



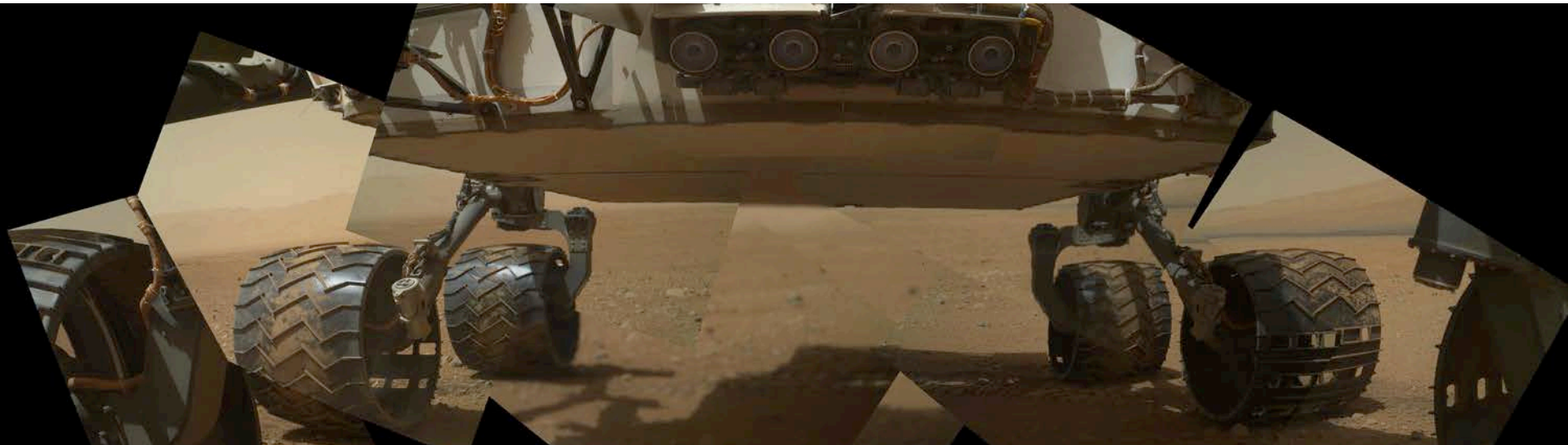
# Curiosity at Nine Months

Prepared by  
Mark Maimone  
JPL/Caltech



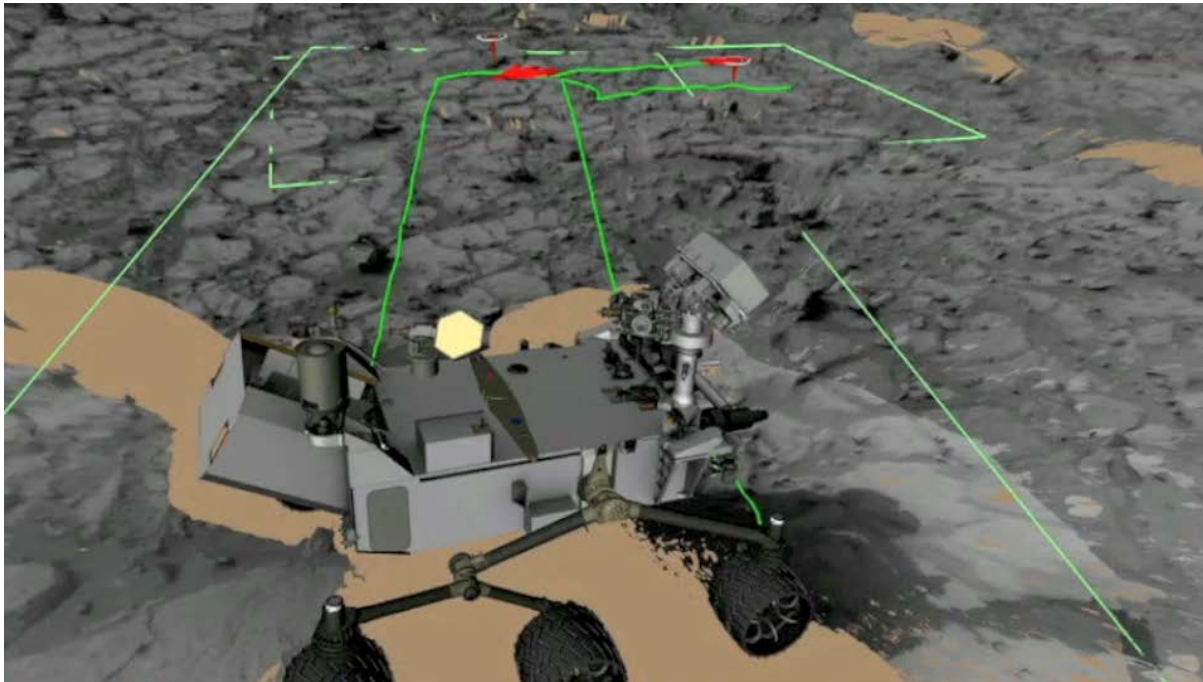
# Curiosity on Mars

- As of 1 May, 2013, Curiosity has driven 724 meters over 262 Martian solar days (sols)
- Curiosity has used Visual Odometry 499 times to update its position knowledge.
- Curiosity has performed arm, scoop, drill, and in situ sample analysis operations
  - Major science result; water previously existed on surface with neutral pH! (MER previously found evidence of ancient acidic water)
- Curiosity has driven 1 meter(!) using onboard hazard detection
  - Merged 3 Navcam stereo wedges with 1 Front Hazcam
  - Longer drives expected to start this summer



# Simulating a Drive

- Human Rover Drivers plan drives in 3D terrain meshes. This movie simulates the sol 124 visodrom drive:



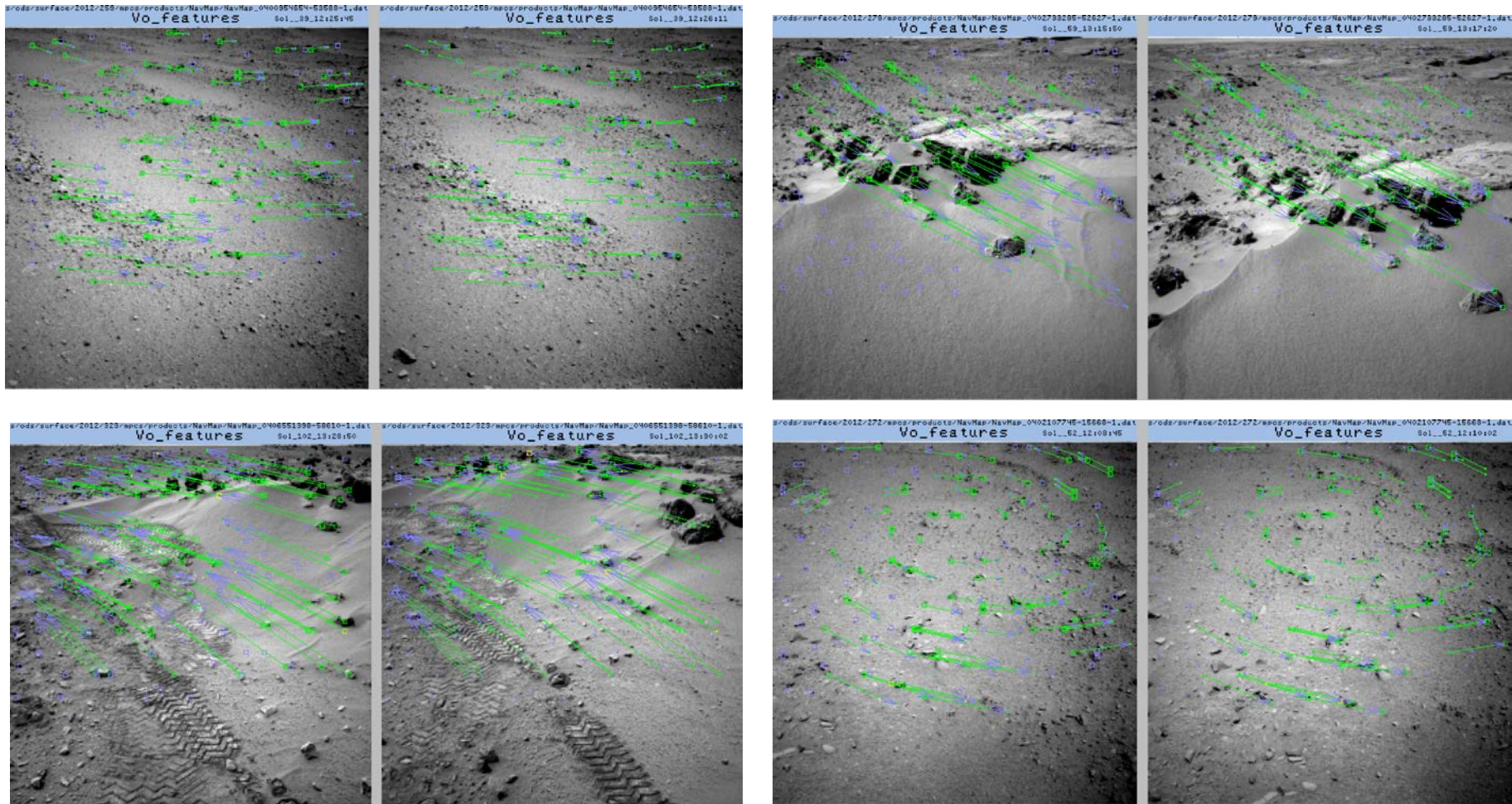
# MSL Visual Odometry

- Curiosity's Visual Odometry improves on MER's by using multiresolution and feature-range-dependent search windows
- Visual Odometry runs more than 3 times faster than MER, enabling its more frequent use.
- VO has run 499 times with no real failures
  - Sol 55 had 3, but we knew a priori that the images would not overlap enough
  - Sols 122, 123, 124 VO attitude update disagreed with IMU gyro integration; but VO was right! IMU parameters were subsequently updated.





# Example MSL VO Feature Tracks

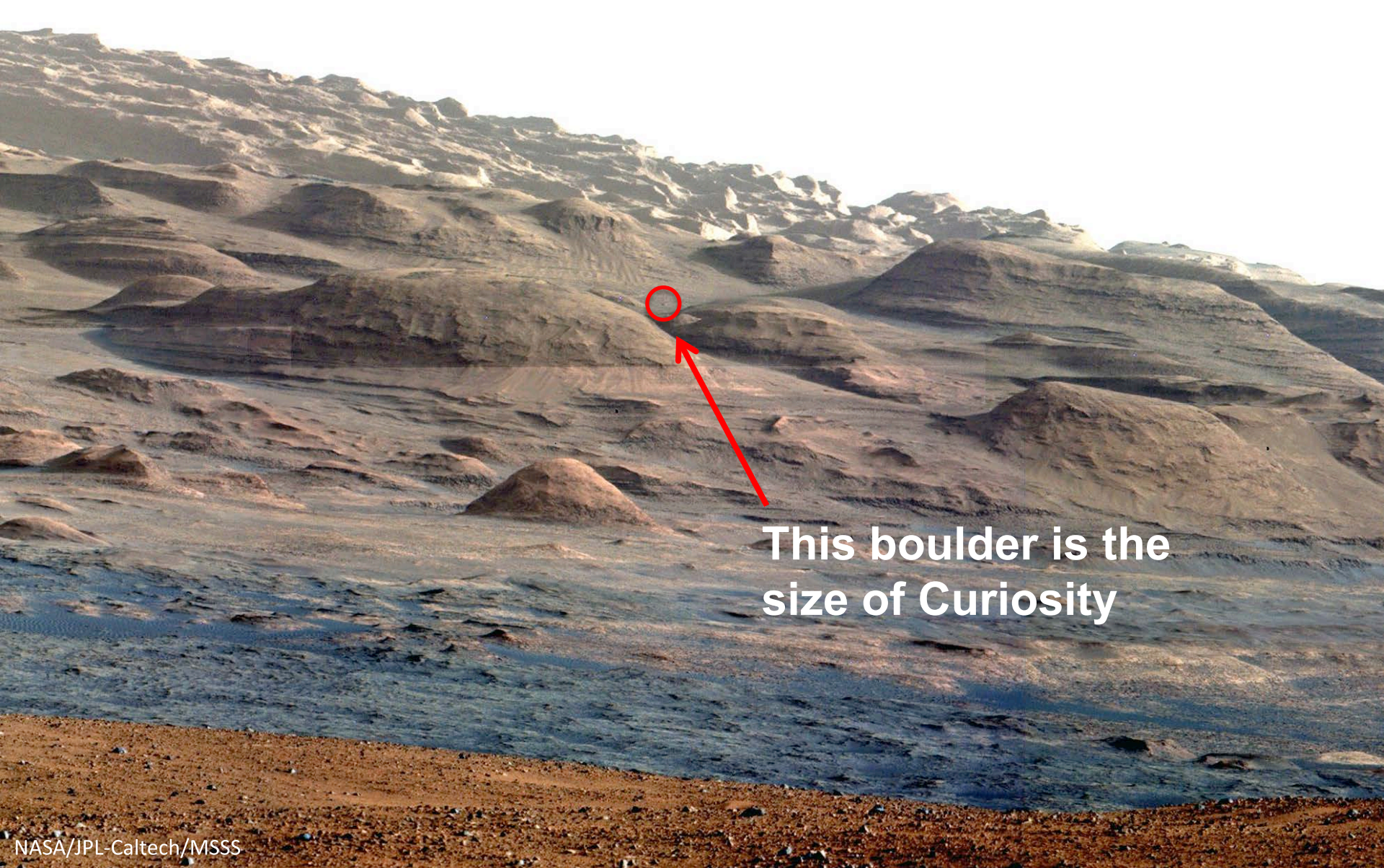


# What's Ahead?

- Curiosity booted into its next flight software release R10.6 on Monday, 6 May 2013
- This release makes it easier to use more autonomous technology:
  - Driving hazard detection and avoidance
  - Potential for autonomous drives spanning multiple sols
  - Slip Checks (stop every 10-20 meters, use VO to see if we're stuck)
  - Visual Target Tracking (eliminate range uncertainty by tracking a distant feature while you drive)
  - Autonomous VO activation in high slip or potential high slip situations
- Will likely spend the next month drilling and studying the nearby Glenelg area; sometime later start driving ~10km to the base of Mount Sharp
- Future flight software updates are anticipated







This boulder is the size of Curiosity

NASA/JPL-Caltech/MSSS



## Layers, Canyons, and Buttes of Mount Sharp



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