Update from the Mars Science Laboratory Mission

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NAC Science Committee

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This document has been reviewed and determined not to contain export controlled technical data.

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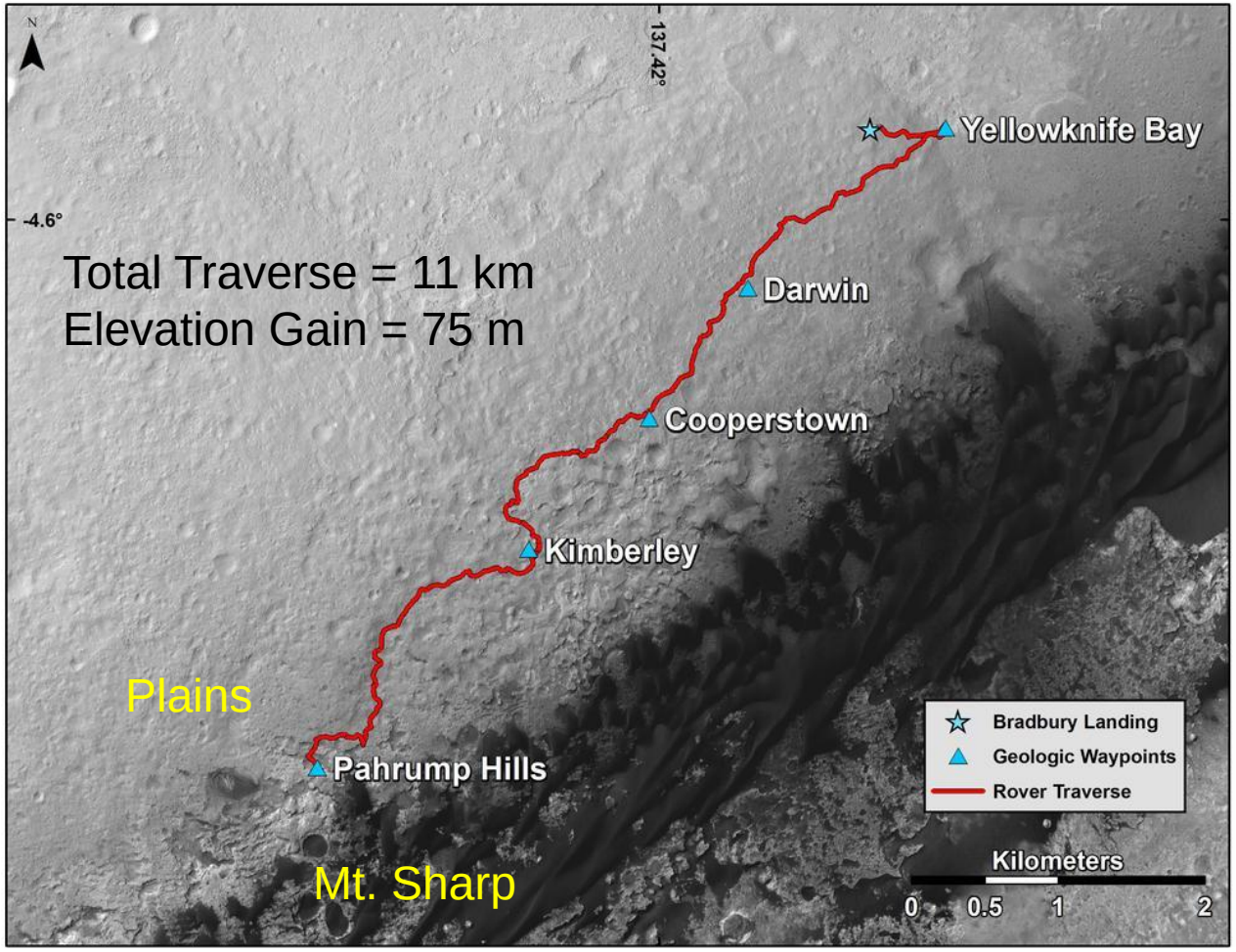
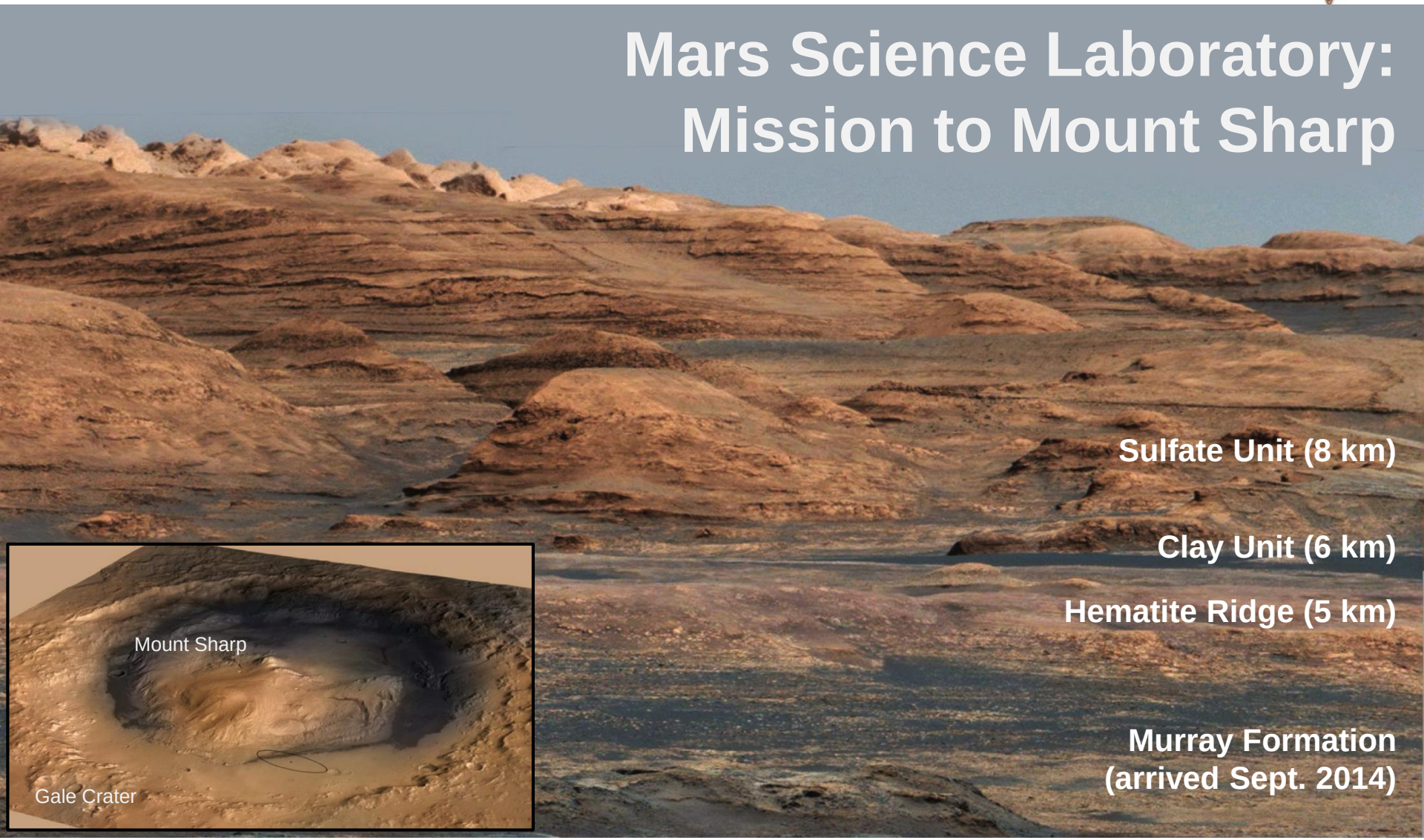
Mission Status



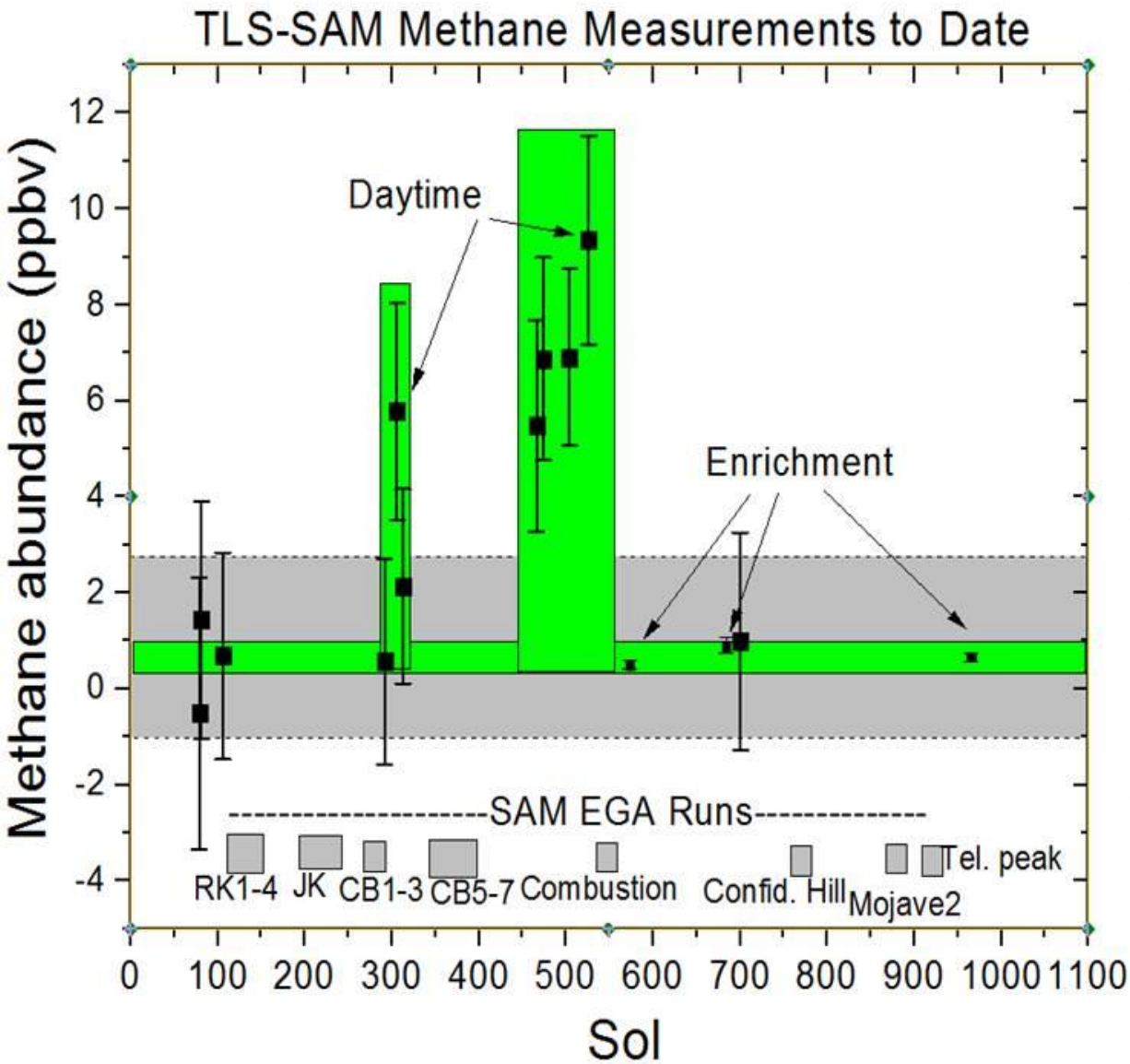
- Today is sol 1058 in Curiosity's surface mission.
- 3-year anniversary of landing on August 5.
- Hundreds of rock and soil analyses by mast and arm mounted spectrometers.
- Dozens of laboratory analyses on two scooped samples, six drilled samples, and numerous atmospheric samples.
- Reached basal rocks of Mount Sharp.

Extended Mission Plans



Ongoing Methane Measurements

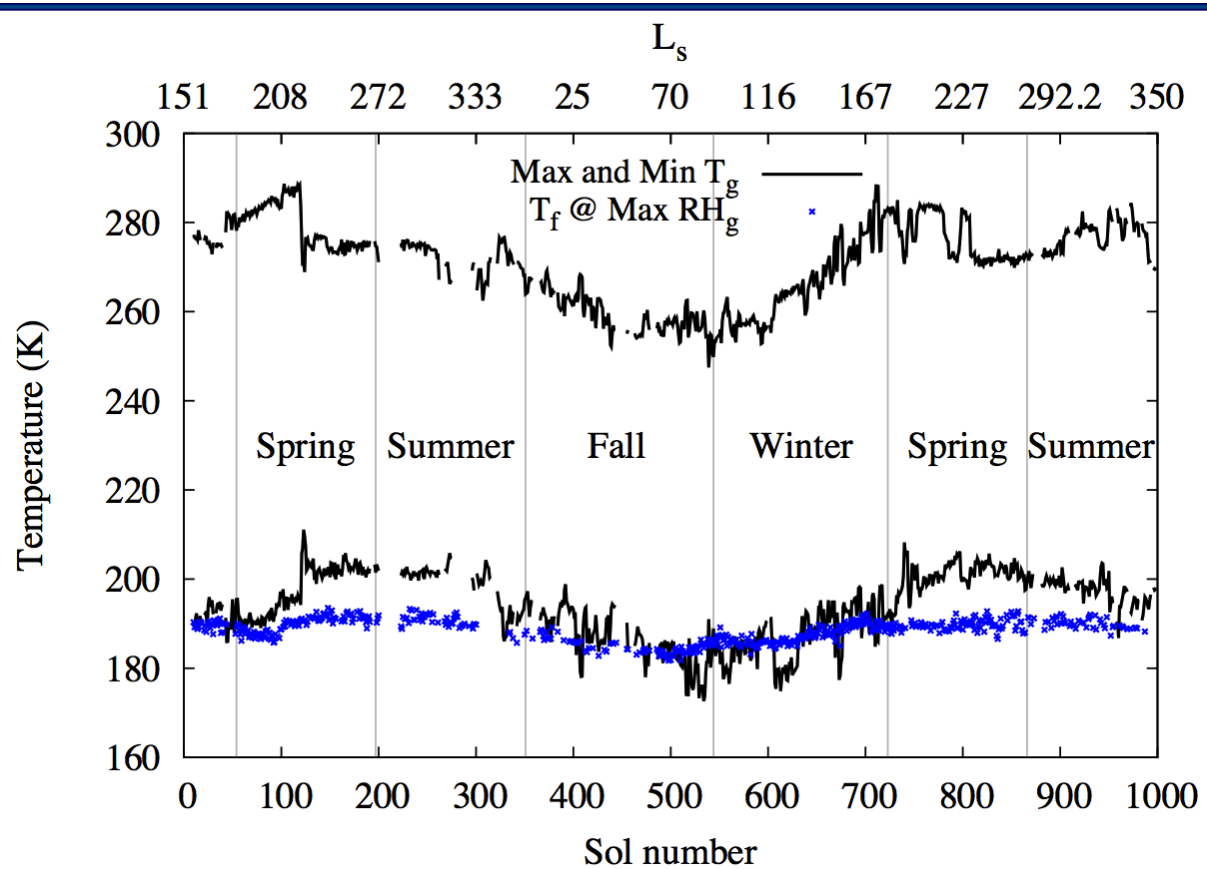
Ongoing Methane Measurements



- Curiosity detected a background methane abundance of 0.7 parts per billion (by volume)
- This background amount can be provided by UV degradation of interplanetary dust or carbonaceous chondrite materials
- A ten-fold enhancement that lasted about 60 sols is unexplained. It indicates active production of methane to the surface via a weak/local or strong/distant source.
- Curiosity will continue to monitor methane. If another enhancement is detected, the rate of sampling will increase to capture the evolution and loss.

Predictions of Frost and Brine

Predictions of Frost



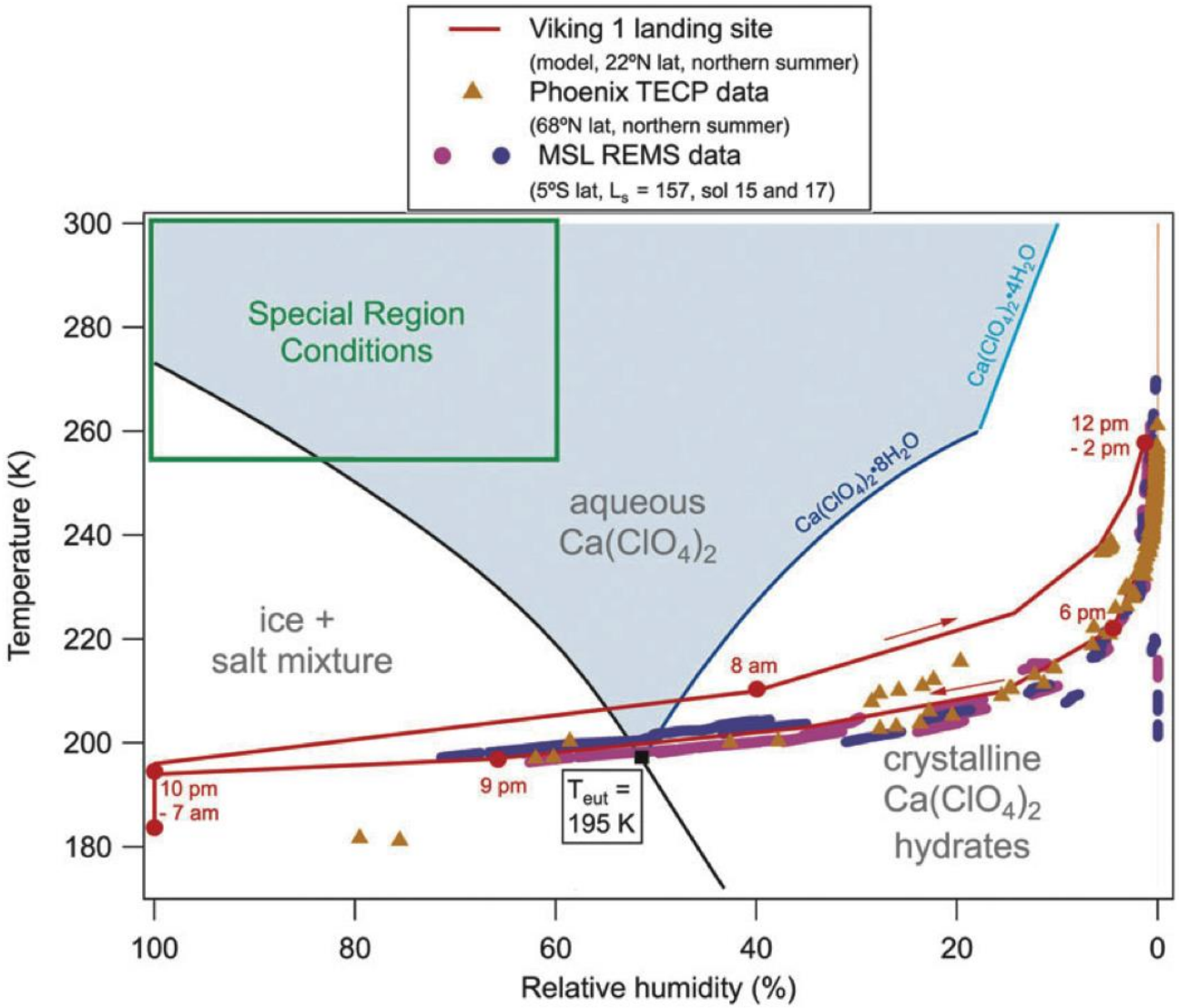
Black lines are the minimum and maximum ground temperatures measured by MSL

Blue dots are the frost point at the time of maximum relative humidity

Martinez *et al.*, 2015

- Frost on the ground may have been possible on some nights during fall and winter, with an estimated thickness of a few tenths of a micron.
- There is no evidence of frost on the ground or rover. Attempts to detect surface frost were made by ChemCam and Mastcam.

Potential for Brines



Rummel et al., 2014

The plot shows a phase diagram of calcium perchlorate, indicating conditions where brines may form

Potential of forming minute amounts of brine exists at Gale Crater based on meteorology measurements

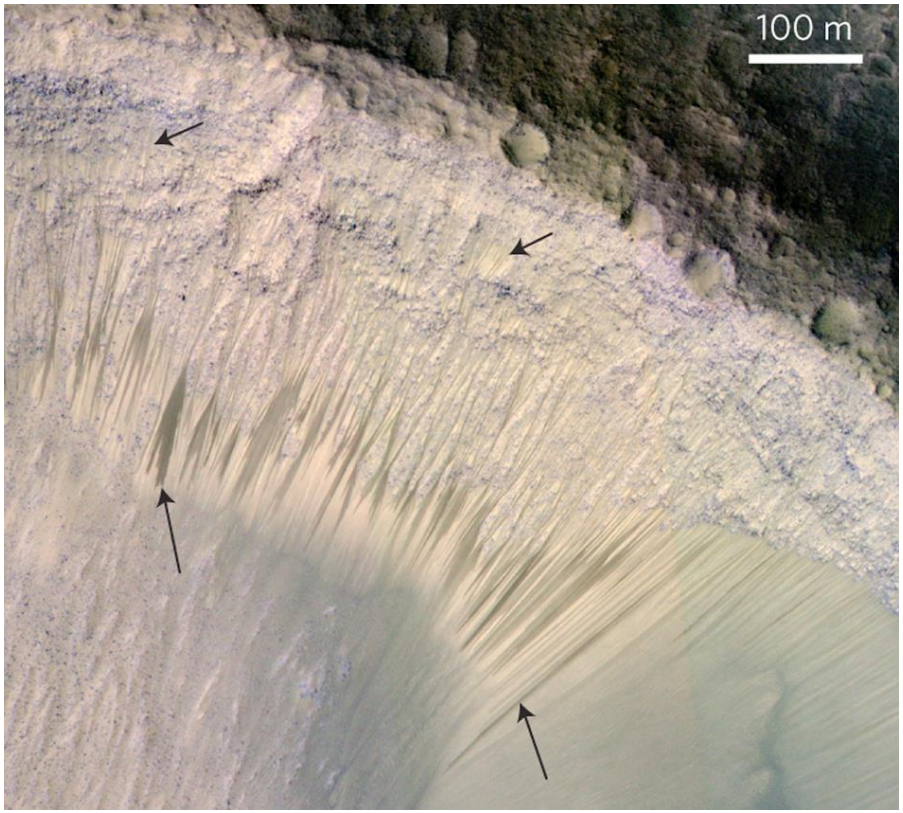
But the brine formed would not qualify as a Special Region due to the low temperature and low water activity (Rummel et al., 2014; Martin-Torres *et al*., 2015)

There is no direct indication of brine formation from imaging or other Curiosity measurements

Potential Recurring Slope Lineae

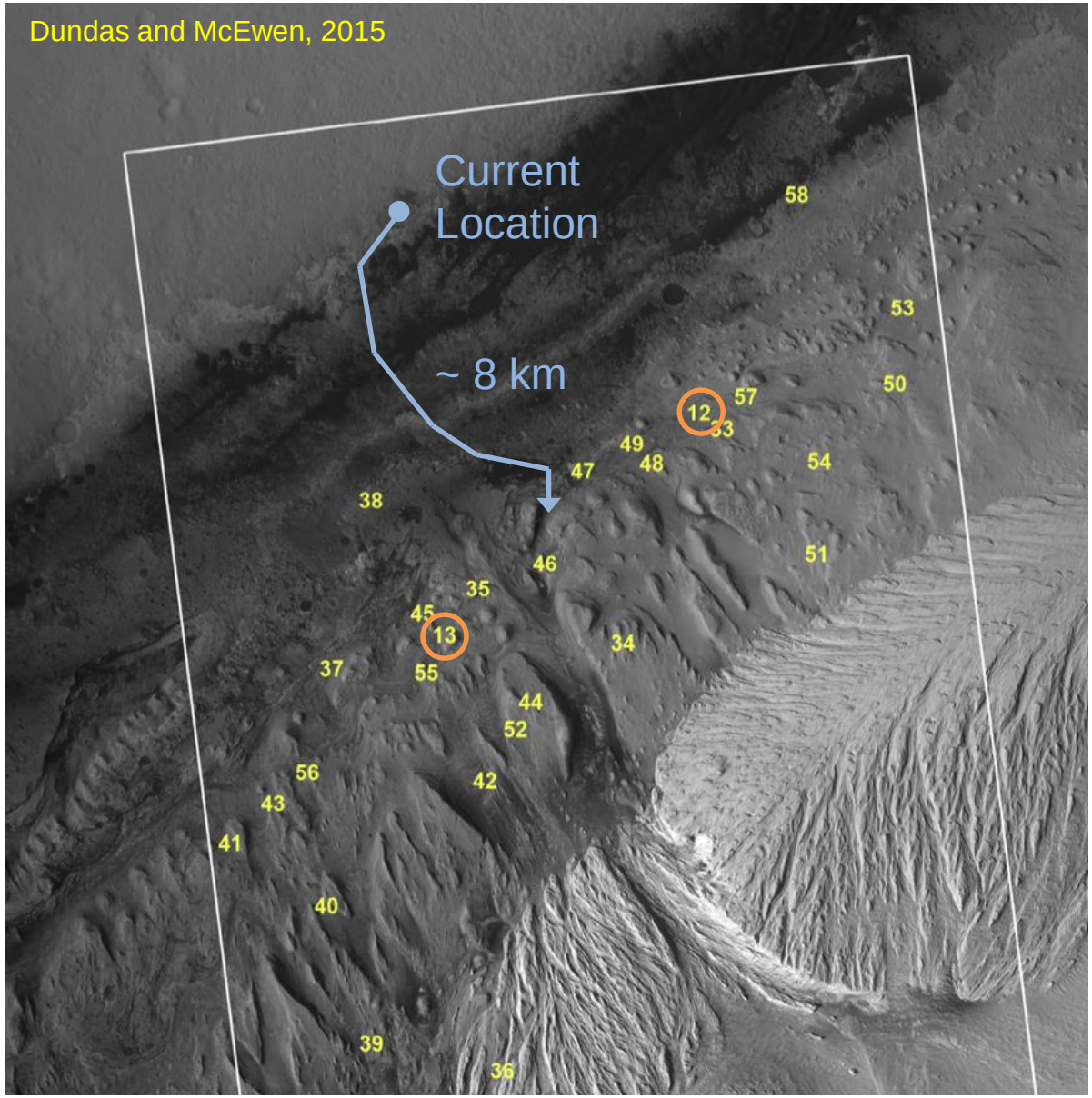
Recurring Slope Lineae

- Recurring Slope Lineae are a class of mass wasting features that:
  - incrementally grow over a period of weeks to months,
  - fade when inactive, and
  - recur annually
- They have been observed at mid and equatorial latitudes
- Currently they are thought to be the best candidates for present-day liquid flow, but as of yet, neither water nor salts has been identified



RSL on the south-facing slope of a crater on the floor of Melas Chasma. McEwen *et al*., 2014.

HiRISE RSL Search in Gale Crater



- Numbered locations are dark lineae identified in HiRISE
- These were assessed in successive images to look for RSL behavior. Two sites on northern Aeolis Mons (orange) show possible growth at the limit of HiRISE resolution.
- The rest do not indicate behavior consistent with RSLs, even if active slope processes
- "Some of the observed slope features have characteristics similar to RSLs, but none is confirmed to be RSL and most have some characteristics suggesting other origins."
- Out of the initially identified lineae, only two in Curiosity's field area remain as candidate RSLs, pending additional imaging