Comparing *Curiosity Rover* Methane Measurements With *MRAMS* Atmospheric Transport Experiments

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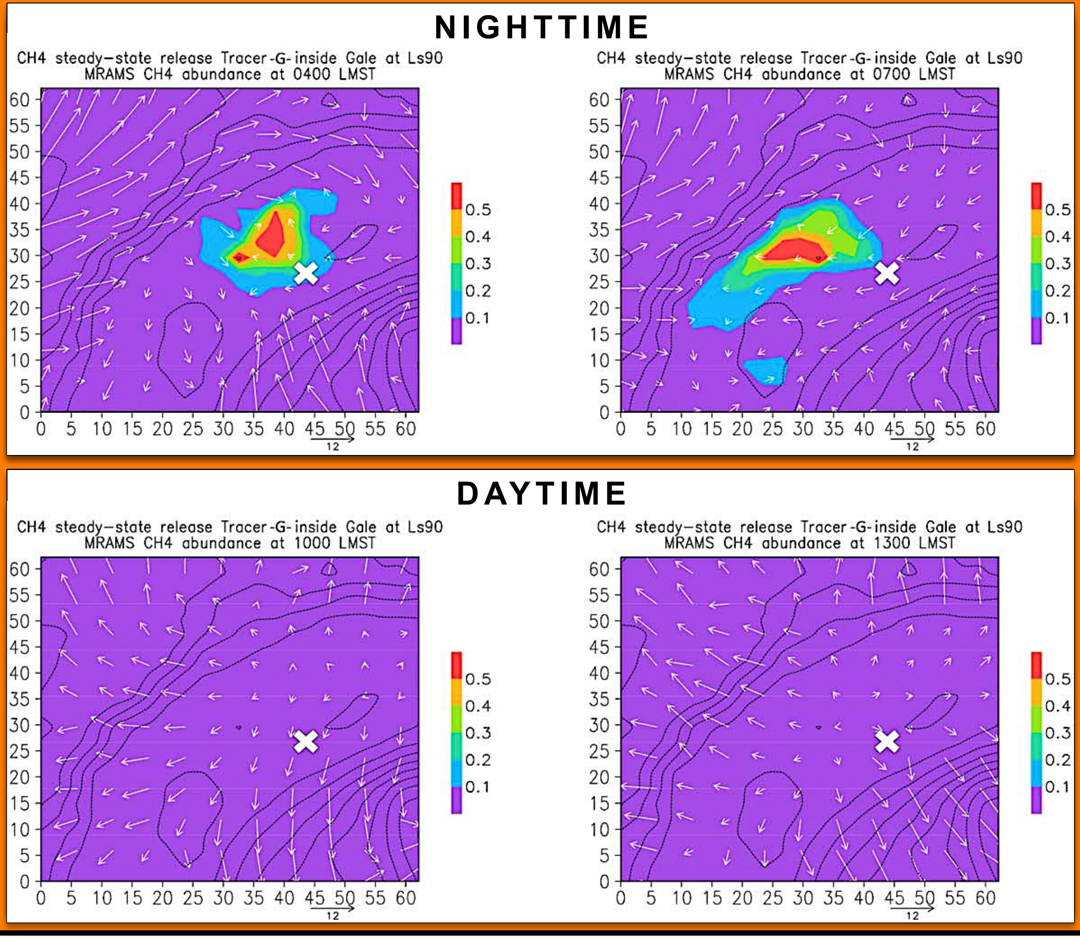

Methane increase during the evening and night, and decrease during the daytime at Gale crater, Mars.

Decrease during the daytime can be explained by the mostly horizontal upslope winds that could transport and vent the methane away.

During nighttime, the downslope winds from crater rims and Mount Sharp converge and constrain methane to the very bottom of the crater, causing it to persist and become trapped for a longer period close to the point where it is released

Crater mixing timescales are ~1 sol during all seasons. There must be a steady state release to counteract this atmospheric mixing.

A possible scenario is an ***intermittent local steady state release close to the rover*** with the restriction that there must be an unknown rapid methane destruction mechanism to reconcile the measured values with TGO orbit observations.

Plan view of methane mixing ratio in the lowest model layer for a steady state methane release close to the rover. White arrows represent wind speed and direction. Black contours represent topography. The x−y axis labels distance in km. White cross is the rover location for sol 305. *Credit: CAB-SSI*

Pla−García, J., Rafkin, S. C., Karatekin, Ö., & Gloesener, E. (2019). Comparing MSL Curiosity Rover TLS−SAM Methane Measurements With MRAMS Atmospheric Transport Experiments. Journal of Geophysical Research: Planets, 124(8), 2141-2167.

https://doi.org/10.1029/2018JE005824