The Mars Science Laboratory
Curiosity’s Gale Crater Field Site in Context

Ken Edgett
Malin Space Science Systems
San Diego, CA
5 November 2012

GSA Annual Meeting 2012
Paper 69-1

MAHLI mosaic, 31 October 2012
Mars is the only terrestrial planet with an atmosphere that appears to have preserved an extensive geologic record of its earliest history.
Mars Robotic Exploration Field Sites

Phoenix
Viking 1
Pathfinder
Opportunity
Viking 2
Curiosity
Spirit

90°N to 90°S, 180°W to 180°W, centered on 0°
Gale Crater

- 5.4°S, 222.3°W
- 155 km diameter
- Mt. Sharp is about 5 km high
- Field site elevation is near –4.5 km
**Gale Crater**

- 5.4°S, 222.3°W
- 155 km diameter
- Mound is about 5 km high
- Field site elevation is near –4.5 km

**Gale Topographic Map**

Derived from Mars Express HRSC data by G. Neukum *et al.*, released to public in October 2011.

[Image of Gale Crater topographic map]

-2.7 km
-4.5 km
0.5 km
0.8 km
1.3 km


ESA/DLR/FU Berlin (G. Neukum)
Curiosity field site

area in previous slide

mass movement deposits

“Grand Canyon of Gale”

Gale Impact

Central Peak

Gale – 4.8°S, 222.7°W

MRO MARCI + CTX, MSSS

Lower Mt. Sharp Strata
- canyons cut by streams
- sulfate and clay-bearing

Upper Mt. Sharp Strata
- no stream erosion
- no sulfate or clay detection
- above erosional unconformity

Record of Equatorial Mars
Transition from “Wet” to “Dry”? 
Curiosity landed here

sub-frame of MRO CTX D03_028269_1752_XI_04S222W

7 August 2012
Crater is
a) ~23 km in diameter
b) younger than Gale
c) impacted into Gale’s ejecta

Moon cratering record → Moon rock age → orbital dynamics/Mars rate → modern Mars rate → Crater Retention Age Per Surface Unit Area
Gale

Henry

Arago

Miyamoto

18.5°S, 358°W

20.4°S, 168.1°W

all craters ~155 km in diameter

Curiosity field site

Opportunity field site

USGS mosaics of Viking orbiter images
Opportunity Field Site
2.1°S, 5.5°W

shaded relief from MGS MOLA topographic product
remains of impact craters (examples)

positive relief (ridge)

negative relief (valley)
35.5°N, 55.5°W

mosaic of MROCTX images
Gale and Volcanic Features

- Elysium Cerberus tholi volcanoes & platy volcanic plains
- Gusev & Spirit Rover & volcanics
- Lanz et al. (2010) volcanoes
- Christiansen’s (1989) “lahar” area
- Wichman & Schultz (1989) volcanic cones
- Cerberus tholi volcanoes & ‘platy’ volcanic plains
- Acidalia Planitia platy flows
- Mare Vallis flows
- Medusae Fossae “Formation”
- Gusev & Spirit Rover & volcanics
- Gale

MGS MOC wide angle red mosaic + MOLA topo as shaded relief, by MSSS
Gale and *Simulated* Apollinaris Tephra Deposition

- Autumn case, 19 km high plume, 35 μm clasts
- See Figure 5 of Kerber *et al.* (2011)

Tephra deposition simulation from:
sub-frame of MRO CTX D03_028269_1752_XI_04S222W

7 August 2012

Curiosity Present Field Area

notional traverse

5 km