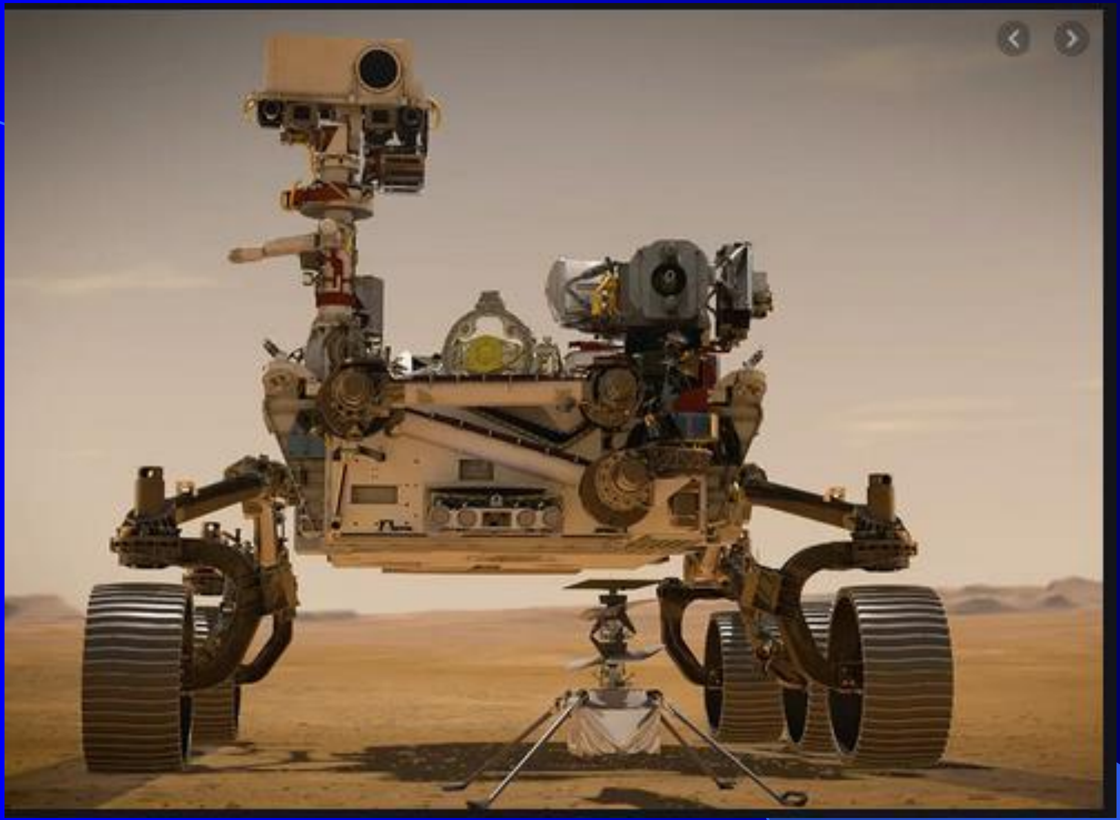
PROBLEMATIC PERSERVERANCE MARTIAN AIR PRESSURE DATA



By Barry S. Roffman,
Lieutenant, USCG-Retired
and David A. Roffman (PhD, Physics)

APRIL 22, 2018

Sufficient air pressure is essential for life. We dispute NASA's 6.1 mbar Mars areoid pressure.

- Areoid is Mars equivalent of Sea Level.

- Average Earth sea level pressure = 1,013.25 Mbar.

- 6.1 Mbar is nearly a vacuum – no fun to experience.

Initial Cause to Question Accepted Pressure

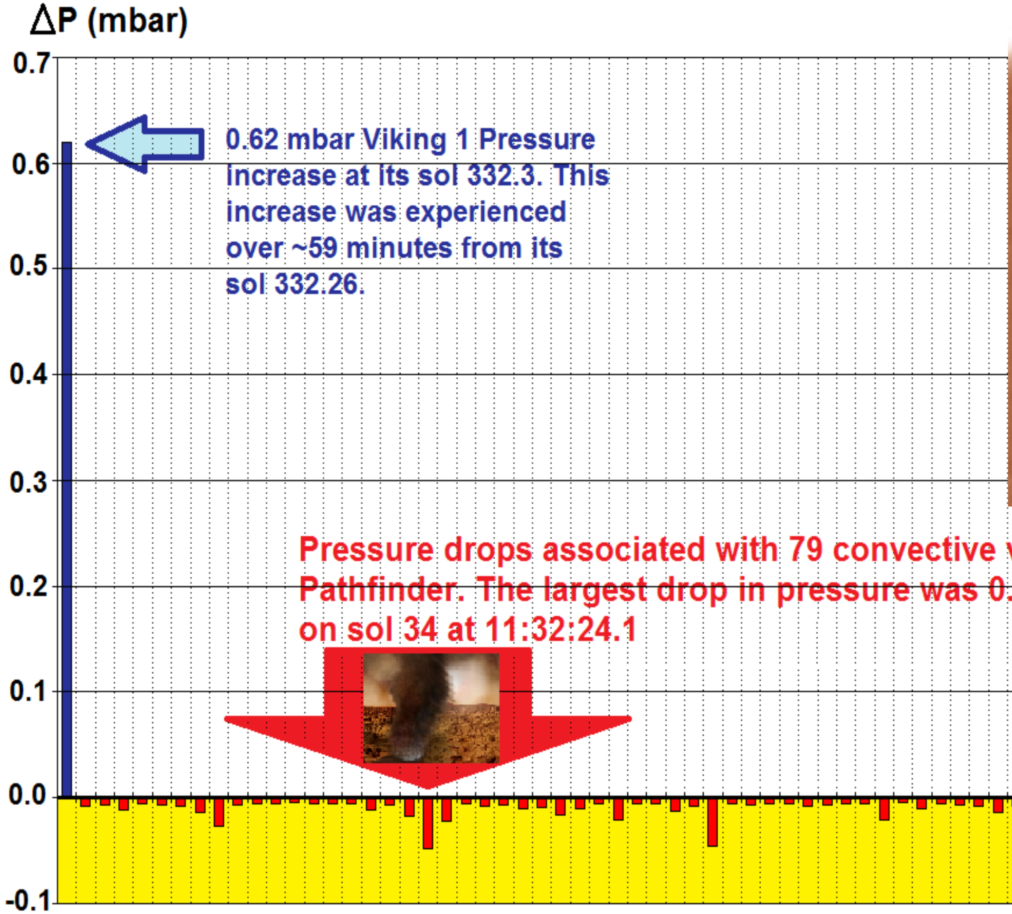
- **Dust devils on Mars and Earth are similar.**
  (timing, electricity, core temperature rises, and often size but they can be much bigger on Mars)

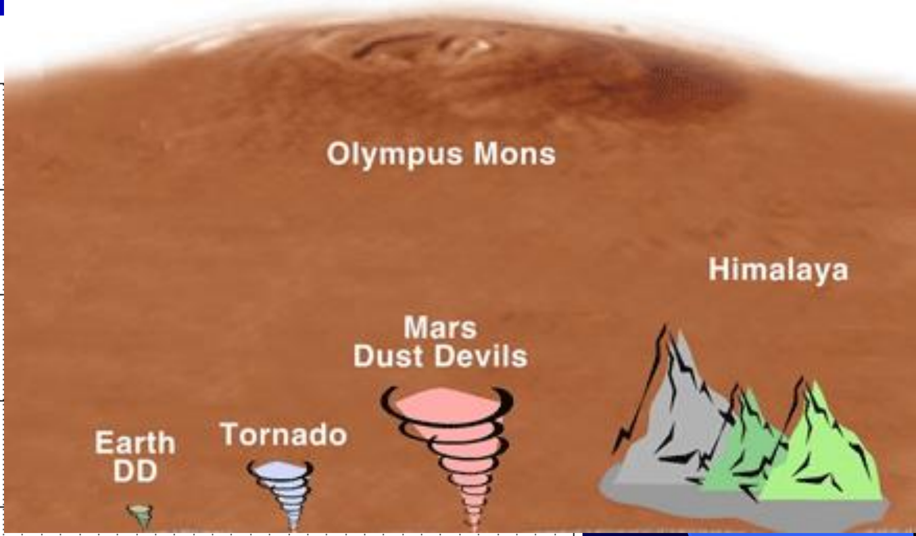
Mars: http://mars.nasa.gov/mer/gallery/press/spirit/20050819a/dd_enhanced_568b-B558R1.gif

Earth

DUST DEVILS ARE THE MOST OBVIOUS WEATHER ODDITY

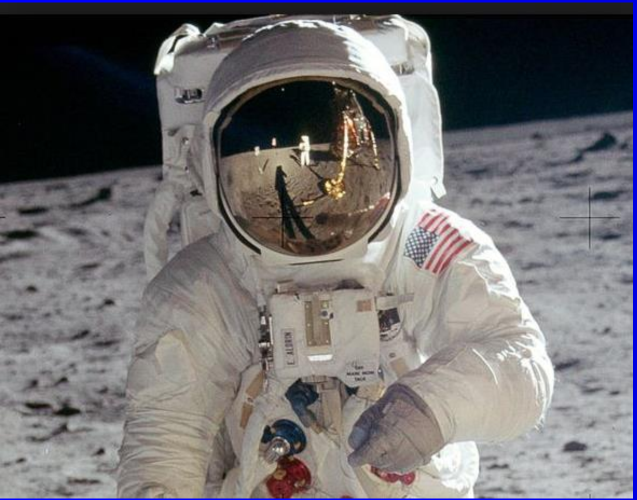
With so little air on Mars, how can there be enough change in pressure to form them at all?



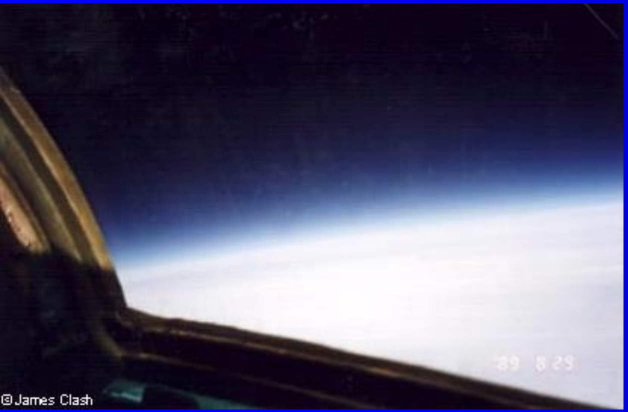


Similar dust particle size (.001 mm). But at 6.1 mbar pressure, an impossible 1,118 MPH wind is required to lift dust.

Martian Sky Color is an Issue.

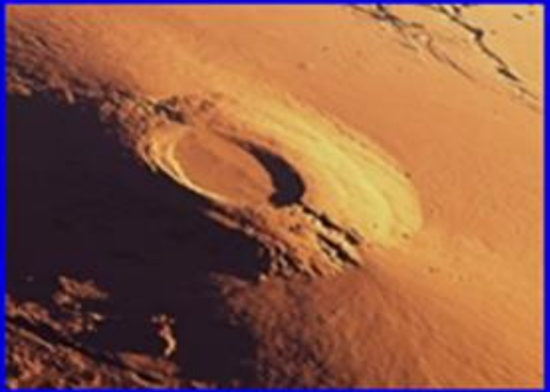


In the Moon's vacuum the sky is black.

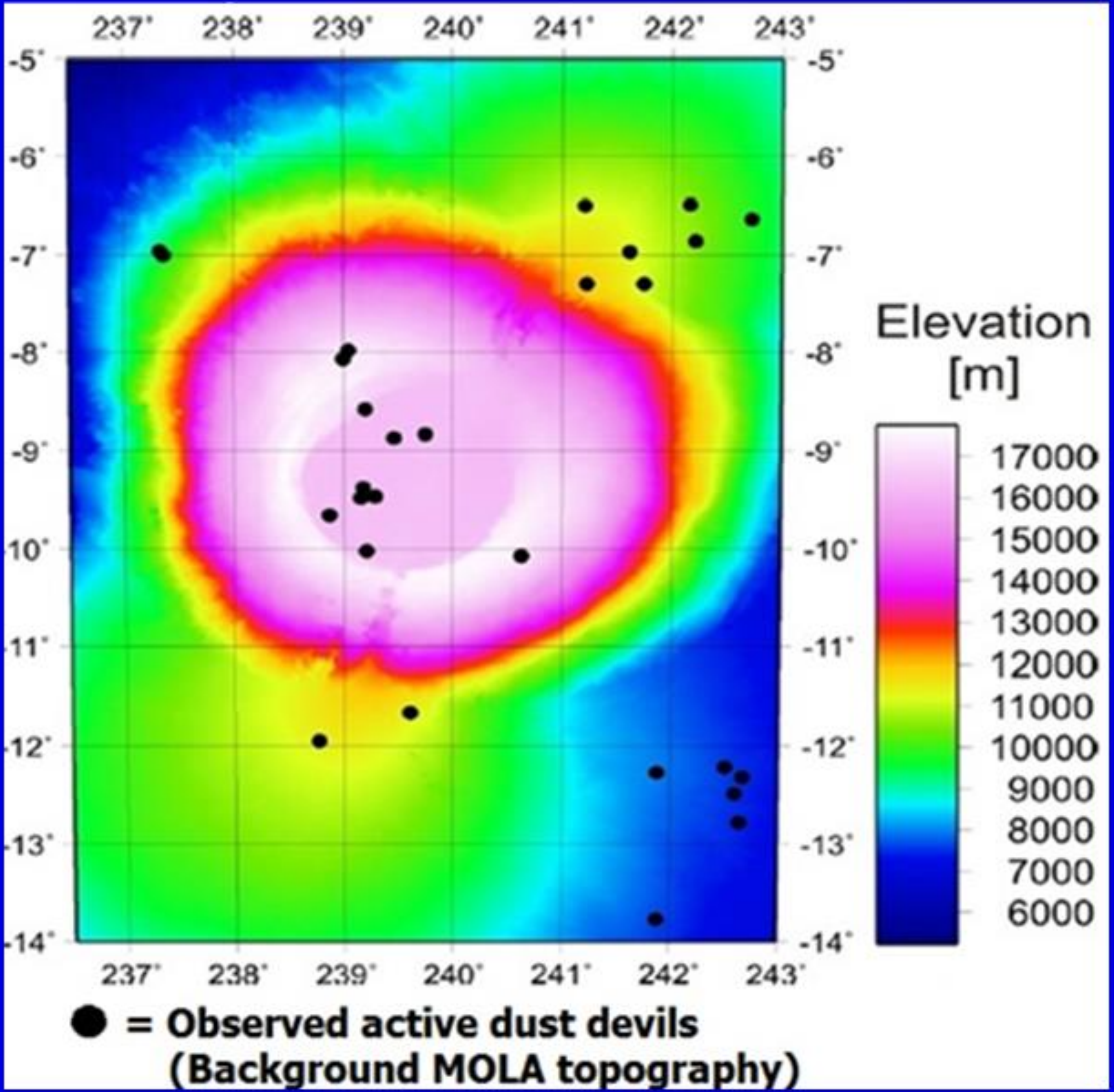


At high altitudes over Earth, like 83,600 feet , (with 11.3 mbar) our sky goes black.

Why Question Pressure?



Dust devils even form at a height of 10.6 miles (17 km) on the Arsia Mons mountain where pressure should only be 1/1000 th of Earth's pressure.



Why Question Pressure?

Dust storms increase air pressure and can block 99% of light on Mars (and Earth).

Mars_dust_opacities_MER-B_Sol_1205_to_1235.jpg (800 × 533 pixels, file size: 39 KB, MIME type: image/jpeg)

Phoenix, AZ Dust Storm of 5 July 2011

- **Pressure increased by 6.6 mbar – more than average 6.1 mbar pressure on Mars.**

Pressure measured on MSL was at least 9.25 mbar. That + 6.6 mbar = 15.85 mbar. Initially NASA claimed MSL couldn't measure over 11.5 mbar, but this figure changed in 2017 to 14 mbar (still too low).

- **The true sensor ability? 0 to 1,025 mbar!**

Abstract to the American Geophysical Union for the Fall 2012 meeting

Or is the maximum pressure 102500 Pa/ 1025 hPa/ 1025 mbar?

adsabs.harvard.edu/abs/2012AGUFM.P21G..06H

Title: Pressure and Humidity Measurements at the MSL Landing Site Supported by Modeling of the Atmospheric Conditions

Authors: Harri, A. ; Savijarvi, H. I. ; Schmidt, W. ; Genzer, M. ; Paton, M. ; Kauhanen, J. ; Atlaskin, E. ; Polkko, J. ; Kahanpaa, H. ; Kemppinen, O. ; Haukka, H.

Affiliation: AA(Finnish Meteorological Institute, Helsinki, Finland; Ari-Matti.Harri@fmi.fi), AB(University of Helsinki, Helsinki, Finland; hannu.savijarvi@helsinki.fi), AC(Finnish Meteorological Institute, Helsinki, Finland; Walter.Schmidt@fmi.fi), AD(Finnish Meteorological Institute, Helsinki, Finland; Maria.Genzer@fmi.fi), AE(Finnish Meteorological Institute, Helsinki, Finland; Mark.Paton@fmi.fi), AF(Finnish Meteorological Institute, Helsinki, Finland; janne.kauhanen@fmi.fi), AG(Finnish Meteorological Institute, Helsinki, Finland; evgeny.atlaskin@fmi.fi), AH(Finnish Meteorological Institute, Helsinki, Finland; Jouni.Polkko@fmi.fi), AI(Finnish Meteorological Institute, Helsinki, Finland; Henrik.Kahanpaa@fmi.fi), AJ(Finnish Meteorological Institute, Helsinki, Finland; Osku.Kemppinen@fmi.fi), AK(Finnish Meteorological Institute, Helsinki, Finland; Harri.Haukka@fmi.fi)

Publication: American Geophysical Union, Fall Meeting 2012, abstract #P21G-06

Publication Date: 12/2012

Origin: AGU

Keywords: 0343 ATMOSPHERIC COMPOSITION AND STRUCTURE / Planetary atmospheres

Bibliographic Code: 2012AGUFM.P21G..06H

Abstract

The Mars Science Laboratory (MSL) called Curiosity Rover landed safely on the Martian surface at the Gale crater on 6th August 2012. Among the MSL scientific objectives are investigations of the Martian environment that will be addressed by the Rover Environmental Monitoring Station (REMS) instrument. It will investigate habitability conditions at the Martian surface by performing a versatile set of environmental measurements including accurate observations of pressure and humidity of the Martian atmosphere. This paper describes the instrumental implementation of the MSL pressure and humidity measurement devices and briefly analyzes the atmospheric conditions at the Gale crater by modeling efforts using an atmospheric modeling tools. MSL humidity and pressure devices are based on proprietary technology of Vaisala, Inc. Humidity observations make use of Vaisala Humicap® relative humidity sensor heads and Vaisala Barocap® sensor heads are used for pressure observations. Vaisala Thermocap® temperature sensors heads are mounted in a close proximity of Humicap® and Barocap® sensor heads to enable accurate temperature measurements needed for interpretation of Humicap® and Barocap® readings. The sensor heads are capacitive. The pressure and humidity devices are lightweight and are based on a low-power transducer controlled by a dedicated ASIC. The transducer is designed to measure small capacitances in order of a few pF with resolution in order of 0.1fF (femtoFarad). The transducer design has a good spaceflight heritage, as it has been used in several previous missions, for example Mars mission Phoenix as well as the Cassini Huygens mission. The humidity device has overall dimensions of 40 x 25 x 55 mm. It weighs18 g, and consumes 15 mW of power. It includes 3 Humicap® sensor heads and 1 Thermocap®. The transducer electronics and the sensor heads are placed on a single multi-layer PCB protected by a metallic Faraday cage. The Humidity device has measurement range of 0 - 100%RH in temperature range of -70°C - +25°C. Its survival temperature is as low as -135°C. The pressure device has overall dimensions of 62 x 55 x 17 mm. It weighs 35 g, and consumes 15 mW of power. The sensor makes use of two transducers placed on a single multi-layer PCB and protected by box-like FR4 Faraday cages. The transducers of the pressure device can be used in turn, thus providing redundancy and improved reliability. The pressure device measurement range is 0 - 1025 hPa in temperature range of -45°C - +55°C, but its calibration is optimized for the Martian pressure range of 4 - 12 hPa. In support of the in situ measurements we have analyzed the atmospheric conditions at the MSL landing site at the Gale crater by utilizing mesoscale and limited area models. The compatibility of the results of these modeling tools with the actual environmental conditions will be discussed.

Print-screen (recorded on July 23, 2017) of the FMI Abstract entitled *Pressure and Humidity Measurements at the MSL Landing Site Supported by Modeling of the Atmospheric Conditions.*

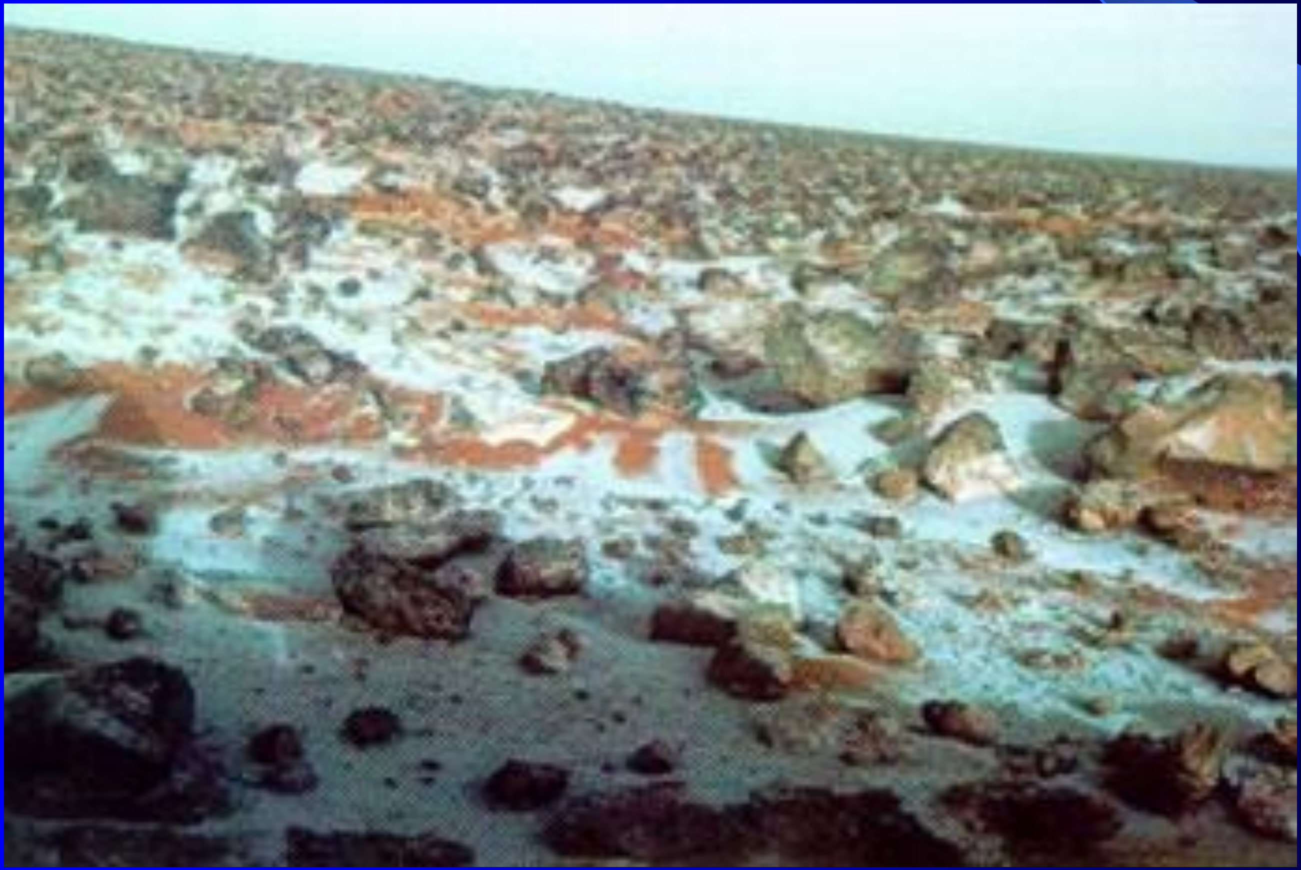
Sol	Ls in º	Earth Date	Jezero Pressure in hPa/mbar	Gale Crater Pressure (MSL)	High Air Temp. º F	High Air Temp º C	Low Air Temp. º F	Low Air Temp º C
46	27.4	4/6/2021	7.48	850	-11.6	-24.2	-117.4	-83.0
47	27.9	4/7/2021	7.47	850	-8.1	-22.3	-117.2	-82.9
48	28.4	4/8/2021	7.46		-9.9	-23.3	-118.5	-83.6
49	28.8	4/9/2021	7.47		-10.1	-23.4	-116.5	-82.5
50	29.3	4/10/2021	7.46		-10.1	-24	-115.4	-81.9
51	29.7	4/11/2021	7.46		-10.1	-23.4	-116.3	-82.4
52	30.2	4/12/2021	7.47		-7.17	-21.7	-116.5	-82.5
53	30.7	4/13/2021	7.48		-7.4	-21.9	-118.1	-83.4
54	31.1	4/14/2021	7.47		-12.3	-24.6	-117.4	-83
55	31.6	4/15/2021	7.48		-9.4	-23.0	-116.0	-82.2
56	32	4/16/2021	7.49		-4.4	-20.2	-116	-82.2
57	32.5	4/17/2021	7.51		-5.6	-20.9	-116.5	-82.5
58	32.9	4/18/2021	7.52		-8.7	-22.6	-117.6	-83.1
59	33.4	4/19/2021	7.51		-8.5	-22.5	-115.2	-81.8
60	34.9	4/20/2021	7.52		-8.0	-22.2	-114.7	-81.5

EARLY WEATHER FOR THE MARS PERSEVERANCE LANDER AT JEZERO CRATER PLUS PRESSURE FOR MSL AT GALE CRATER

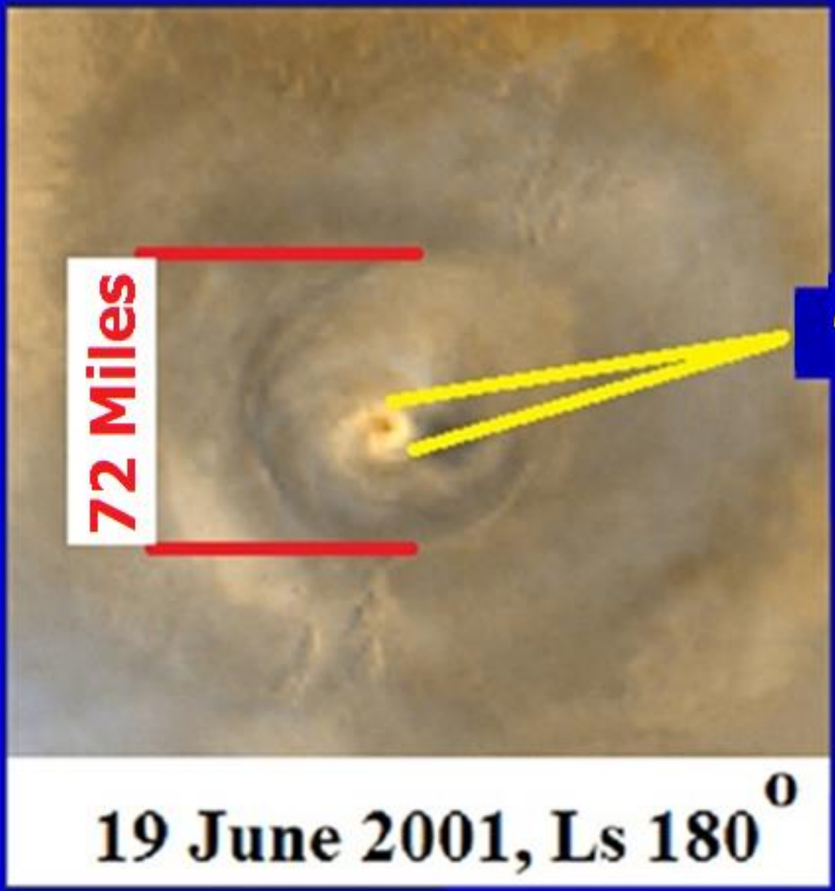
NOTE 45 SOLS OF MISSING WEATHER FOR PERSEVERANCE.

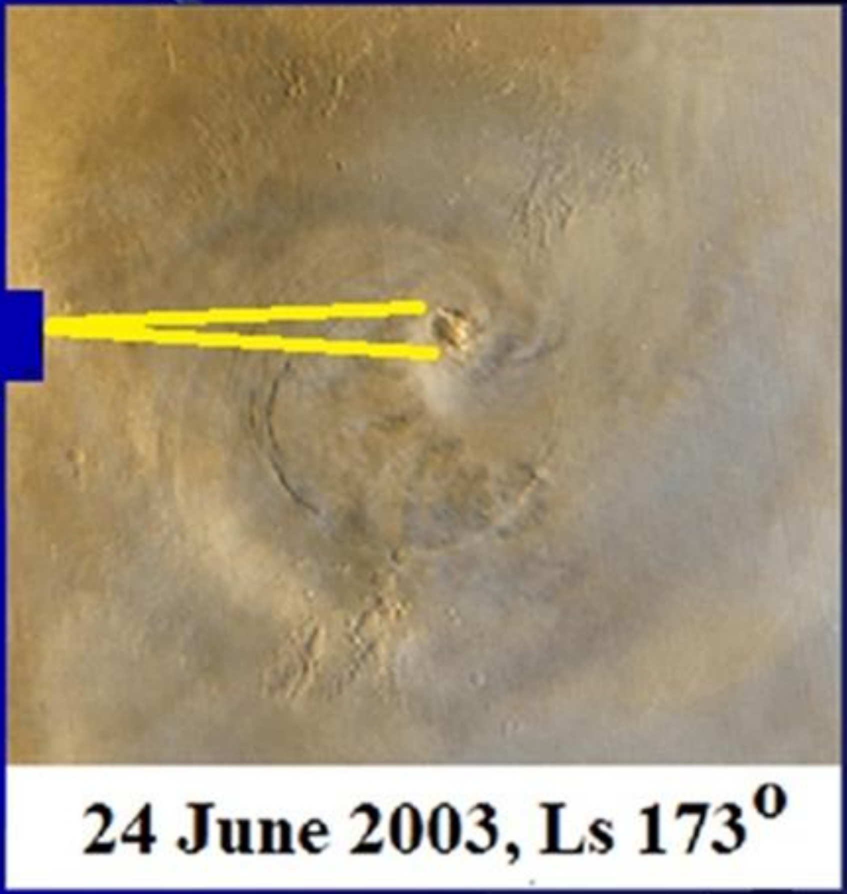
Why Question Pressure?

- Snow on Mars with ice particles in clouds ten times too small for accepted pressure.



Spiral Clouds on Arsia Mons look like Hurricane Eye Walls. 1 mbar NASA claim seems too low.





Eye wall ~6.25 Miles

These clouds go up 18.75 miles above Arsia Mons. Believe NASA, and pressure there is only ~.07 Mbar – too low to support such weather.

STRATUS CLOUDS 16 KM ABOVE MARS SUGGEST A PRESSURE AT AREOID OF 511 MBAR AND AT HELLIS BASIN HIGHER THAN PRESSURES ON EARTH AT SEA LEVEL.

1. CIRROSTRATUS CLOUDS ARE FOUND ON EARTH UP TO 13,000 METERS HIGH.

3. STRATUS CLOUDS ON MARS AT ALTITUDE OF 16,000 METERS ABOVE MARS PATHFINDER.

PHOTO TAKEN 1 HOUR 40 MINUTES BEFORE SUNRISE ON 7/19/1997!

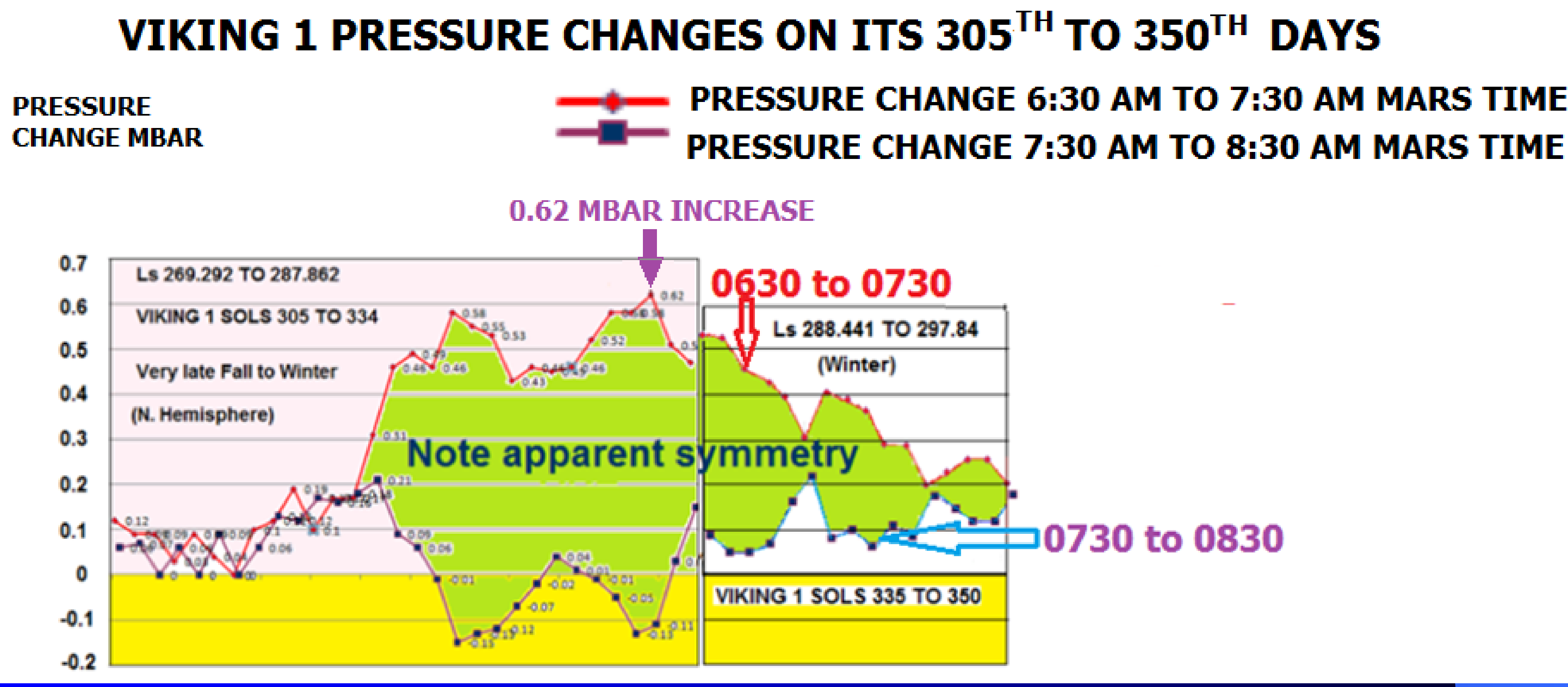
Meteorology Calculator Version 1.5.9		
Pressure Altitude Required Data Entry		
Station Pressure	163.33	in of Hg / mm of Hg / (•) millibars (hPa)
Calculated Results		
Pressure Altitude Calculation	42651.1	ft
Pressure Altitude Calculation	13000	m

2. PRESSURE AT 13,000 METERS IS ABOUT 163 MILLIBARS

4. Pathfinder was 3,682 m below areoid. 16,000 m above that is 12,318 m. Table assumes stratus clouds cannot form at pressures lower than on Earth (163 mbar).

	A	B	C	D	E	F	G	H	I
1	CALCULATIONS BASED ON	ENTERING ARGUMENTS SCALE HEIGHT 10.8 KM AND 163.33 mbar at 12,318 meters							
2	MARS PATHFINDER	KILOMETERS	10.8km Scale	RATIO B/C	=-EXP(D VALUE)	1/E value	-F VALUE = PRESSURE	PERCENT OF	PRESSURE IN
3	VIEW OF STRATUS CLOUDS		Height (MARS)				MULTIPLE OF	PRESSURE AT	MILLIBARS
4							6.1 MBAR MEAN	MEAN AREOID	
5	CLOUDS 16 KM ABOVE MPF	12.318	10.8	1.140555556	-3.128505941	-0.319641394	0.319641394	31.96413939	163.3303595
6	MARS PATHFINDER (MPF)	-3.682	10.8	-0.340925926	-0.711111581	-1.40624907	1.40624907	140.624907	718.56515
7	MEAN AREOID	0	10.8	0	-1	-1	1	100	510.98
8	VALLES MARINERIS	-5.31	10.8	-0.491666667	-0.611606201	-1.635039015	1.635039015	163.5039015	835.4722361
9	HELLAS BASIN	-7.825	10.8	-0.724537037	-0.484548845	-2.063775427	2.063775427	206.3775427	1054.547968

Viking pressure spikes at 6:30 to 7:30 am were evidence for internal (heater-related) processes at work. Thus they were **not** measuring outside air pressure!



TINY DUST FILTERS HAD NO CLEANING MECHANISM

Mars is very dusty. All dust filters likely clogged immediately on landing.

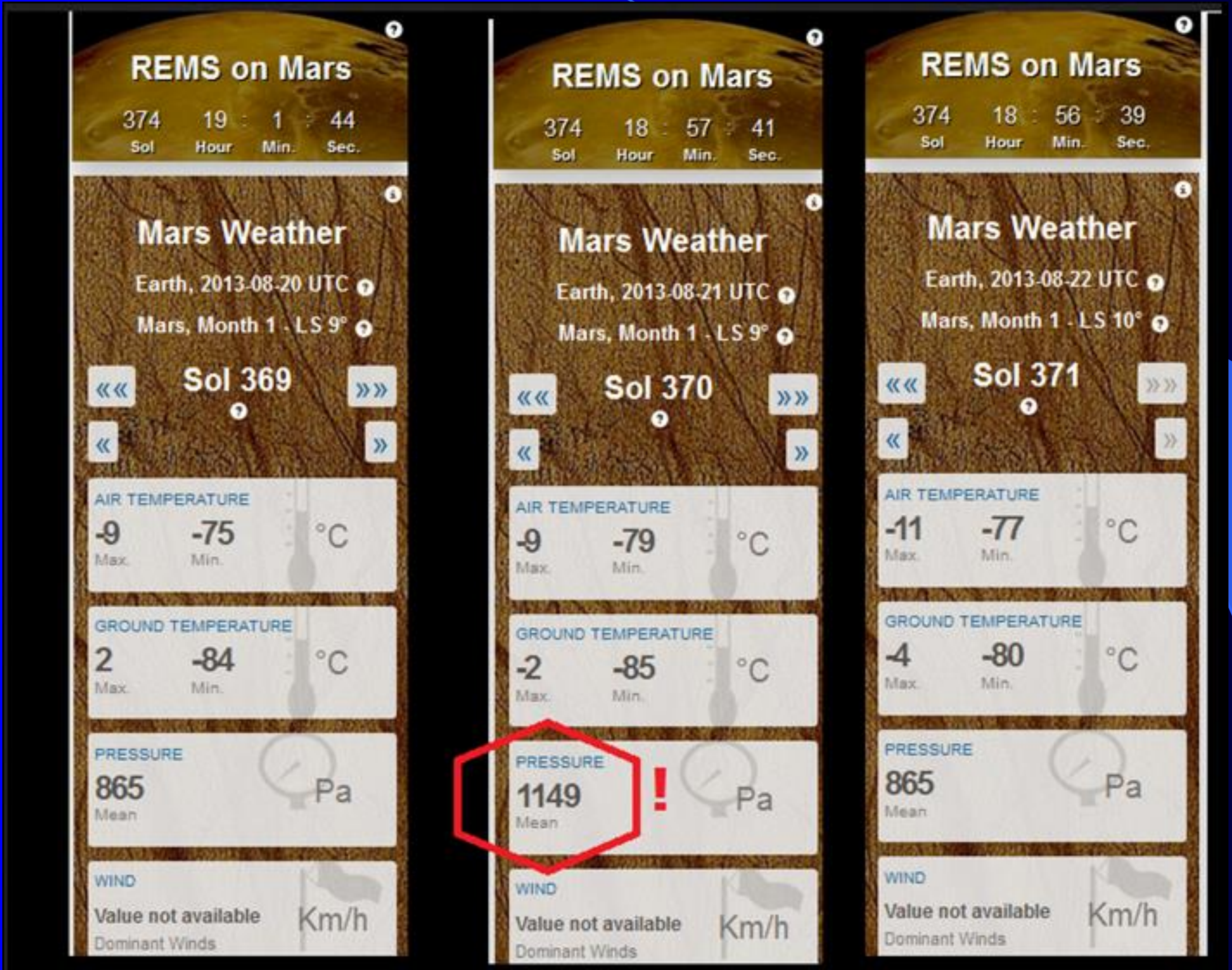
DIME SURFACE AREA = ~251.9 mm^2

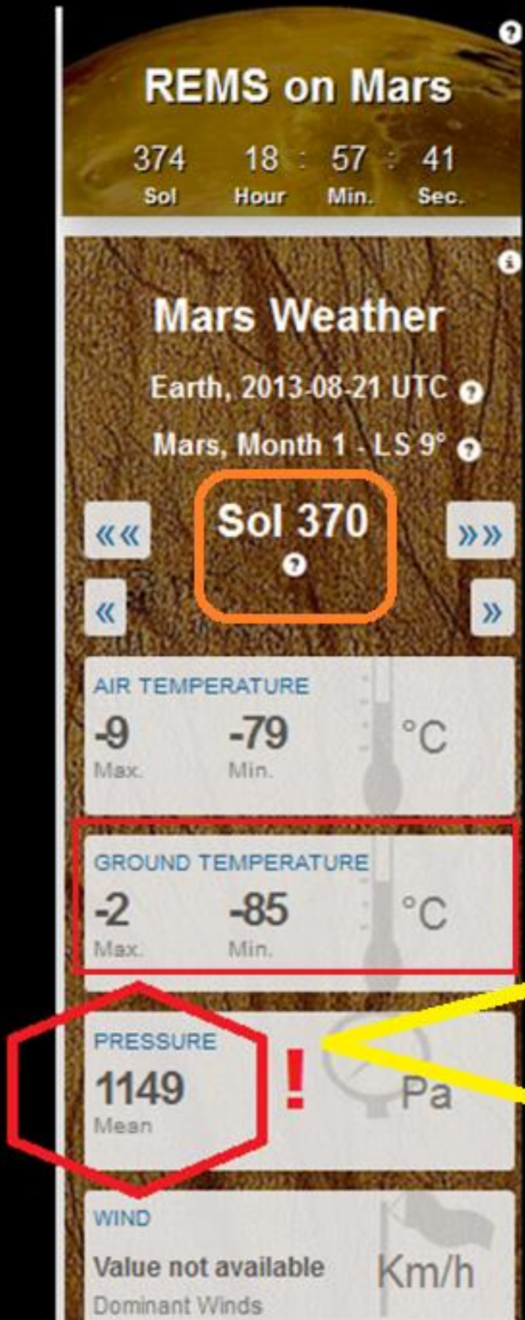
TAVIS DUST FILTER FOR VIKING = ~40 mm^2

TAVIS DUST FILTER FOR PATHFINDER= ~ 3.14 mm^2

VAISALA DUST FILTER FOR PHOENIX OR MSL = ~10 mm^2

On Sol 369 pressure was 865 Pascals (8.65 mbar). The next day a record high of 1149 Pa was recorded – then most the sensor could measure. We called JPL. The next day it was back to 865 Pa.

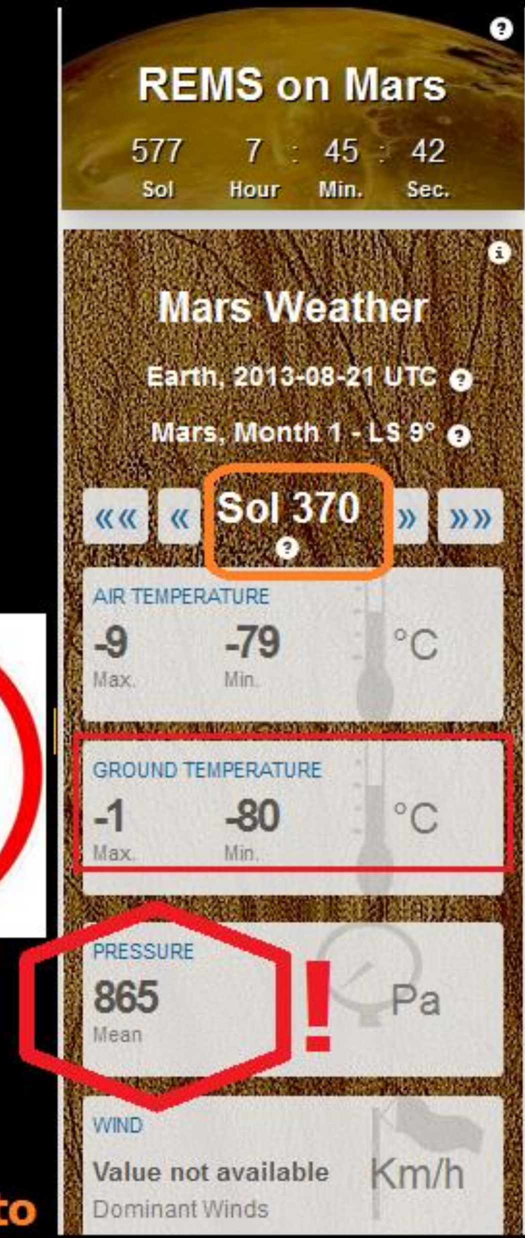




REMS Team/ NASA/JPL Critical Data changes After Hearing from the Roffman Mars Correct Team.

Pressure reported as 1149 Pa BEFORE we brought it to JPL's attention.

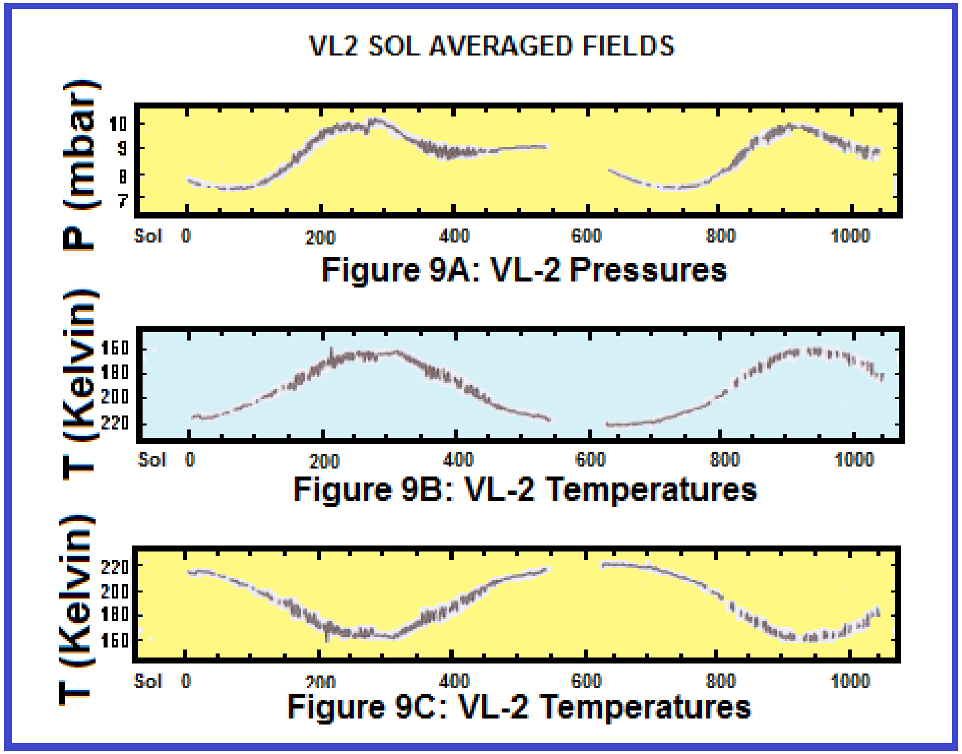
About 7 months after we brought the 1149 Pa pressure to JPL's attention, they changed it to 865 Pa!



Evidence for clogged dust filters: Viking pressure data for over a Martian year

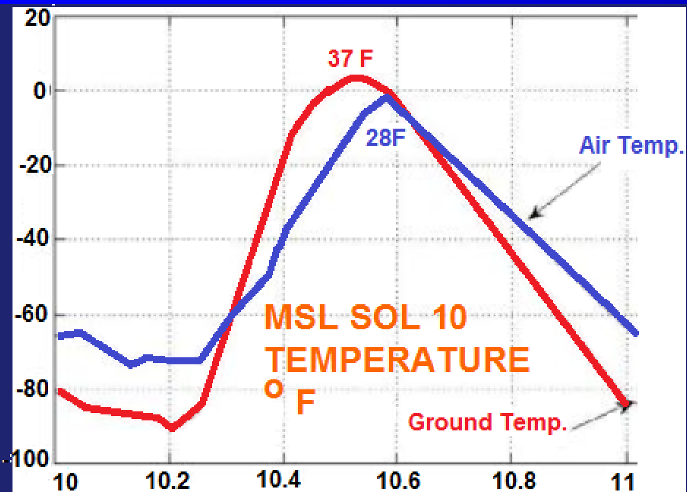
Figures 9A and 9C show that as temperature fell pressure recorded rose.

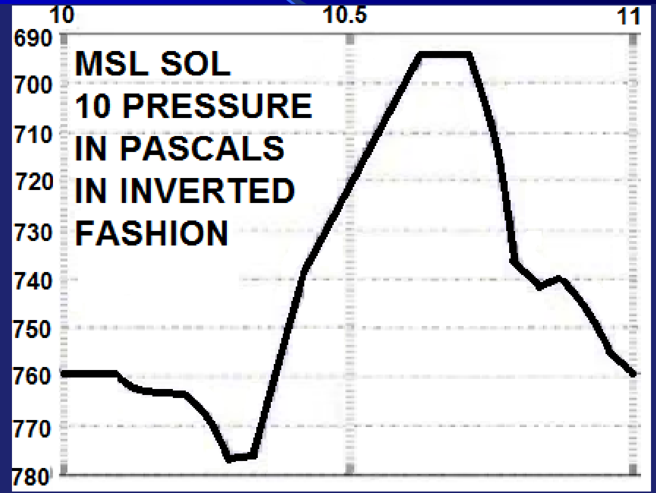
Figure 9B is 9C inverted to show quality of pressure and temperature link.



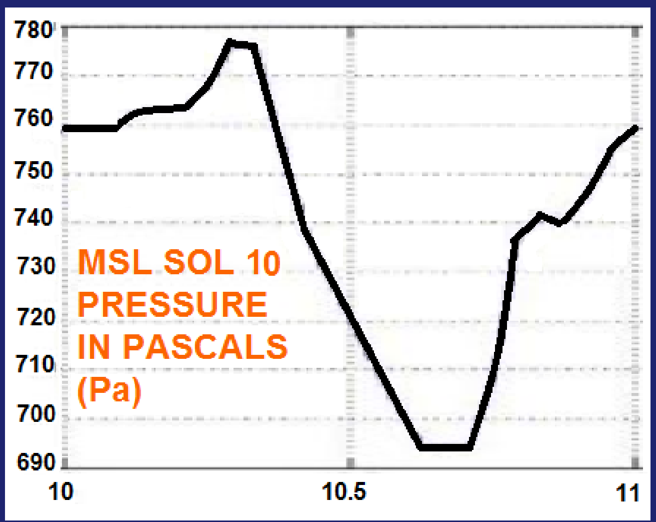
Hypothesis: Above annual trend will be matched at the hourly level when RTG heaters are on & increasing pressure behind a dust clot.

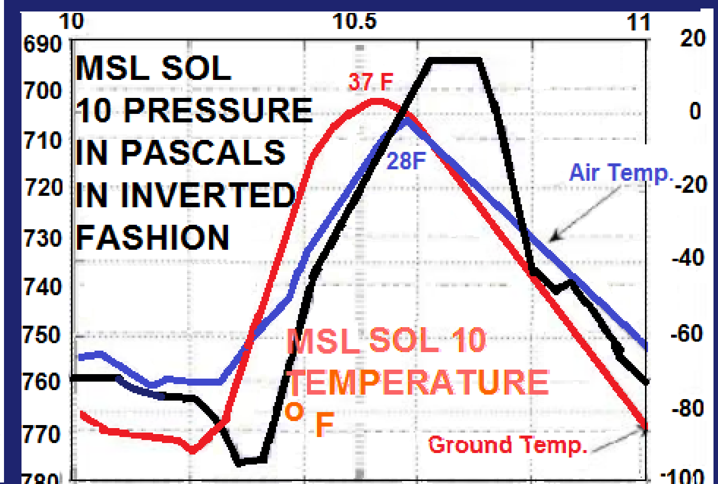
Initial MSL daily pressure also varied inversely with outside temperature. This reinforces the dust clot idea.



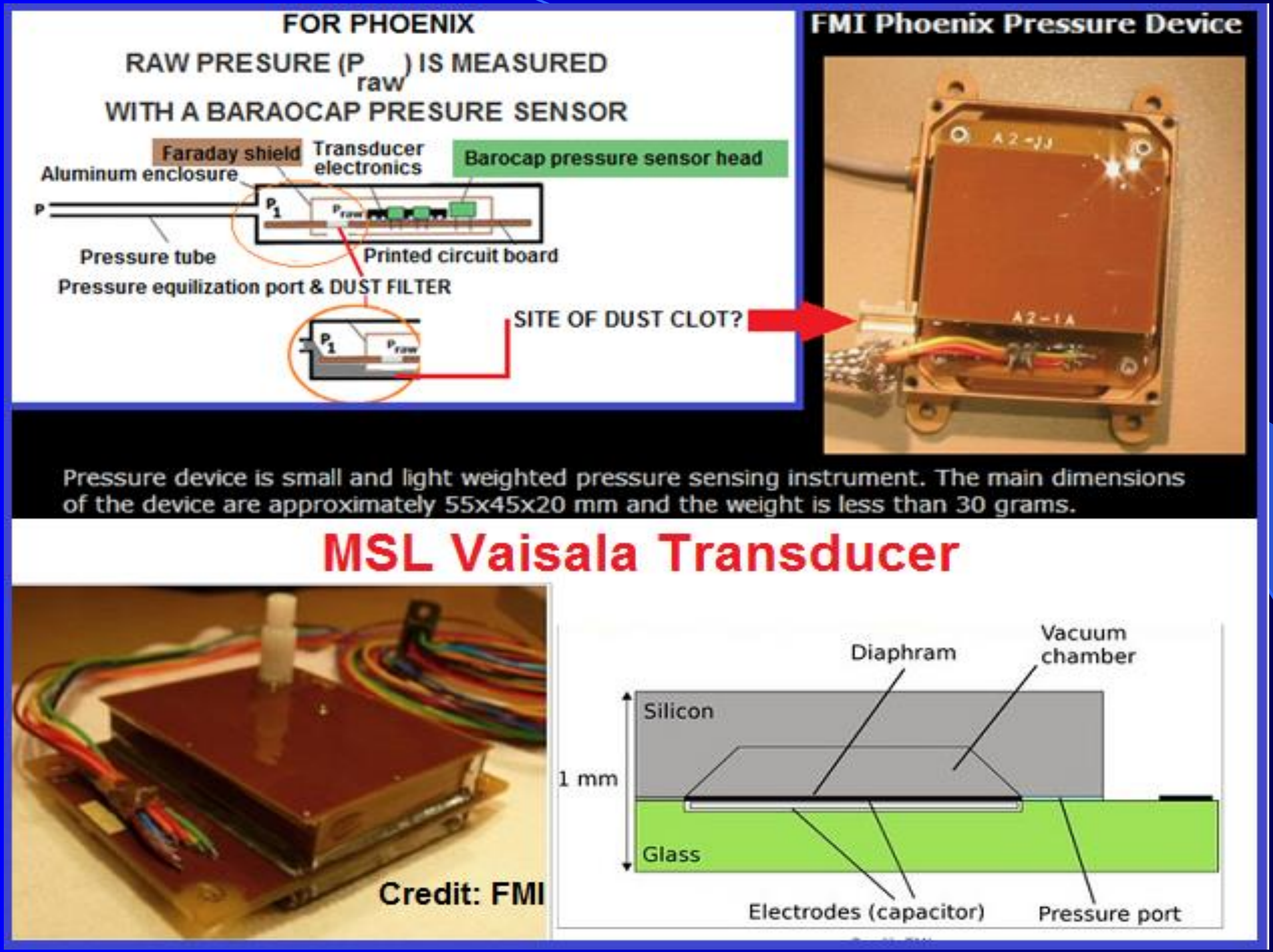


ARE DAILY PRESSURE CYCLES RELATED TO THE INVERSE OF TEMPERATURES OUTSIDE THE MSL AS WITH VIKINGS?





FMI knew it had a problem with Phoenix



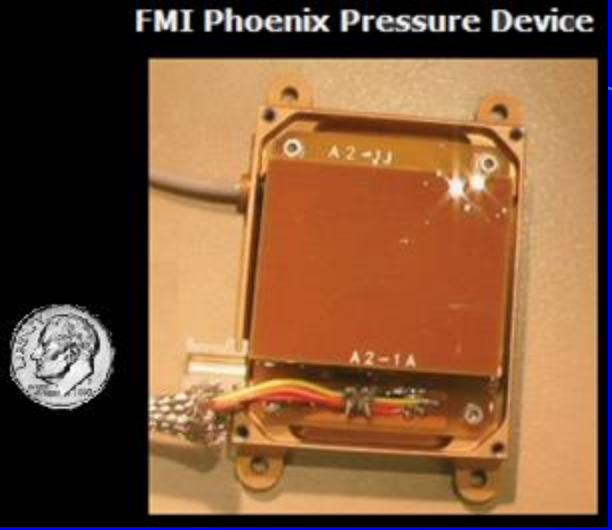
In 2009 they wrote, *"We should find out how the pressure tube is mounted in the spacecraft and if there are additional filters etc."* FMI designed the sensor.

KENRIK KAHANPÄÄ: MAN AT THE CENTER OF PHOENIX AND MSL PRESSURE CONTROVERSY

"That we at FMI did not know how our sensor was mounted in the spacecraft and how many filters there were shows that the exchange of information between NASA and the foreign subcontractors did not work optimally in this mission!"

(Kahanpää [FMI] Personal communication, December 15, 2009)

Henrik Kahanpää and REMS- Pressure measuring device. Photo: Jouni Polkko / Finnish Meteorological Institute



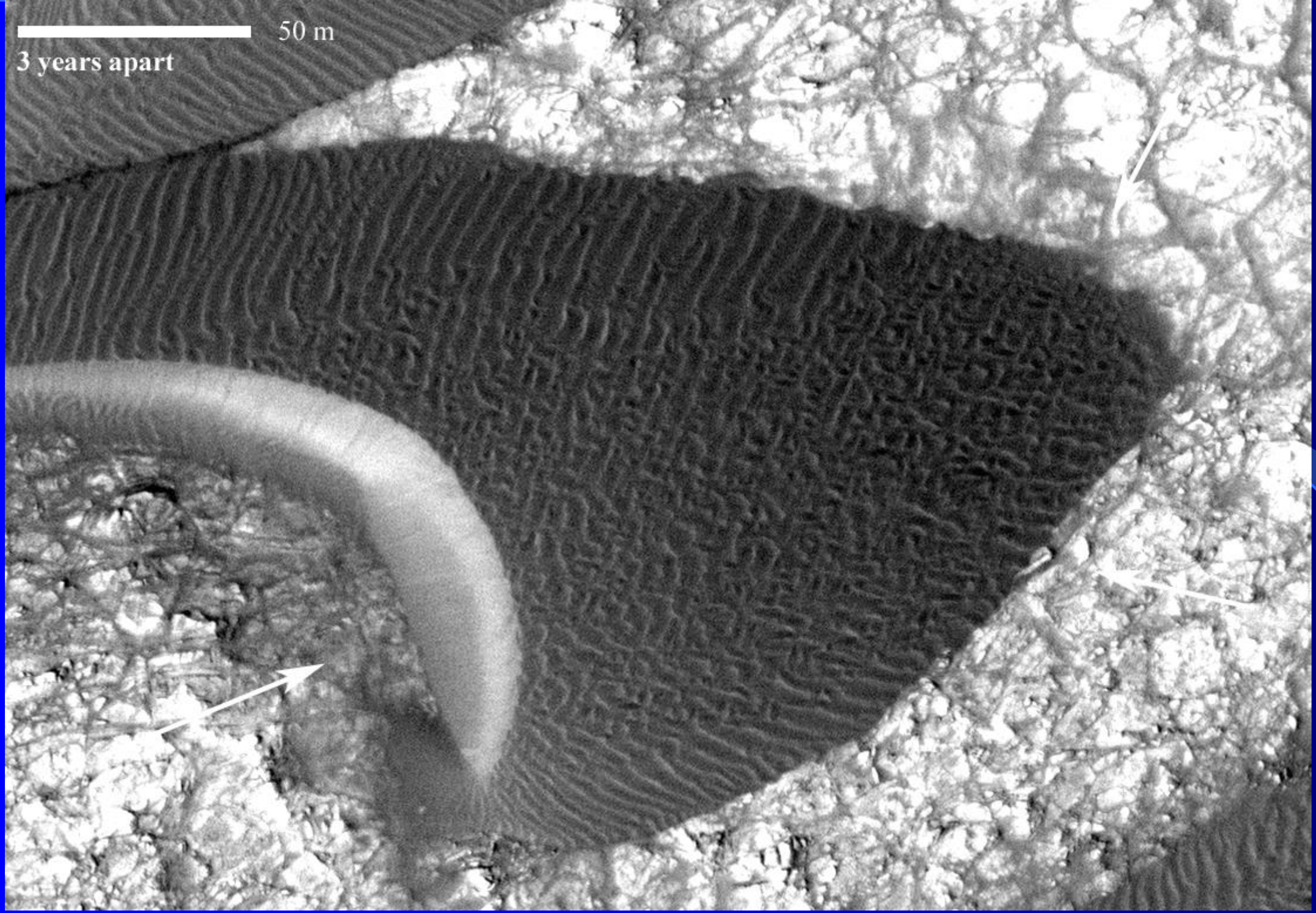
International Traffic in Arms Regulations (ITAR)

- *"After Phoenix landed… the actual thermal environment was worse than the expected worse case…* ***Information on re-location of the heat source had not been provided due to ITAR restrictions."*** (Taylor, P.A., et al, 2009)

Occam's Razor

The simplest solution is usually correct.

This suggests repeatable pressure data should be believed. But, consistent pressures measured by all landers may only exist because they all had pressure sensor air access tubes clog in similar fashion (or because, as was just shown, the data has been altered).



Why Trash Occam?

Moving Sand Dunes on Mars.

"Mars either has more gusts of wind than we knew about before, or the winds are capable of transporting more sand."

Nathan Bridges,
Planetary scientist, Johns Hopkins University's Applied Physics Laboratory

Why Trash Occam?

- **Wind-tunnel trials show a patch of sand would take wind 80 mph to move on Mars (vs. 10 mph on Earth). No lander ever saw wind so high on Mars. JPL: Spirit rover detected shifting sand in 2004.**
- **Sand was filmed moving under Curiosity in January, 2017 (see https://photojournal.jpl.nasa.gov/archive/PIA21143.gif).**

Temperature data was also distorted in 2013. Who killed warm days on Mars, and why?

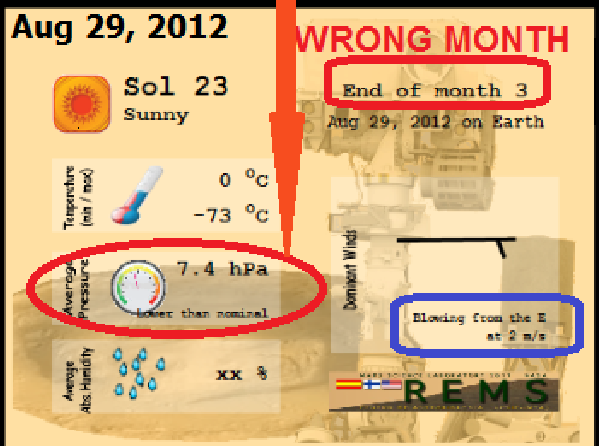
A	B	C	D
SOL	ORIGINAL MAX AIR TEMP TEMP ≥ 0°C REDUCED TO TEMP ≤ 0°C	NEW MAX AIR TEMP °C	CHANGE °C
23	0	-16	16
26	2	-14	16
27	-1	-15	14
31	-3	-23	20
38	-3	-13	10
40	2	-12	14
41	2	-12	14
42	5	-7	12
43	3	-12	15
44	4	-10	14
45	3	-9	12
46	4	-12	16
47	6	-9	15

A	B	C	D
SOL	ORIGINAL MAX AIR TEMP TEMP ≥ 0°C REDUCED TO TEMP ≤ 0°C	NEW MAX AIR TEMP C	CHANGE °C
49	4	-10	14
50	0	-10	10
51	3	-7	10
52	7	-7	14
53	5	-5	10
54	5	-9	14
102	8	-3	11
112	5	-8	13
116	5	-6	11
118	4.53	-6	10.53
123	2.1	-10	12.1
124	5.4	-5	10.4
179	5	-7	12

Data Reporting Fiasco

REMS Reported 6 Days of Earth-like Pressure

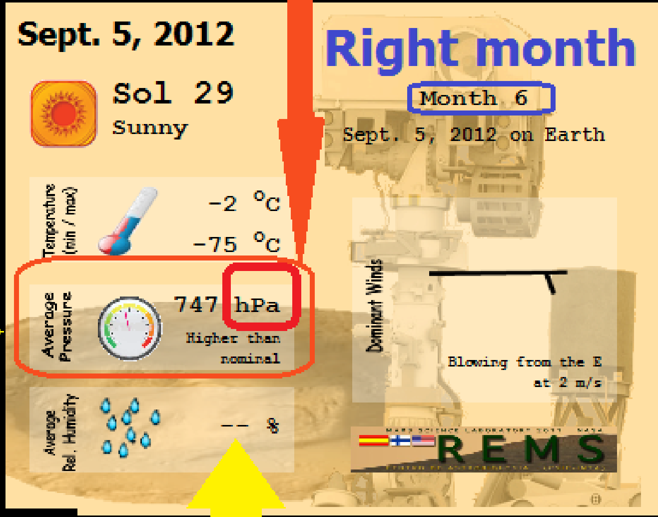
PRESSURE REPORTED INCREASED 100 FOLD



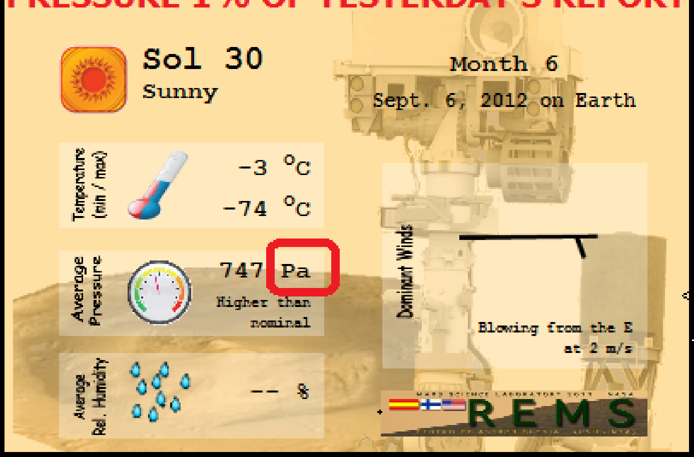
2012 Centro de Astrobiologia (CAB)

DID MSL LAND AT GALE ON MARS OR VAIL IN COLORADO?

Pressure like Earth at 8,192.6 feet above sea level.



PRESSURE 1% OF YESTERDAY'S REPORT



100 Pa = 1 hPa = 1 Mbar.
Sol 29 was first given as 747 hPa, while Sol 30 was given as 747 Pa (7.47 hPa) after questions by us and others

DAILY WEATHER NEVER INCLUDES RELATIVE HUMIDITY

ALL WINDS (2 M/S) REPORTED WRONG UNTIL MAY 2013

cab.inta-csic.es/rems/marsweather.html

Why Trash Occam?

- **Weather doesn't match low pressure values**
  - **Running water**
  - **Dust Devils**
  - **Dust Storms**
  - **Eye walls on big storms over Arsia Mons and Olympus Mons**
  - **Stratus clouds at 16 km.**
  - **Too much sand movement for low pressure**
  - **Light in the sky 1 hr 40 min before sunrise and after sunset. Just due to high dust, or a denser atmosphere?**

WHY TRASH OCCUM?
MRO AEROBRAKING

"***At some points in the atmosphere, we saw a difference in the atmospheric density ... 30% higher than the model, but ...***

around the south pole

it was 350% off the model."

Han You,

Navigation Team Chief for

Mars Reconnaissance Orbiter (MRO).

The ESA EXOMARS 2016 Schiaparelli Anomaly Inquiry mentions atmospheric density as a concern. In fact, trust in NASA's low pressure values was likely the direct cause of the crash.

6.2.2.2 High angular rate due to natural phenomenon

With respect to this branch of the failure tree, it has to be noted that hypersonic parachute deployment is a very complex and dynamic phenomenon affected by several uncertainties (**winds**, wake, etc.) and therefore very difficult to predict (and model).

The following aspects, on which the investigation has focused, have been identified as potentially contributing to the high angular rates at parachute deployment

1. Mach number different than estimated, potentially due to

a. **Atmospheric** dispersion (**density**/temperature)

2. Propagation error from accelerometers into position and velocity

We further note:

Each of the potential contributors to high angular rates have been analyzed. The main contributors appears to be:

2.a Presence of **Wind/Gust**

ESA UNCLASSIFIED - Releasable to the Public

esa

DOCUMENT

EXOMARS 2016 - Schiaparelli Anomaly Inquiry

Prepared by	Toni Tolker-Nielsen, ESA IG
Reference	DG-I/2017/546/TTN
Issue	1
Revision	0
Date of Issue	18/05/2017
Status	Issued
Document Type	Report

Hooo Hoooo 😁
http://blogs.esa.int/rocketscience/2017/10/19/exomars-successful-flux-reduction-manoeuvre

blogs.esa.int/rocketscience/2017/10/19/exomars-successful-flux-reduction-manoeuvre/ Search

rocket science blog
news from the edge of gravity

esa

Posted on 19 October 2017 by Giulia

→ EXOMARS SUCCESSFUL FLUX REDUCTION MANOEUVRE

ExoMars Spacecraft Operations Engineer tracks TGO's orbits

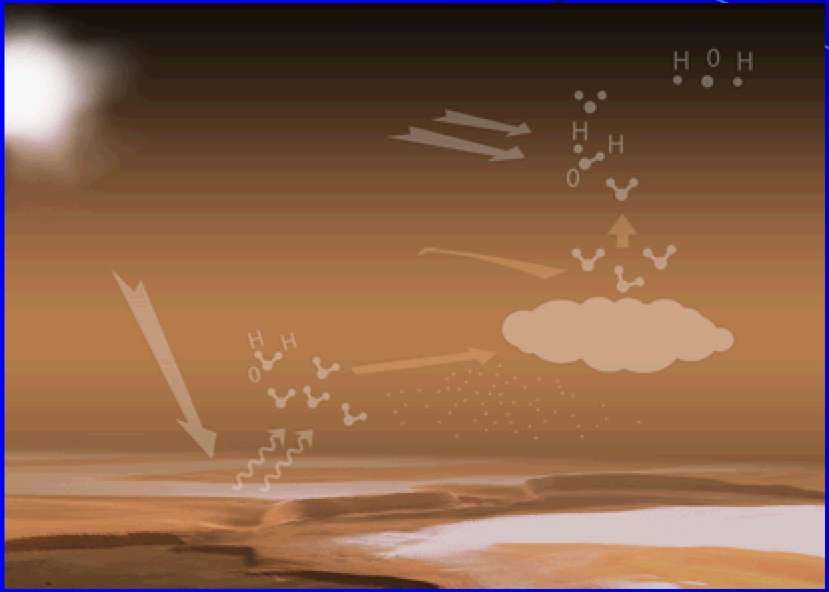
ExoMars has successfully performed a Flux Reduction Manoeuvre (FRM) for the first time. The manoeuvre was triggered by the excessive density of Mars' atmosphere, which had slowed the spacecraft above the limit the operations team normally allows.

The manoeuvre happened on 19 September, just a month before ExoMars' first arrival anniversary. (*Editor's note: Cool!*)

FRM together with the so-called 'Popup' manoeuvre are the spacecraft's automatic responses meant to save it from critical conditions that could cause damage, such as excessive heat or deceleration.

On September 19, 2017 ExoMars was forced to raise its orbit "due to excessive density of Mars' Air.

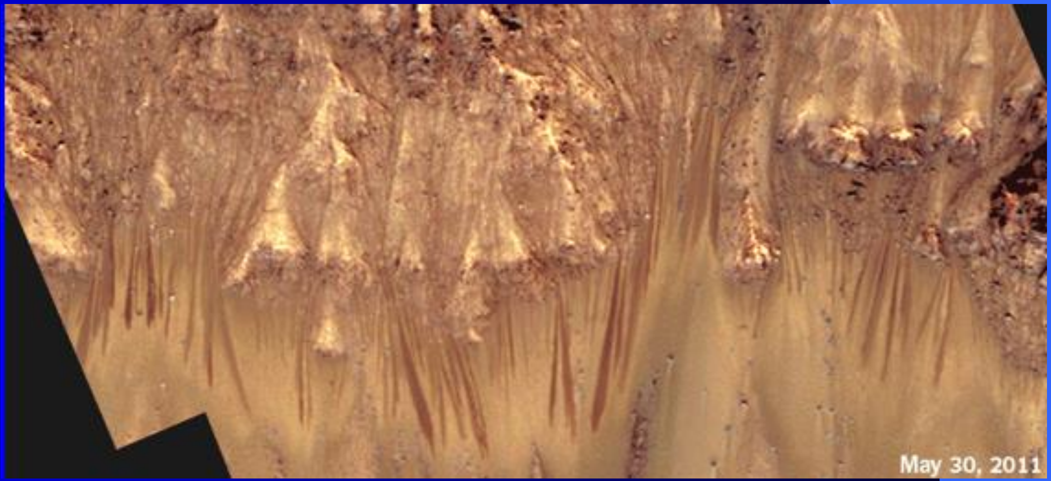
Why Trash Occam?



Mars Express spacecraft reveals Mars air is supersaturated with water vapor (29 Sep 2011).

10 to 100 times more H_2O than expected at 20 to 50 km. Partial pressures imply denser air too.

Since then running water has been found at many sites on Mars on 28 Sep 2015.



Rainbow or Camera Problem on Perseverance?

There is an issue with which Tavis Pressure Transducers were actually sent to Mars.

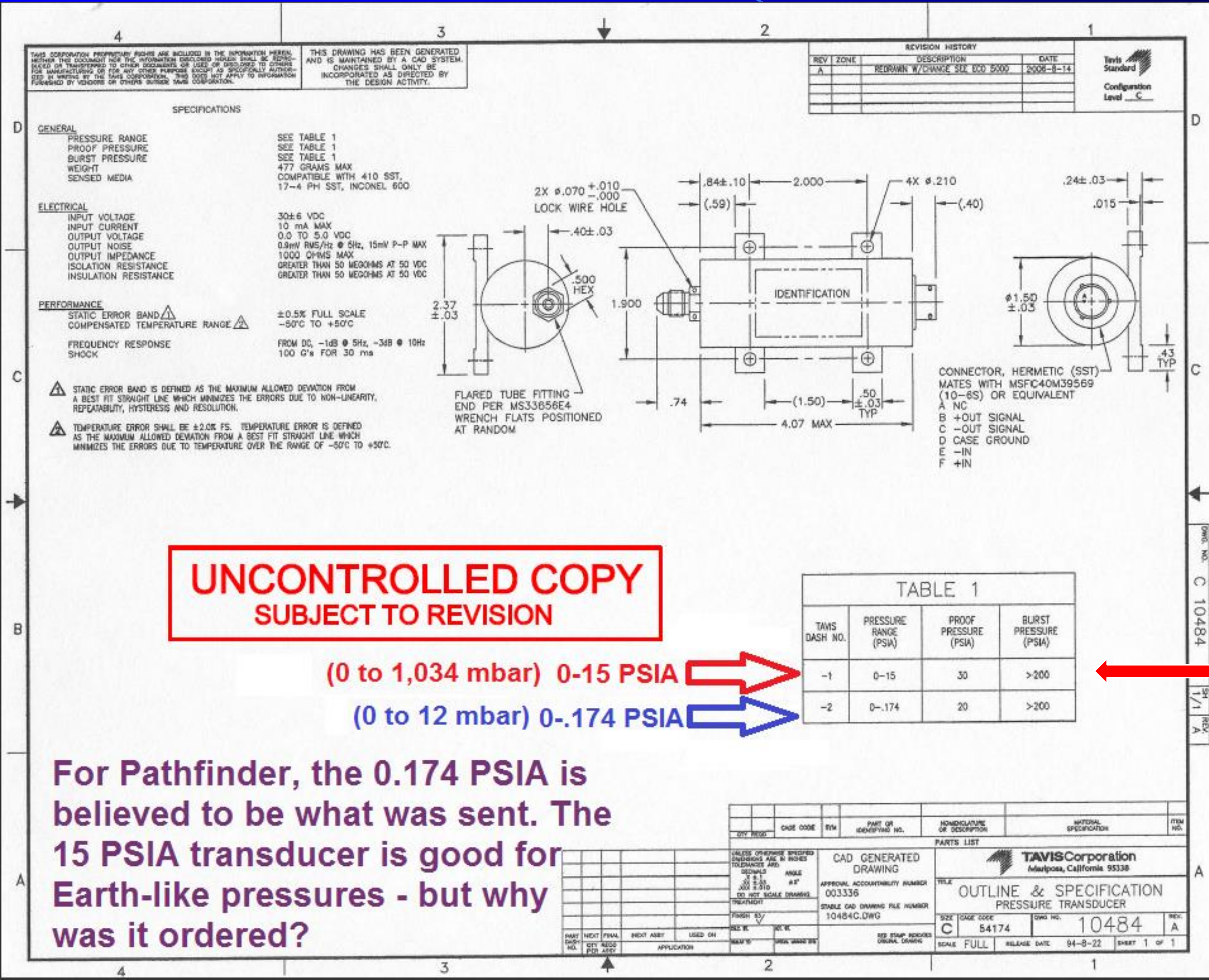


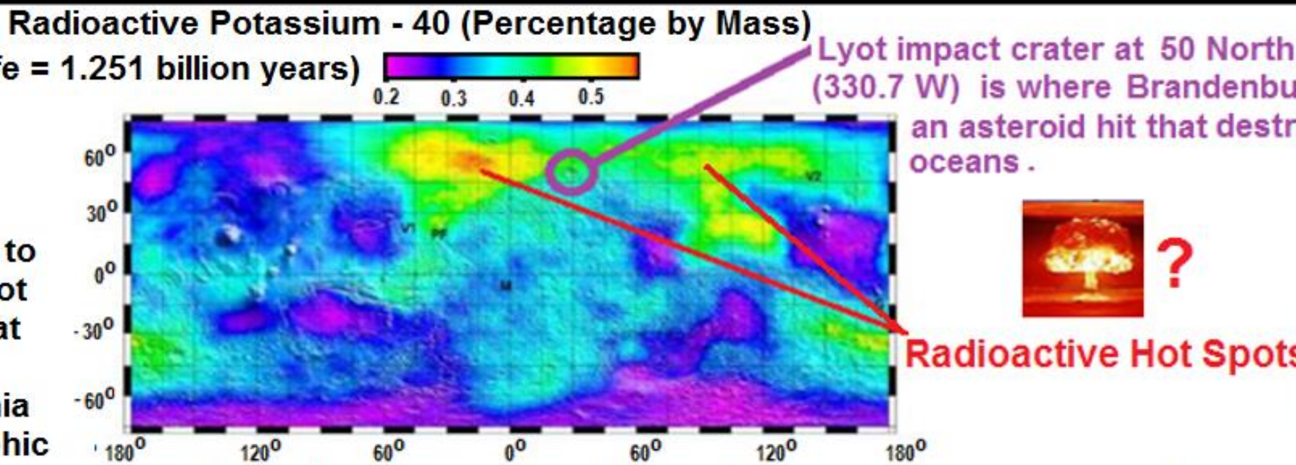
TABLE 1

TAVIS DASH NO.	PRESSURE RANGE (PSIA)	PROOF PRESSURE (PSIA)	BURST PRESSURE (PSIA)
-1	0-15	30	>200
-2	0-.174	20	>200

For Pathfinder, the 0.174 PSIA is believed to be what was sent. The 15 PSIA transducer is good for Earth-like pressures - but why was it ordered?

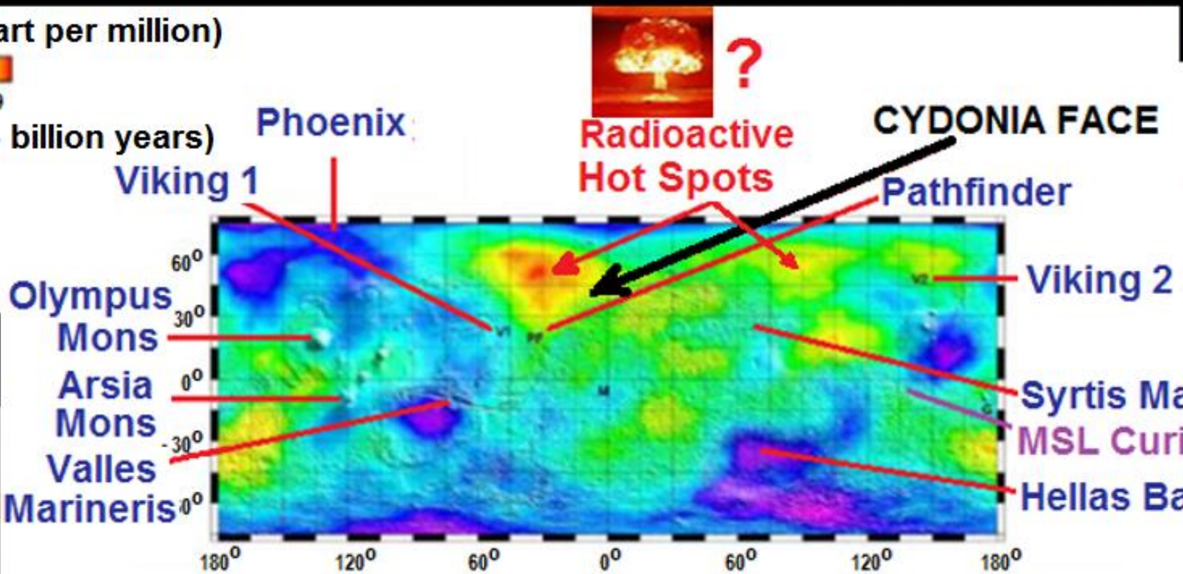
The sensor labeled Tavis Dash No. 1 could Measure Earth-like Pressure! (1,034 mbar)

Do radioactive sites on Mars = Disinformation?



Adapted from Brandenburg, 2011 to relate radioactive hot spots to landers that had meteorology instruments, Cydonia "face" and geographic landmarks.

Distribution of radioactive potassium on Mars



Distribution of Thorium on Mars

Why did NASA Administrator James Fletcher order the alteration of Martian sky color in 1976?

- Every picture of Mars sky color was wrong for 36 years after his order until MSL in August 2012.
- He kept our astronauts in low orbit to this day.