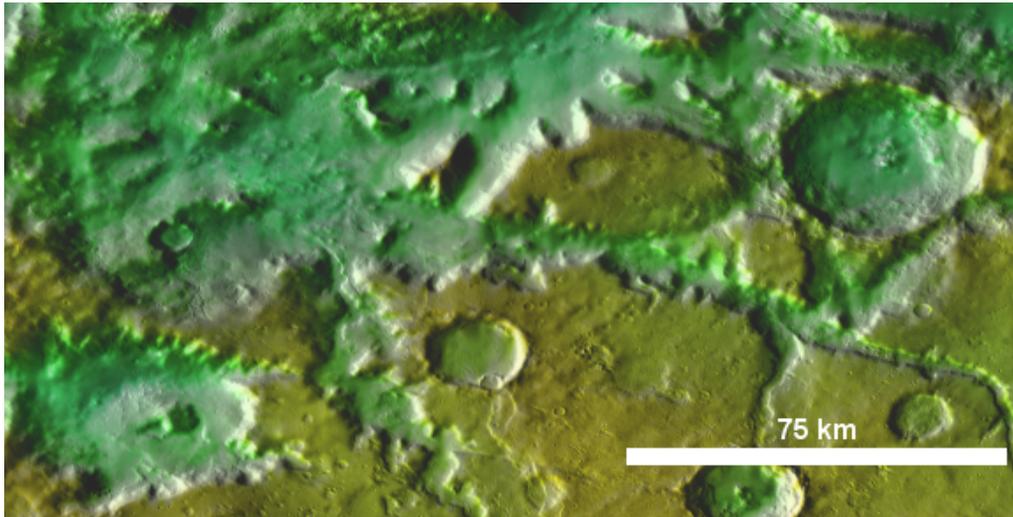


Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Resource ROI4

1st EZ Workshop for Human Missions to Mars

Noachian Highlands (mNh)



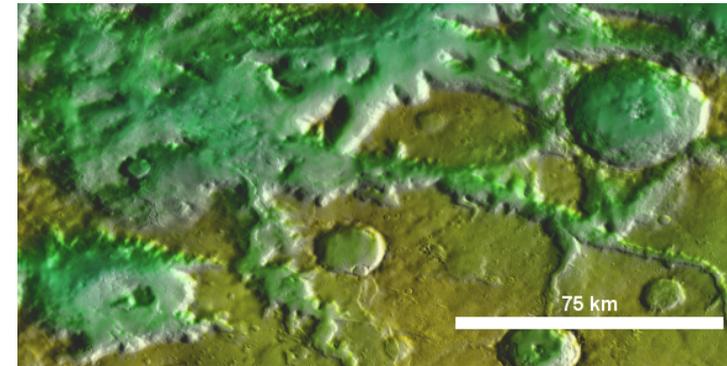
- 48.766E, 39.977
- Cobbles, rocks, regolith
- Metals?

Resource ROI4 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI4	
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●	
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	
			Potential for hydrated minerals	
			Quantity for substantial production	
			Potential to be minable by highly automated systems	
			Located less than 3 km from processing equipment site	
			Located no more than 3 meters below the surface	
			Accessible by automated systems	
	Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals		
		Distance to resource location can be >5 km		
		Route to resource location must be (plausibly) traversable		
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution	
			1-10 km length scale: <10°	
			Located within 5 km of landing site location	
	Qualifying	Located in the northern hemisphere		
		Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	●	
	Food Production	Qualifying	Utilitarian terrain features	
			Low latitude	
			No local terrain feature(s) that could shadow light collection facilities	
			Access to water	
Metal/Silicon Resource	Threshold	Access to dark, minimally altered basaltic sands		
		Potential for metal/silicon	●	
		Potential to be minable by highly automated systems	●	
		Located less than 3 km from processing equipment site	○	
		Located no more than 3 meters below the surface	○	
	Accessible by automated systems	●		
	Qualifying	Potential for multiple sources of metals/silicon	●	
Distance to resource location can be >5 km		●		
Route to resource location must be (plausibly) traversable		●		

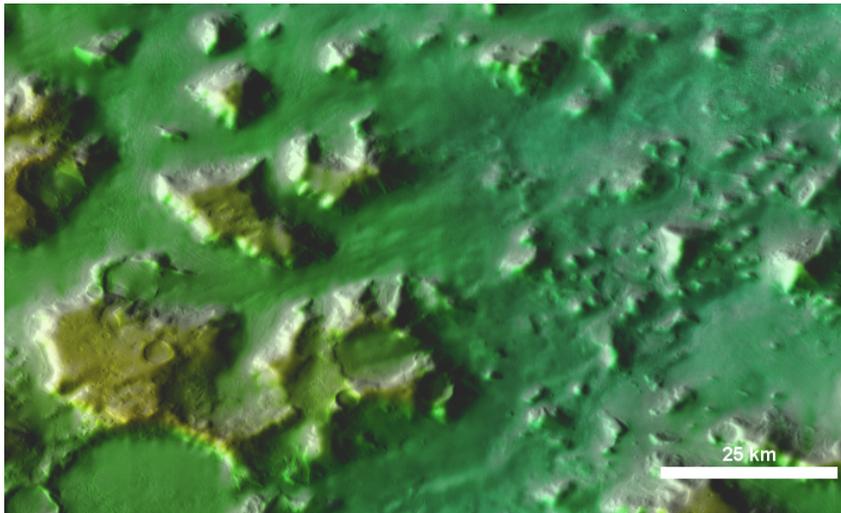


Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Resource ROI5

1st EZ Workshop for Human Missions to Mars

Early Hesperian transition unit (eHt)



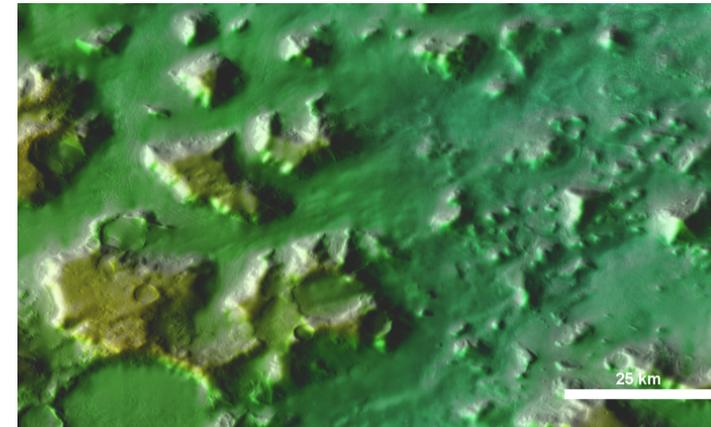
- 49.312E, 42.898
- Cobbles, rocks, regolith
- Metals?

Resource ROI5 Rubric

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI5		
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●		
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	●	
			Potential for hydrated minerals	●	
			Quantity for substantial production	●	
			Potential to be minable by highly automated systems	●	
			Located less than 3 km from processing equipment site	●	
			Located no more than 3 meters below the surface	●	
			Accessible by automated systems	●	
			Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals	●
				Distance to resource location can be >5 km	●
				Route to resource location must be (plausibly) traversable	●
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution	●	
			1-10 km length scale: <10°	●	
			Located within 5 km of landing site location	●	
		Qualifying	Located in the northern hemisphere		
	Food Production	Qualifying	Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	●	
			Utilitarian terrain features		
			Low latitude		
			No local terrain feature(s) that could shadow light collection facilities		
	Metal/Silicon Resource	Threshold	Access to water	●	
			Access to dark, minimally altered basaltic sands		
			Potential for metal/silicon		
			Potential to be minable by highly automated systems		
			Located less than 3 km from processing equipment site		
		Located no more than 3 meters below the surface			
		Accessible by automated systems			
		Qualifying	Potential for multiple sources of metals/silicon		
Distance to resource location can be >5 km					
Route to resource location must be (plausibly) traversable					



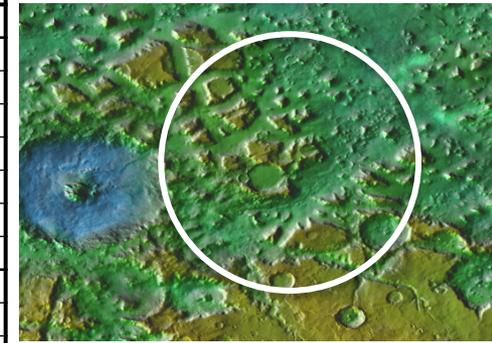
Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

Resource Rubrics

1st EZ Workshop for Human Missions to Mars



Site Factors			RROI1	RROI2	RROI3	RROI4	RROI5	EZ SUM		
ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)	●	●	●	●	●	(5,0)		
	Water Resource	Threshold	AND/OR Potential for ice or ice/regolith mix	●	●	●		●	(4,0)	
			Potential for hydrated minerals		●	●		●	(3,0)	
			Quantity for substantial production	●	●	●		●	(4,0)	
			Potential to be minable by highly automated systems	●	●	●		●	(4,0)	
			Located less than 3 km from processing equipment site	○	○	○		●	(1,3)	
			Located no more than 3 meters below the surface	○	○	○		●	(1,3)	
			Accessible by automated systems	●	●	●		●	(4,0)	
	Qualifying	Potential for multiple sources of ice, ice/regolith mix and hydrated minerals	●	●	●		●	(4,0)		
		Distance to resource location can be >5 km	●	●	●		●	(4,0)		
		Route to resource location must be (plausibly) traversable	●	●	●		●	(4,0)		
	Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution	●				●	(2,0)	
			1-10 km length scale: <10°	●				●	(2,0)	
			Located within 5 km of landing site location	●				●	(2,0)	
	Qualifying	Located in the northern hemisphere								
		Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith	○	●	●	●	●		(4,1)	
		Utilitarian terrain features	●	●					(2,0)	
	Food Production	Qualifying	Low latitude							
			No local terrain feature(s) that could shadow light collection facilities							
			Access to water	●	●	●		●		(4,0)
	Access to dark, minimally altered basaltic sands									
Metal/Silicon Resource	Threshold	Potential for metal/silicon			●	●			(2,0)	
		Potential to be minable by highly automated systems			●	●			(2,0)	
		Located less than 3 km from processing equipment site			○	○			(0,2)	
		Located no more than 3 meters below the surface			○	○			(0,2)	
		Accessible by automated systems			●	●			(2,0)	
	Qualifying	Potential for multiple sources of metals/silicon			●	●			(2,0)	
		Distance to resource location can be >5 km			●	●			(2,0)	
Route to resource location must be (plausibly) traversable				○	●			(1,1)		



Key	
●	Yes
○	Partial Support or Debated
	No
?	Indeterminate

EZ Rubrics

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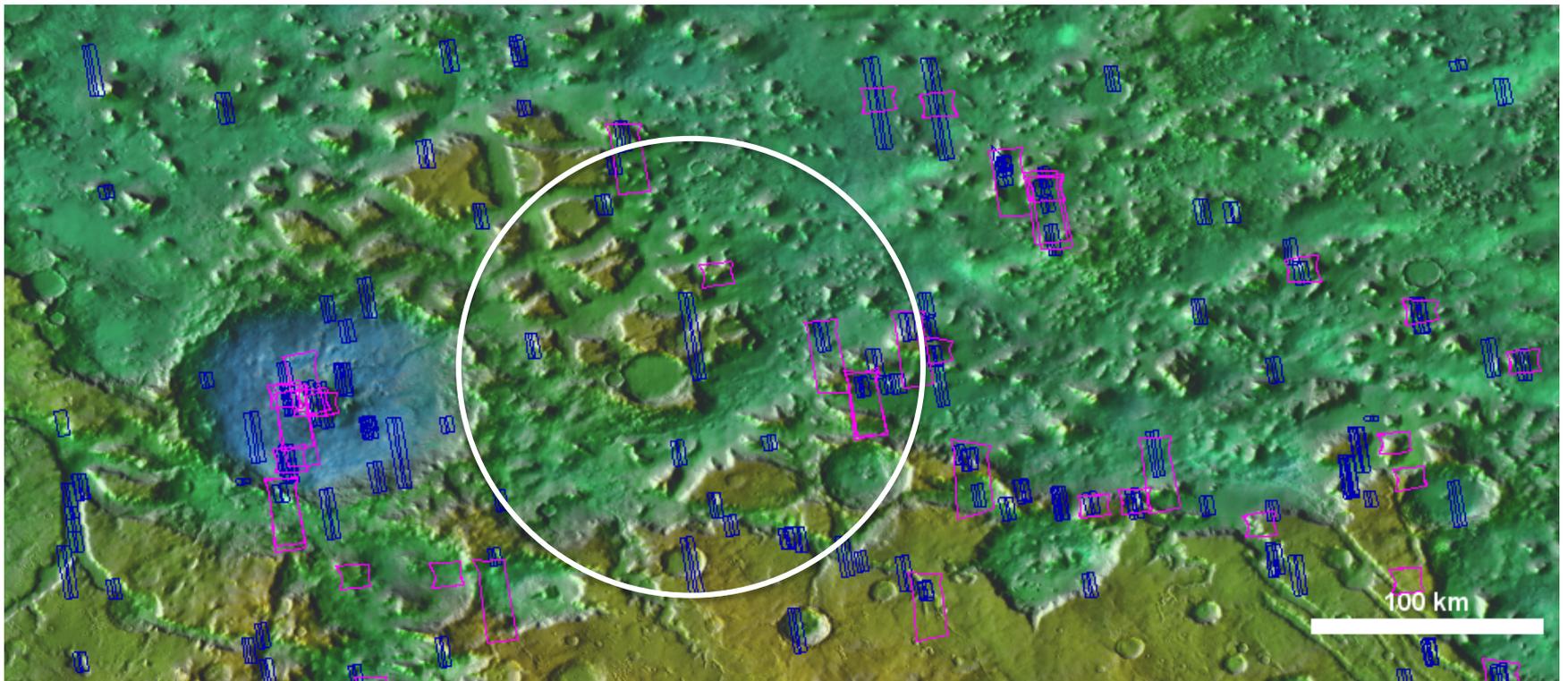


Science Site Criteria				Site Factors	EZ	ISRU and Civil Engineering Criteria				Site Factors	EZ			
Science Site Criteria	Astrobio	Threshold	AND/OR	Potential for past habitability	●	ISRU and Civil Engineering Criteria	Engineering	Meets First Order Criteria (Latitude, Elevation, Thermal Inertia)			●			
			Potential for present habitability/refugia	●	AND/OR			Potential for ice or ice/regolith mix	●					
		Qualifying	Potential for organic matter, w/ surface exposure	?	Potential for hydrated minerals			●						
	Atmospheric Science	Threshold	Noachian/Hesperian rocks w/ trapped atmospheric gases		●			Water Resource	Threshold	Quantity for substantial production			●	
			Meteorological diversity in space and time	●	Potential to be minable by highly automated systems					●				
		Qualifying	High likelihood of surface-atmosphere exchange		●					Located less than 3 km from processing equipment site			○	
			Amazonian subsurface or high-latitude ice or sediment		●					Located no more than 3 meters below the surface			○	
			High likelihood of active trace gas sources		?					Accessible by automated systems			●	
	Geoscience	Threshold	Range of martian geologic time; datable surfaces		●				Civil Engineering	Threshold	~50 sq km region of flat and stable terrain with sparse rock distribution			●
			Evidence of aqueous processes		●						1-10 km length scale: <10°			●
			Potential for interpreting relative ages		●		Located within 5 km of landing site location				●			
		Qualifying	Igneous Rocks tied to 1+ provinces or different times		●		Qualifying			Located in the northern hemisphere			●	
			Near-surface ice, glacial or permafrost		●					Evidence of abundant cobble sized or smaller rocks and bulk, loose regolith			●	
			Noachian or pre-Noachian bedrock units		●		Utilitarian terrain features			●				
			Outcrops with remnant magnetization		●		Food Production	Qualifying	Low latitude			●		
			Primary, secondary, and basin-forming impact deposits		●				No local terrain feature(s) that could shadow light collection facilities			●		
			Structural features with regional or global context		●				Access to water			●		
			Diversity of aeolian sediments and/or landforms		○				Access to dark, minimally altered basaltic sands			●		
				Metal/Silicon Resource	Threshold				Potential for metal/silicon			●		
							Potential to be minable by highly automated systems			●				
			Located less than 3 km from processing equipment site			○								
			Located no more than 3 meters below the surface			○								
			Accessible by automated systems			●								
			Qualifying		Potential for multiple sources of metals/silicon			●						
					Distance to resource location can be >5 km			●						
					Route to resource location must be (plausibly) traversable			●						

Current HIRISE and CRISM coverage



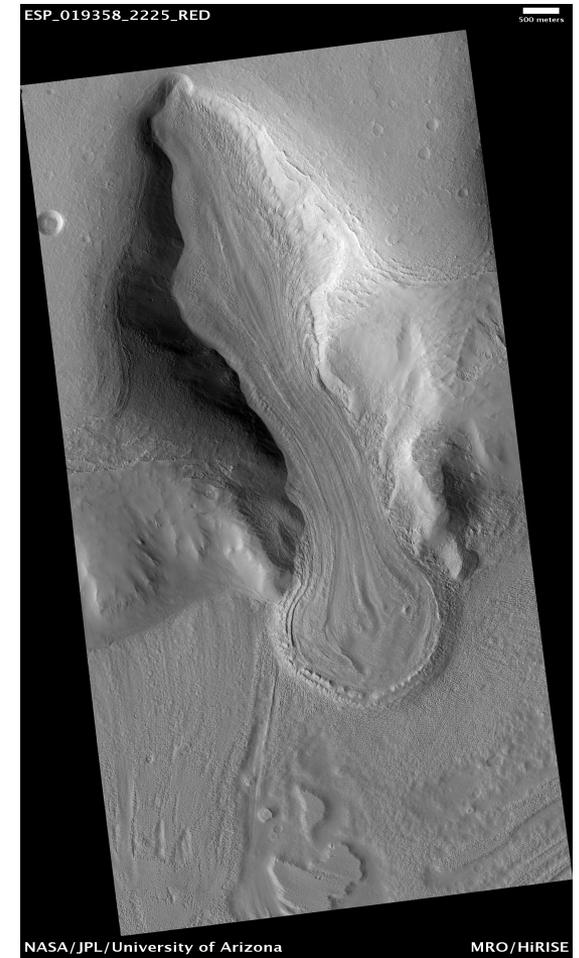
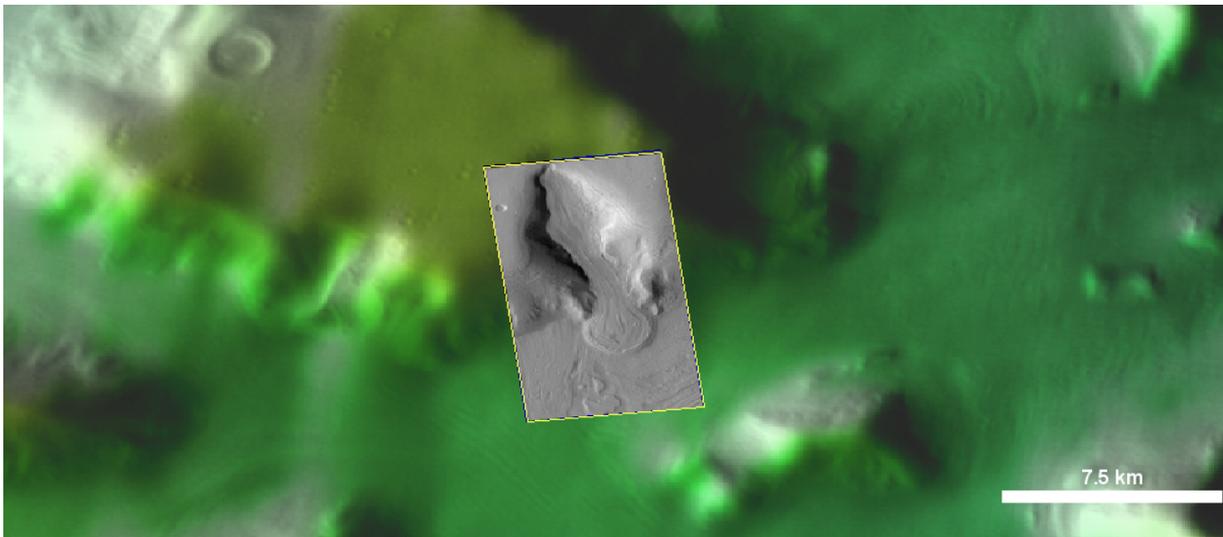
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HIRISE and CRISM

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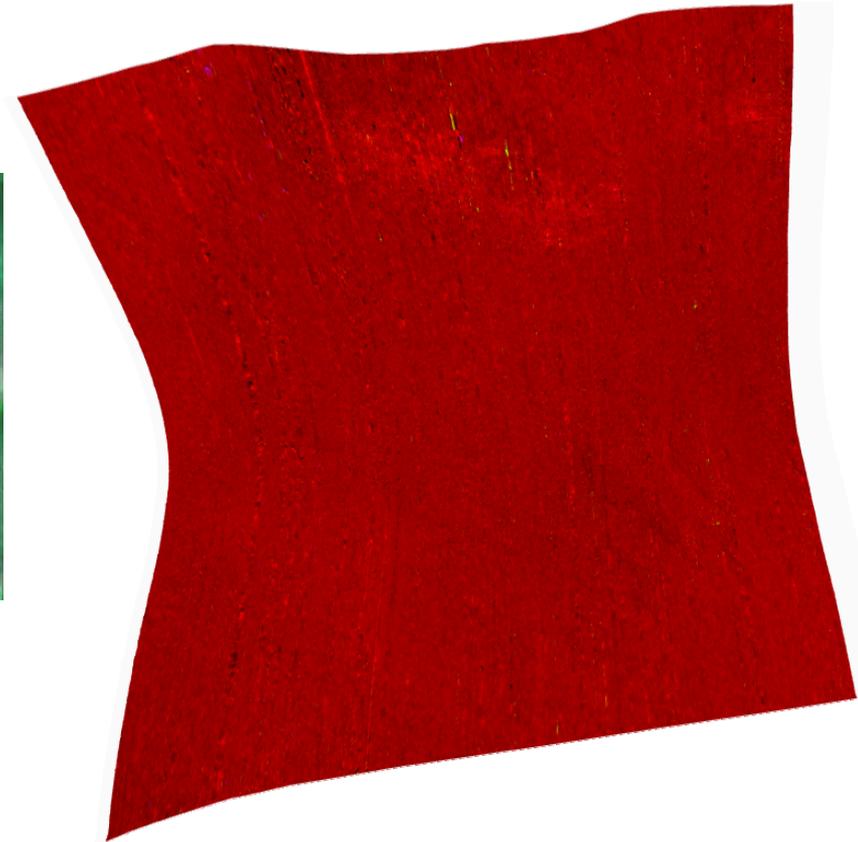
- Amazonian Noachian apron unit



HIRISE and CRISM

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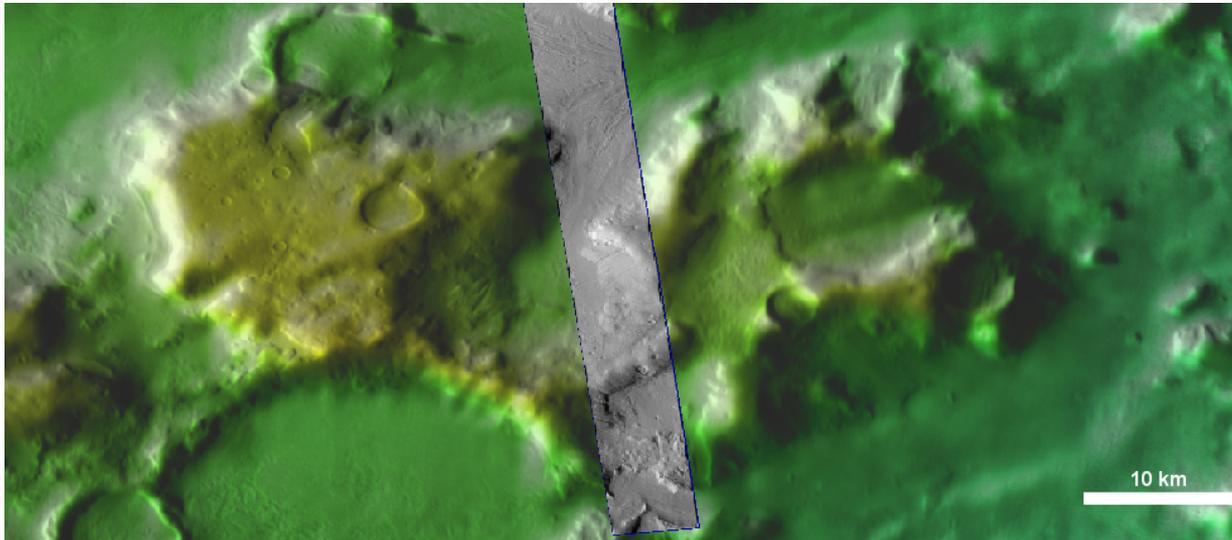
- Amazonian Noachian apron unit
- Bound water



HIRISE and CRISM

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- Landing site crater outlet
- Amazonian Noachian apron unit

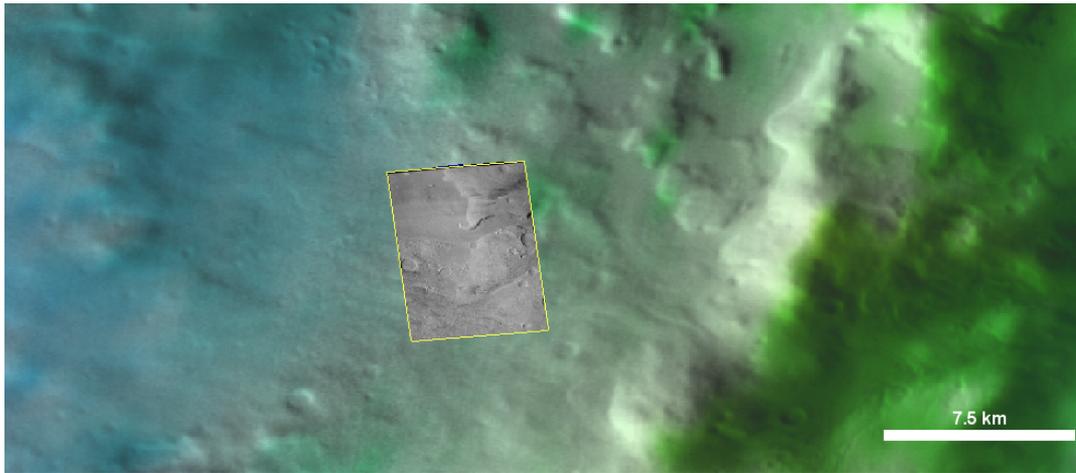


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HIRISE and CRISM

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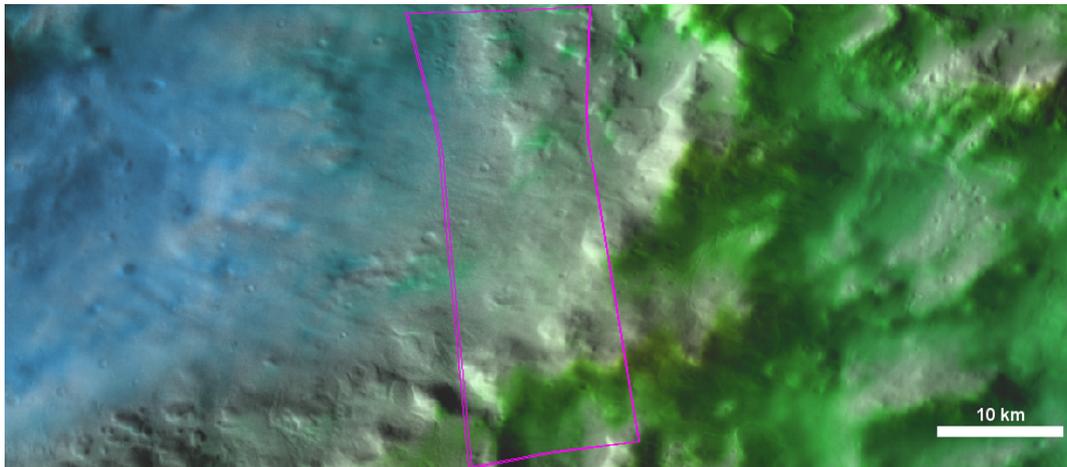
- Inside Moreux Crater



HIRISE and CRISM

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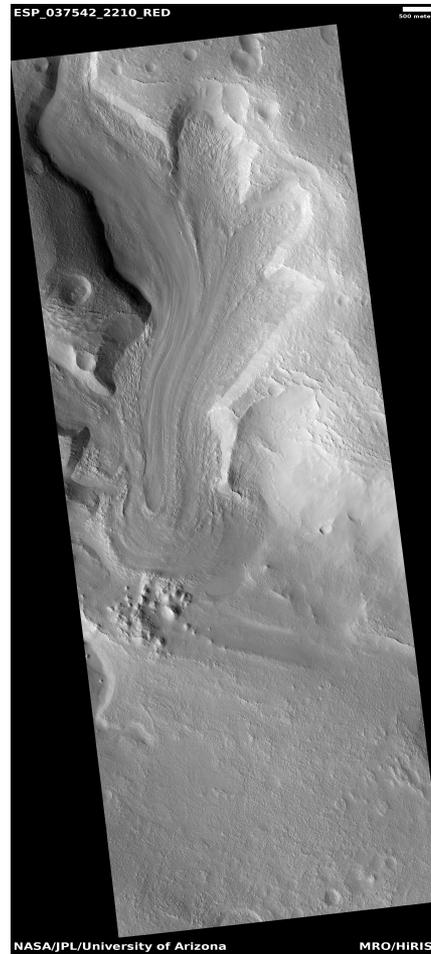
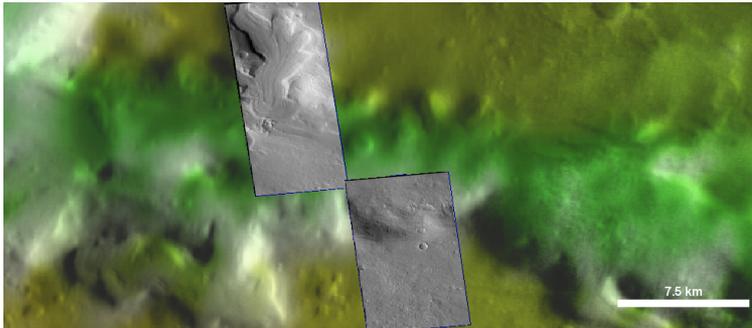
- Inside Moreux Crater
- Bound water



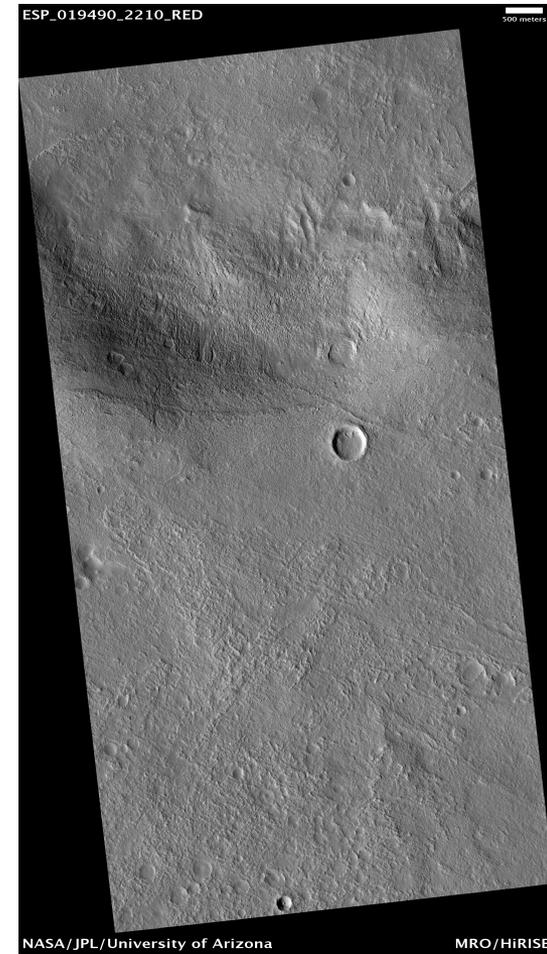
HIRISE and CRISM

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- Highlands outflow channel



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EZ Science Data Needs

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1. Orbital data

- High-resolution imagery
- Spectroscopy

3. MSL class rover

- Science reconnaissance

EZ Resource Data Needs

1st EZ Workshop for Human Missions to Mars

1. MSL class rover

- Resource reconnaissance
 - ANa ice (sell the mission as exploring Mars glaciers!)
 - Impact glass and metals

2. Orbital data

- High-resolution imagery
- Spectroscopy
- More radar data?

EZ Engineering Data Needs .

A small image of an astronaut in a white spacesuit standing on the reddish, rocky surface of Mars, looking towards the horizon under a blue sky.

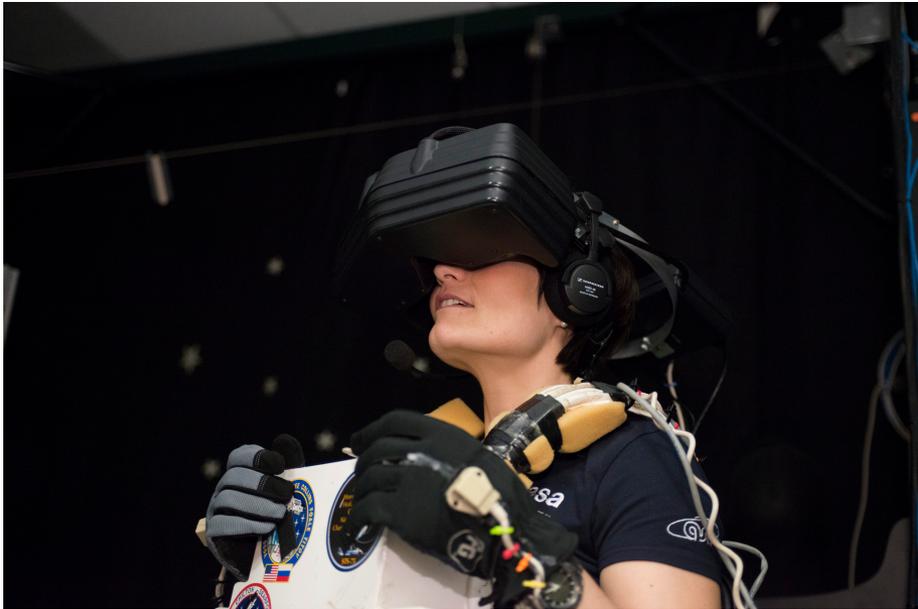
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1. High-resolution orbital imagery

- Landing site conformation
- Traverse capabilities
- Rock abundance

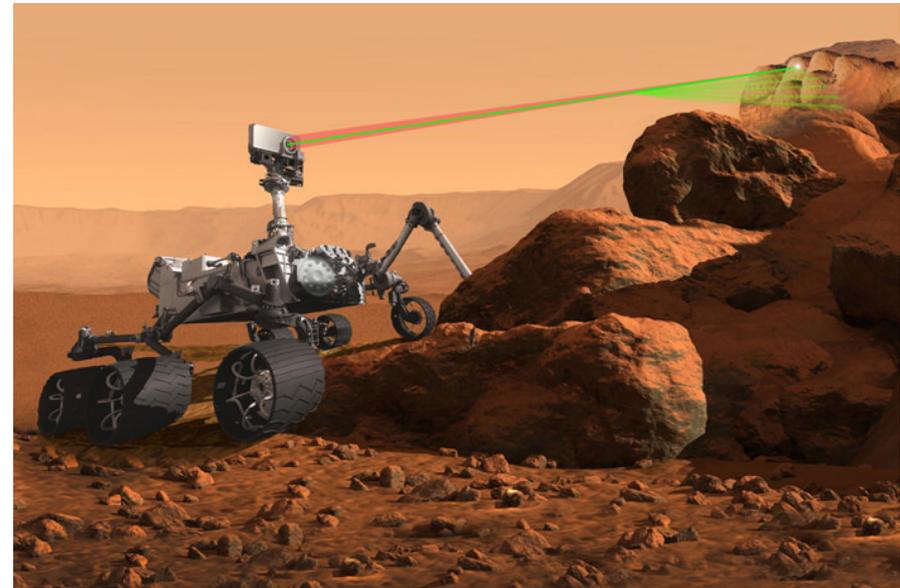
Rover Tele-operations

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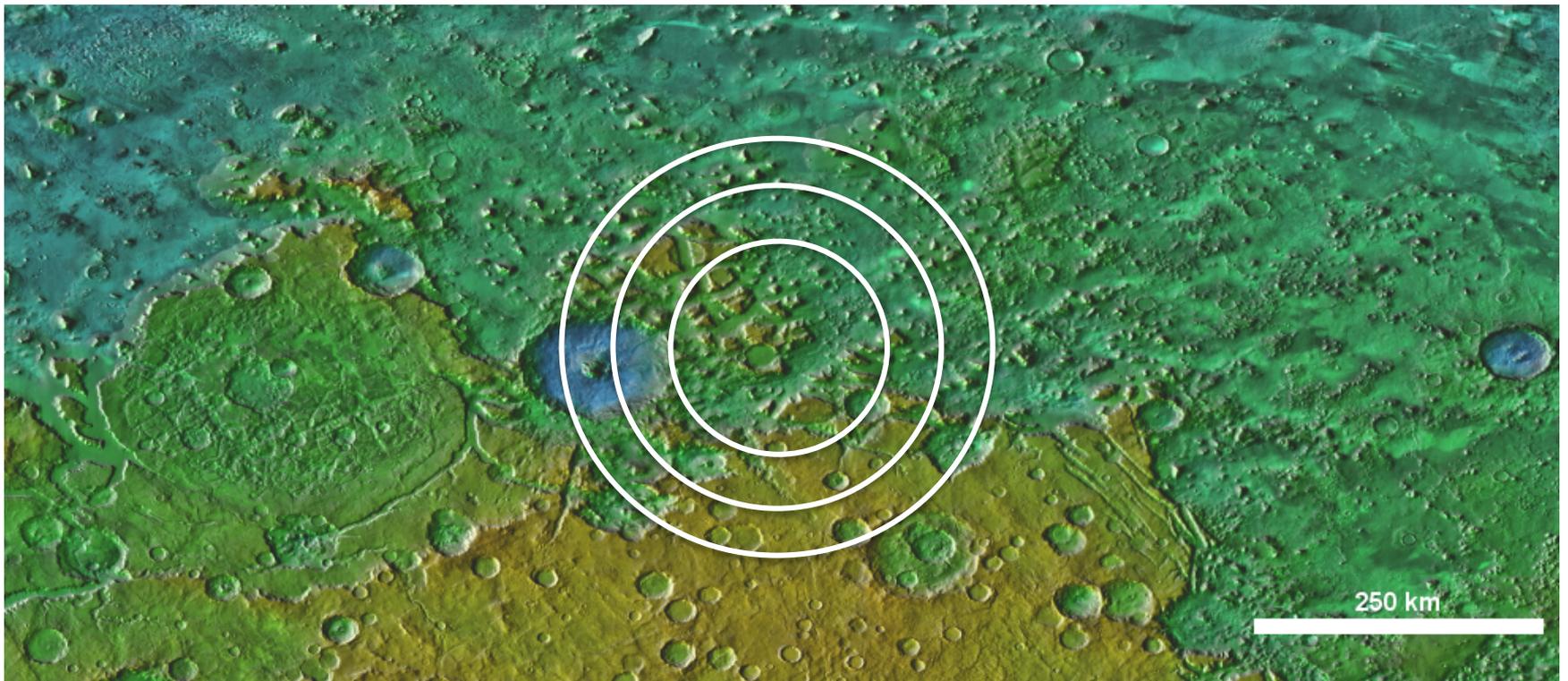
- Gives astronauts something to do
- Faster, more capable than Earth-based operation

- Increases EZ area/radii
- More science potential for every site



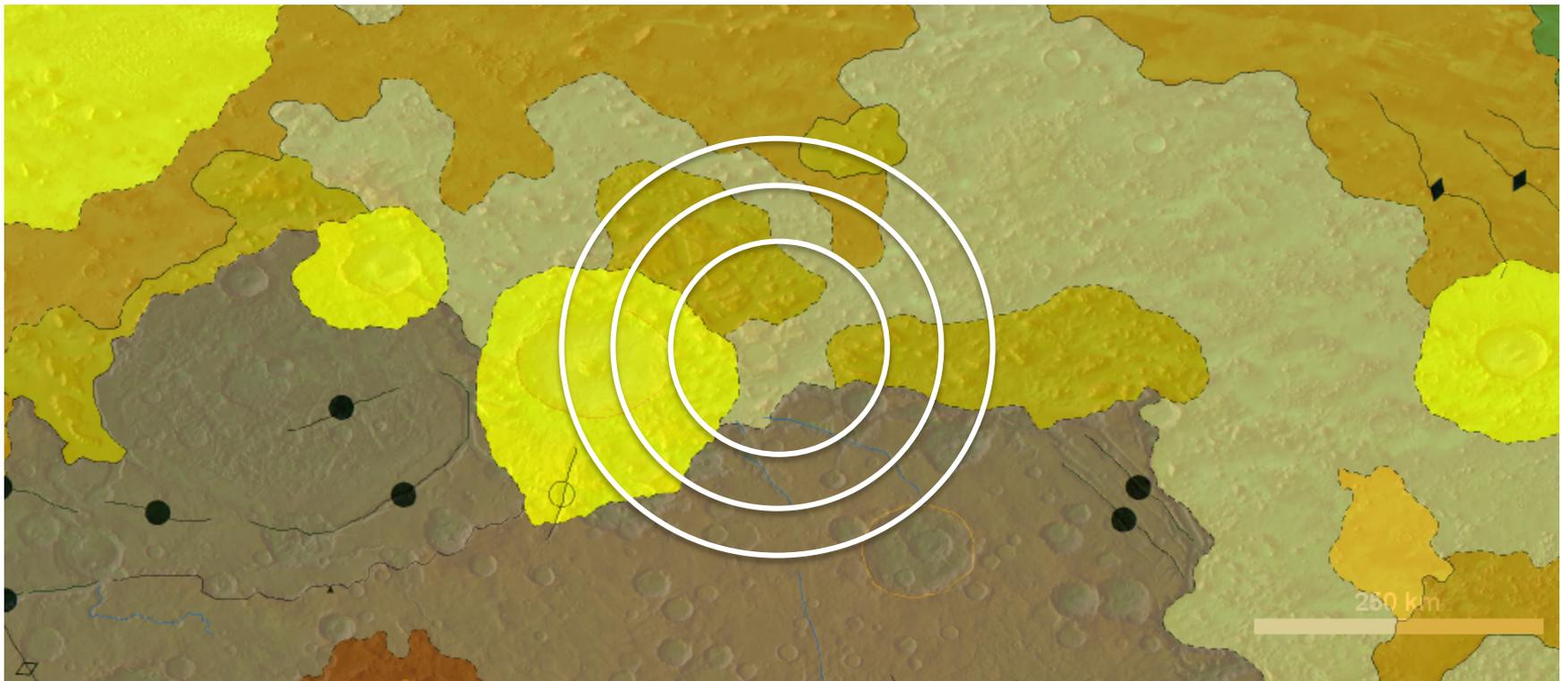
Extended Rover EZ

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Extended Rover EZ

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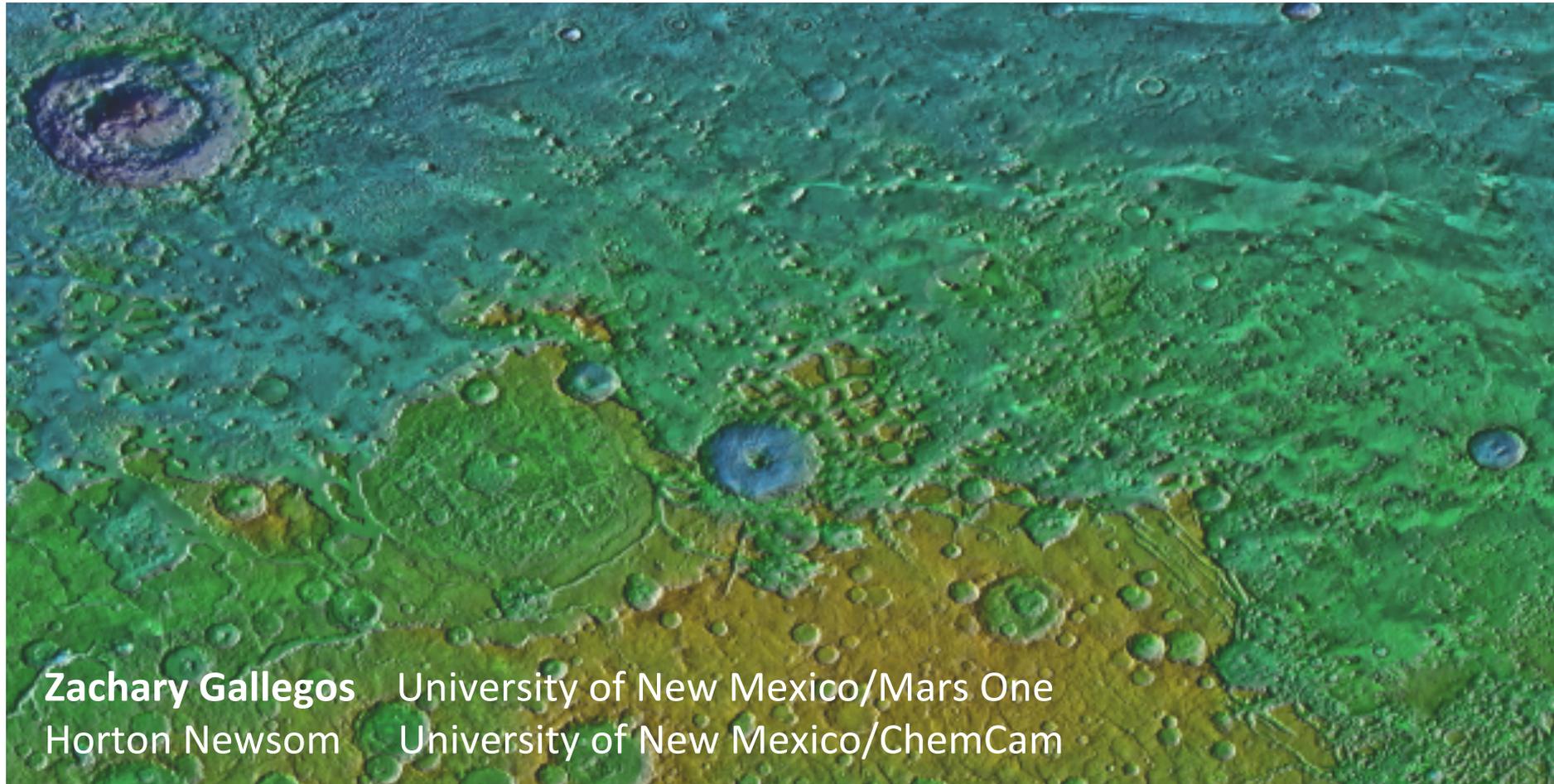


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Abstract #1053

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Zachary Gallegos University of New Mexico/Mars One
Horton Newsom University of New Mexico/ChemCam

Extra Slides



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Communications Blimp

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