ABSTRACT FOR MARS CORRECT:
CRITIQUE OF ALL NASA MARS WEATHER DATA

We present evidence that NASA is seriously understating Martian air pressure. Our 12-year study critiques 3,025 Sols up through 8 February 2021 (8.51 terrestrial years, 4.52 Martian years) of highly problematic MSL Rover Environmental Monitoring Station (REMS) weather data, and offers an in depth audit of over 8,311 hourly Viking 1 and 2 weather reports. We discuss analysis of technical papers, NASA documents, and personal interviews of transducer designers. We troubleshoot pressures based on radio occultation/spectroscopy, and the previously accepted small pressure ranges that could be measured by Viking 1 and 2 (18 mbar), Pathfinder and Phoenix (12 mbar), and MSL (11.5 mbar – altered to 14 mbar in 2017). For MSL there were several pressures published from August 30 to September 5, 2012 that were from 737 mbar to 747 mbar – two orders of magnitude high – only to be retracted. We challenged many pressures and NASA revised them down. However **there are two pressure sensors ranges listed on a CAD for Mars Pathfinder**. We long thought the CAD listed two different sensors, but based on specifications of a new Tavis sensor for InSight that is like that on PathFinder, it appears that the transducer could toggle between two pressures ranges: 0-0.174 PSIA/12 mbar (Tavis Dash 2) and 0-15 PSIA/1,034 mbar (Tavis Dash 1). Further, an **Abstract to the American Geophysical Union for the Fall 2012 meeting,** shows the Finnish Meteorological Institute (FMI) states of their MSL (and Phoenix) Vaisala transducers, "The pressure device measurement range is 0 – 1025 hPa in temperature range of -45°C - +55°C (-45°C is warmer than MSL night temperatures), but its calibration is optimized for the Martian pressure range of 4 – 12 hPa." So in fact of the first five landers with meteorological suites, three were actually equipped to measure Earth-like pressure.

All original 19 low µV values were removed when we asked about them, although eventually 12 were restored. REMS always-sunny opacity reports were contradicted by Mars Reconnaissance Orbiter photos. We demonstrate that REMS weather data was regularly revised after they studied online critiques in working versions of this report. REMS even labelled all dust 2018 Global Dust Storm weather as sunny, although they did list the µV values then as all low. Vikings and MSL showed consistent timing of daily pressure spikes which we link to how gas pressure in a sealed container would vary with Absolute temperature, to heating by radioisotope thermoelectric generators (RTGs), and to dust clots at air access tubes and dust filters. Pathfinder, Phoenix and MSL wind measurements failed. Phoenix and MSL pressure transducer design problems included confusion about dust filter location, and lack of information about nearby heat sources due to International Traffic and Arms Regulations (ITAR). NASA Ames could not replicate dust devils at 10 mbar. Rapidly filled MER Spirit tracks required wind speeds of 80 mph at the assumed low pressures. These winds were never recorded on Mars. Nor could NASA explain drifting Barchan sand dunes. Based on the above and dust devils on Arsia Mons to altitudes of 17 km above areoid (Martian equivalent of sea level), spiral storms with 10 km eye-walls above Arsia Mons and similar storms above Olympus Mons (over 21 km high), dust storm opacity at MER Opportunity blacking out the sun, snow that descends 1 to 2 km in only 5 or 10 minutes, excessive aero braking, liquid water running at or near the surface in numerous locations at Recurring Slope Lineae (RSL) and stratus clouds 13 km above areoid, we argue for an average pressure at areoid of ~511 mbar rather than the accepted 6.1 mbar. This pressure grows to 1,050 mbar in the Hellas Basin.