How to (safely) land a robot on another planet: Mapping planetary missions from Venus to Mars

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GIS Day
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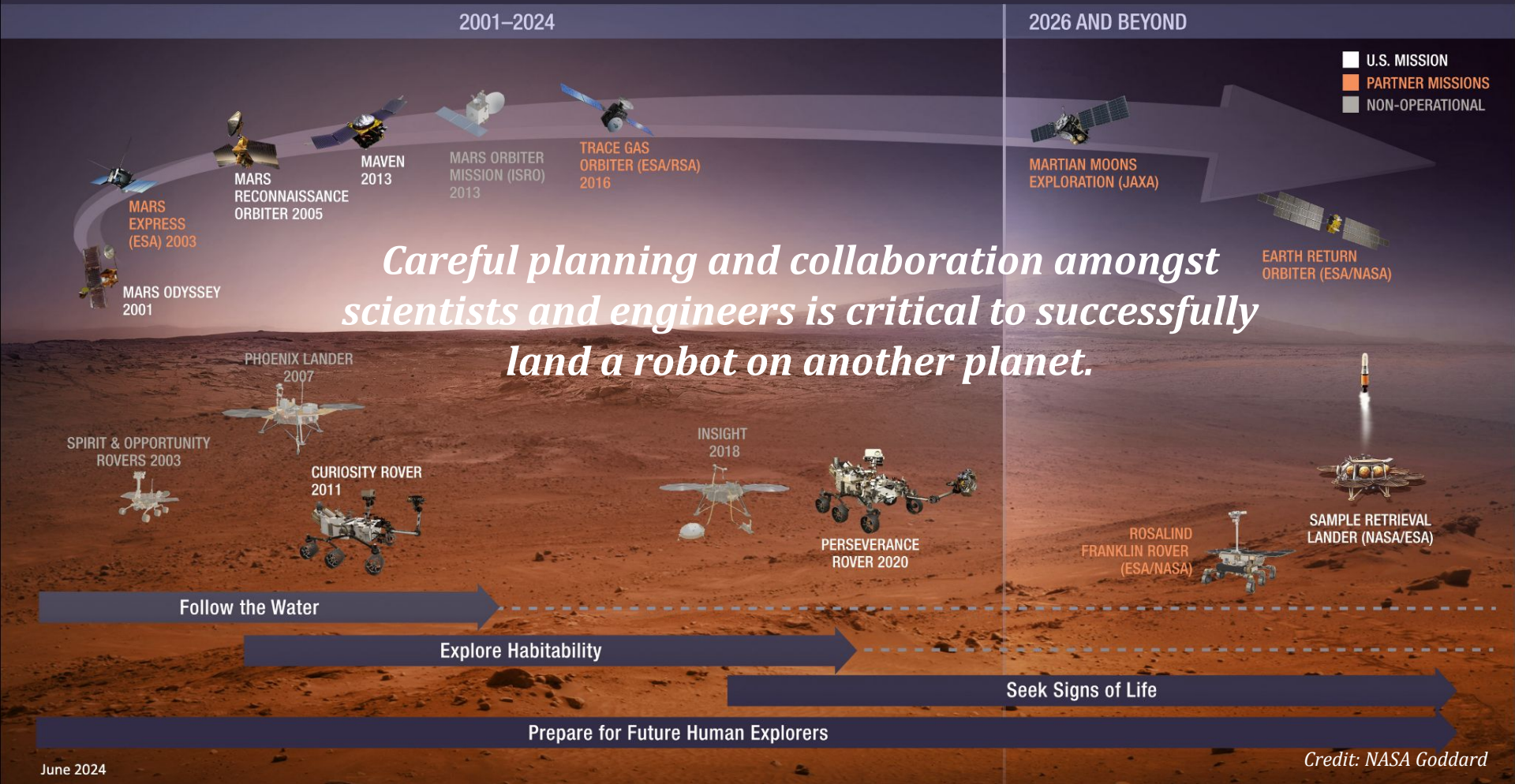
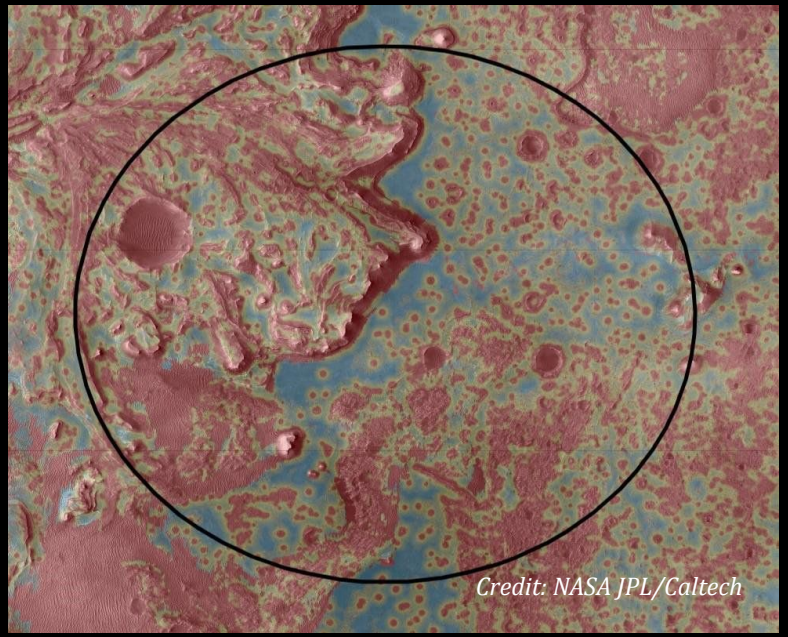
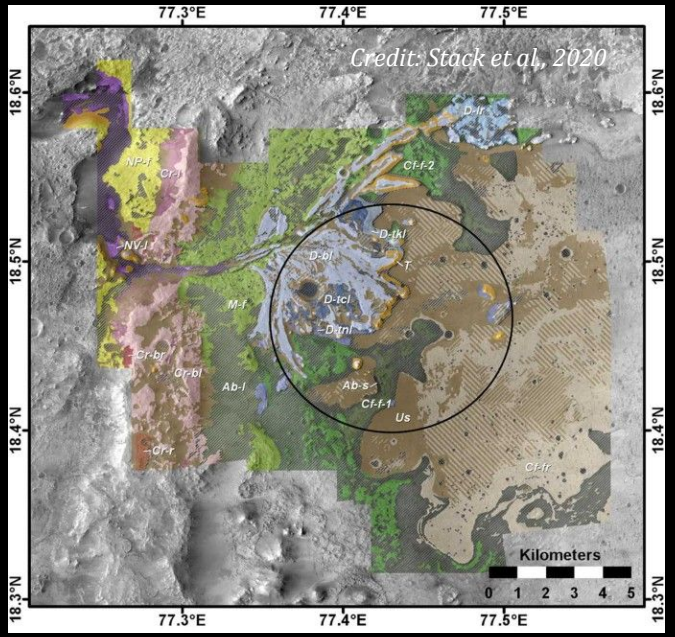


Credit: NASA Goddard

GIS can be used to analyze datasets beyond our own planet to plan and execute missions to Venus and Mars

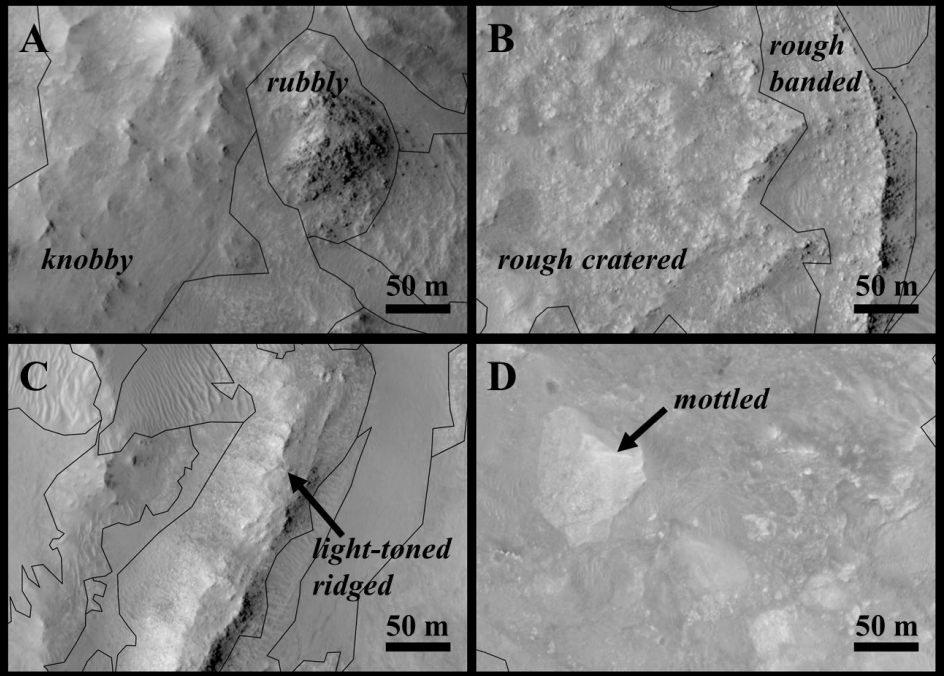


Applied mapping practices allow scientists and engineers to carefully assess landing hazards



Qualitative mapping practices provide scientists with geologic context to address mission goals

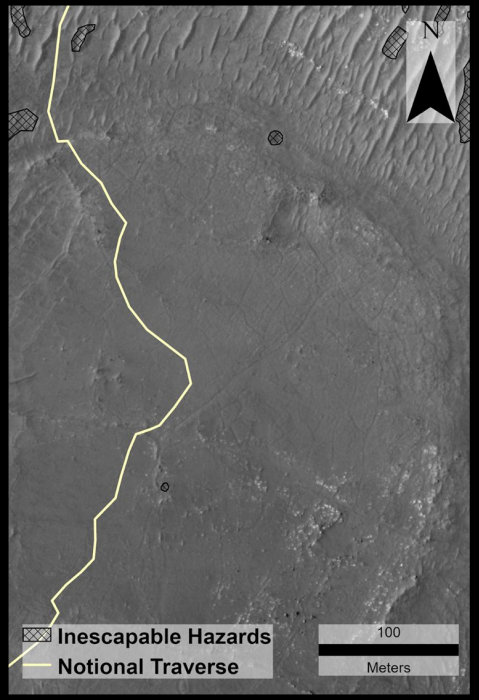
For example, a combination of orbital datasets are referenced to characterize terrains on Mars



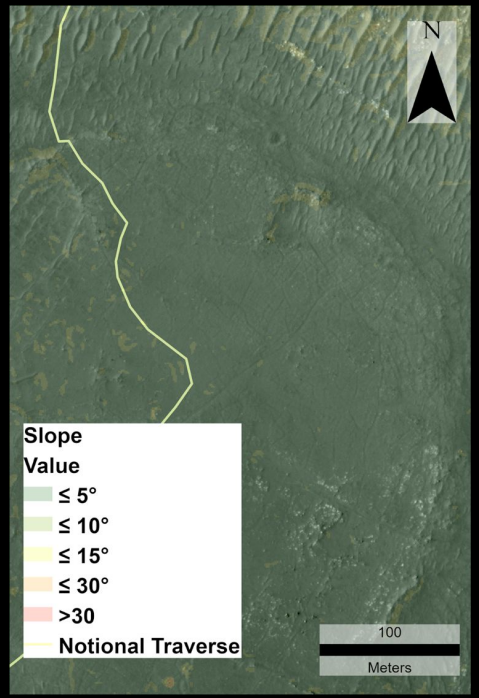
The High-Resolution Imaging Experiment on the Mars Reconnaissance Orbiter imaged the surface at ~25 cm per pixel

Given engineering constraints for a future Mars mission, geoscientists can use GIS to strategically map out candidate landing sites

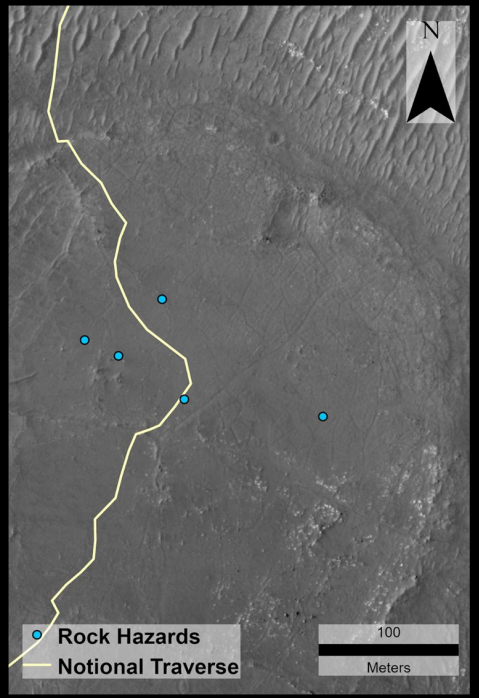
Identify smooth region



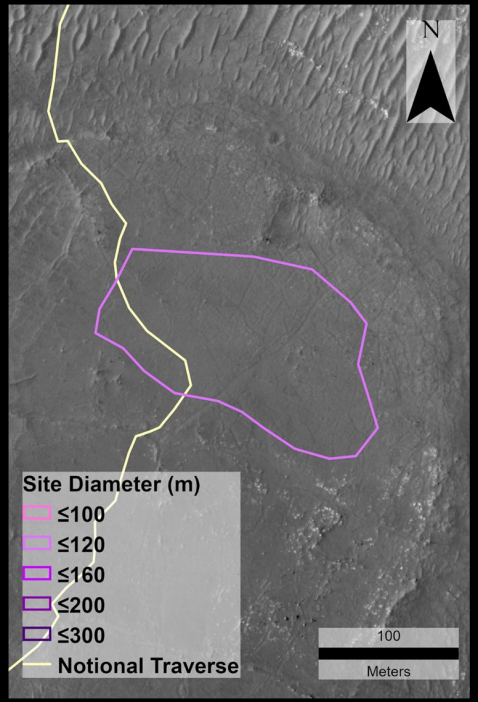
Slope <10 deg



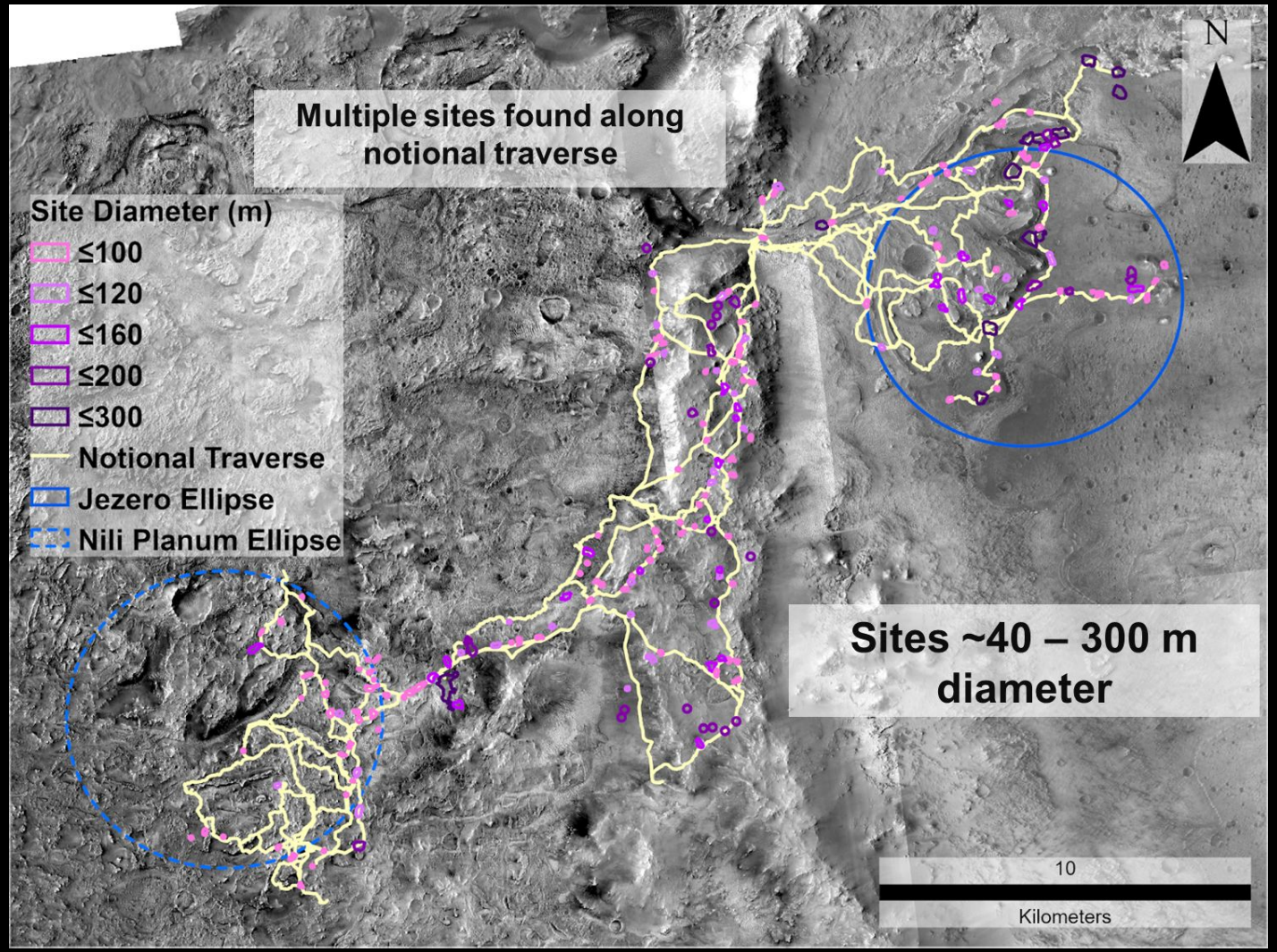
Few geologic hazards



Outline candidate site

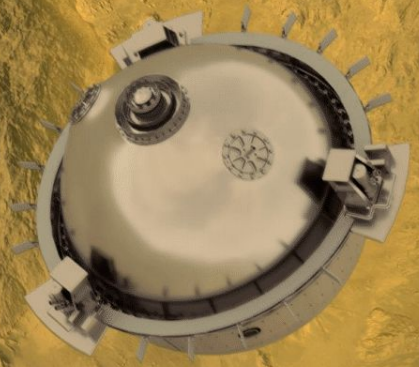


A reference map is then created for future strategic planning



Venus's harsh climate presents a new challenge…

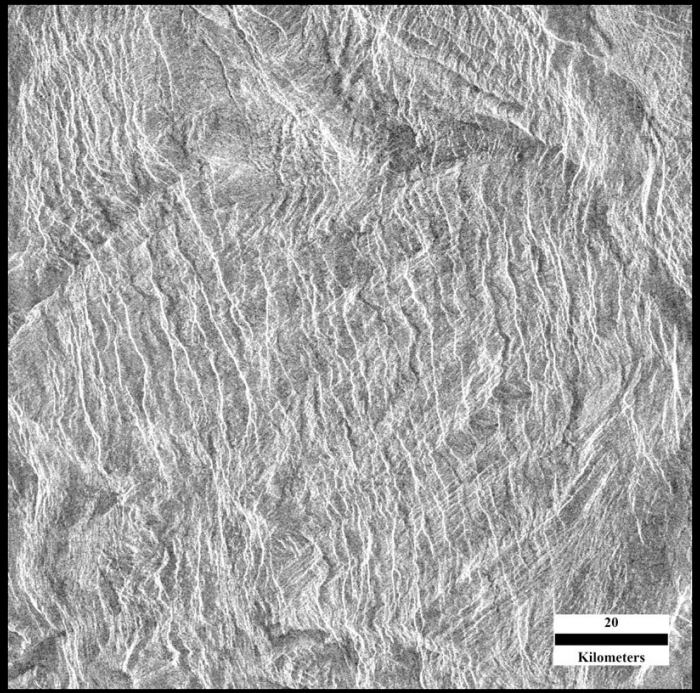
Engineers are designing an imaging probe to dive beneath a thick layer of sulfuric-acid clouds



Credit: NASA Goddard

The highest resolution dataset available on Venus is radar imagery taken by the Magellan Orbiter in the 1990s

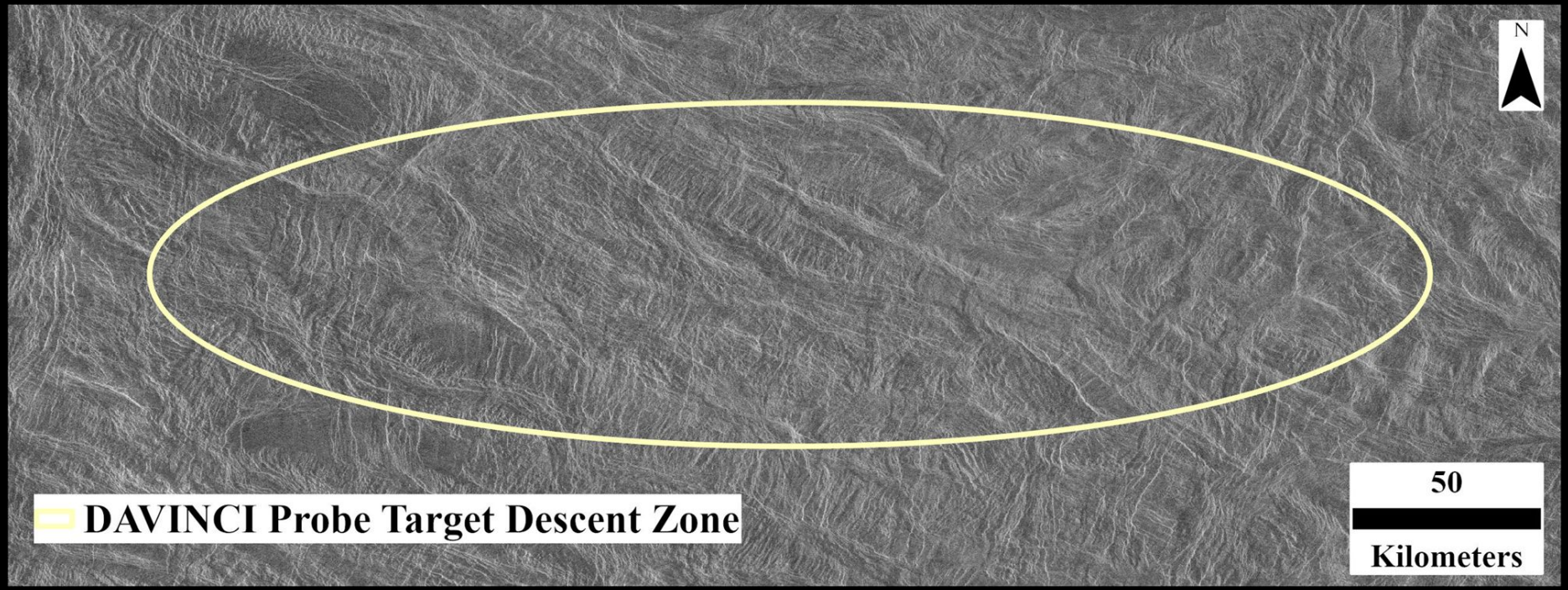
Magellan Orbiter (Credit: NASA)



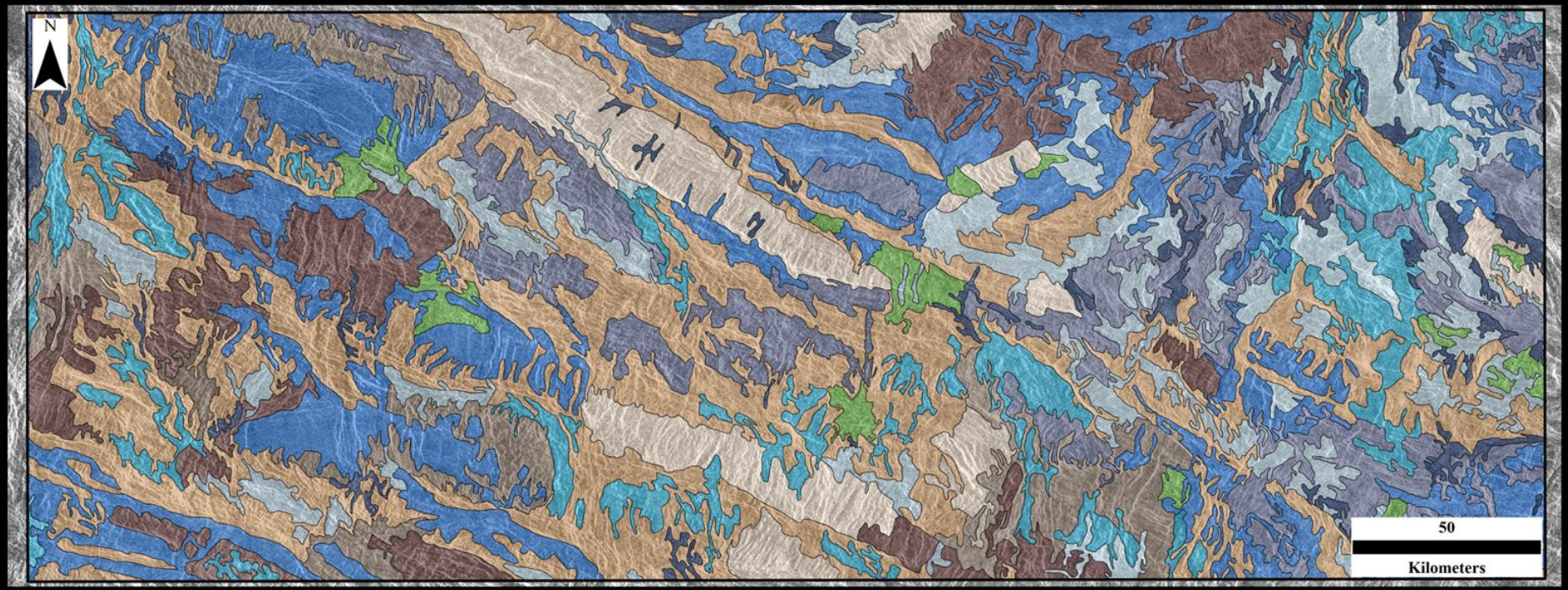
To the left is a radar image of Alpha Regio, Venus. One pixel on this image is about the size of a football field!

Magellan radar collects data on surface roughness at ~75 meters per pixel

The probe does not require hazard analysis since it isn't "landing"...



But mapping will provide necessary geologic context for future probe image calibration!



GIS tools are essential for the planning and execution of missions to other planets!