Table 1. Summary of in situ pressure observations and observation systems in the Martian atmosphere.

Lander	Sensor type	Reference	Location	Durat
Viking Lander 1	magnetic reluctance diaphragm	*Hess et al.* [1977]	N subtropics	Marti
Viking Lander 2	magnetic reluctance diaphragm	*Hess et al.* [1977]	N mid-latitudes	Marti
Mars Pathfinder	magnetic reluctance diaphragm	*Seiff et al.* [1997]	N subtropics	tens c
Phoenix	capacitive	*Taylor et al.* [2010]	N polar regions	tens c
MSL	capacitive	*Gómez-Elvira et al.* [2012]	equatorial regions	> 10(

Table 2. Factors limiting the REMS-P performance. Colums LL and RSP2M give the characteristic measures of the factor for the LL and RSP2M sensor head types, respectively.

Factor	LL	RSP2M	Notes
Warm-up time	150 s	1 s	
Noise	0.2 Pa	0.2 Pa	Peak-to-peak
Response time	1 s	1 s	
Shadow effect	1 Pa	1 Pa	Pressure drop
Repeatability variation	< 1.5 Pa	< 1.5 Pa	Peak-to-peak
Offset drift rate during cruise	+0.5 Pa/year	-3 – -5 Pa/year	
Estimated offset drift rate during mission	± 0.5 Pa/year	N/A	
Absolute uncertainty of single reading	< 2.7 Pa		MSL sols 0 - 100
Sampling interval	16 s	1 s	Nominal REMS observations

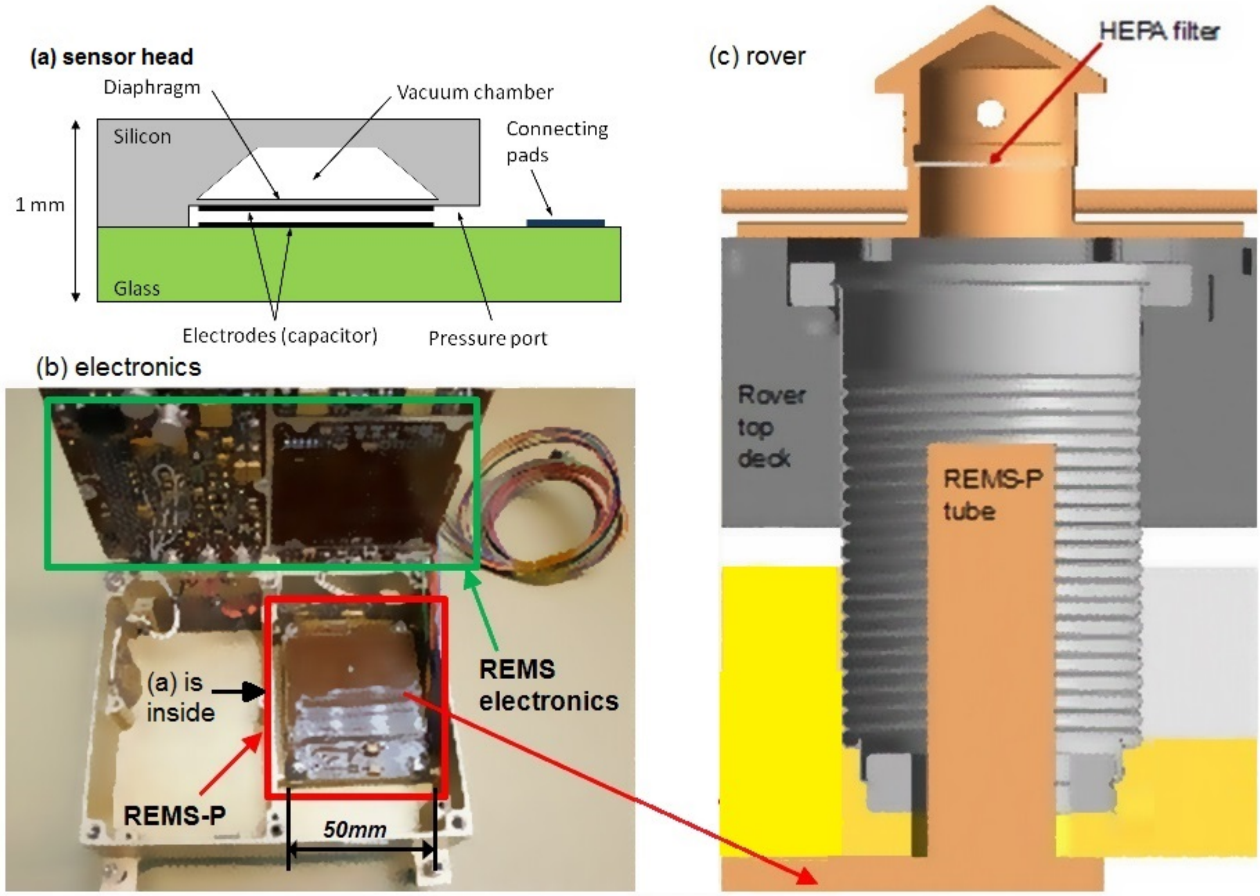

Figure 1. The Barocap® (a) is a silicon micromachined miniaturised capacitive sensor head. The measured pressure is fed between the two capacitor plates through an inlet port. Varying pressure bends the thin silicon membrane. One of the capacitor plates is attached to the bending silicon membrane generating varying capacitance.REMS-P is accommodated inside the MSL rover body and embedded in the REMS electronics box, as shown on the left pane photo (b) depicting the EM electronics. The measured pressure is let in via a special inlet port on the deck of the MSL as shown on the right (c). A small tube The inletThe sensor is located below the REMS-P as shown by the arrow in the figure.

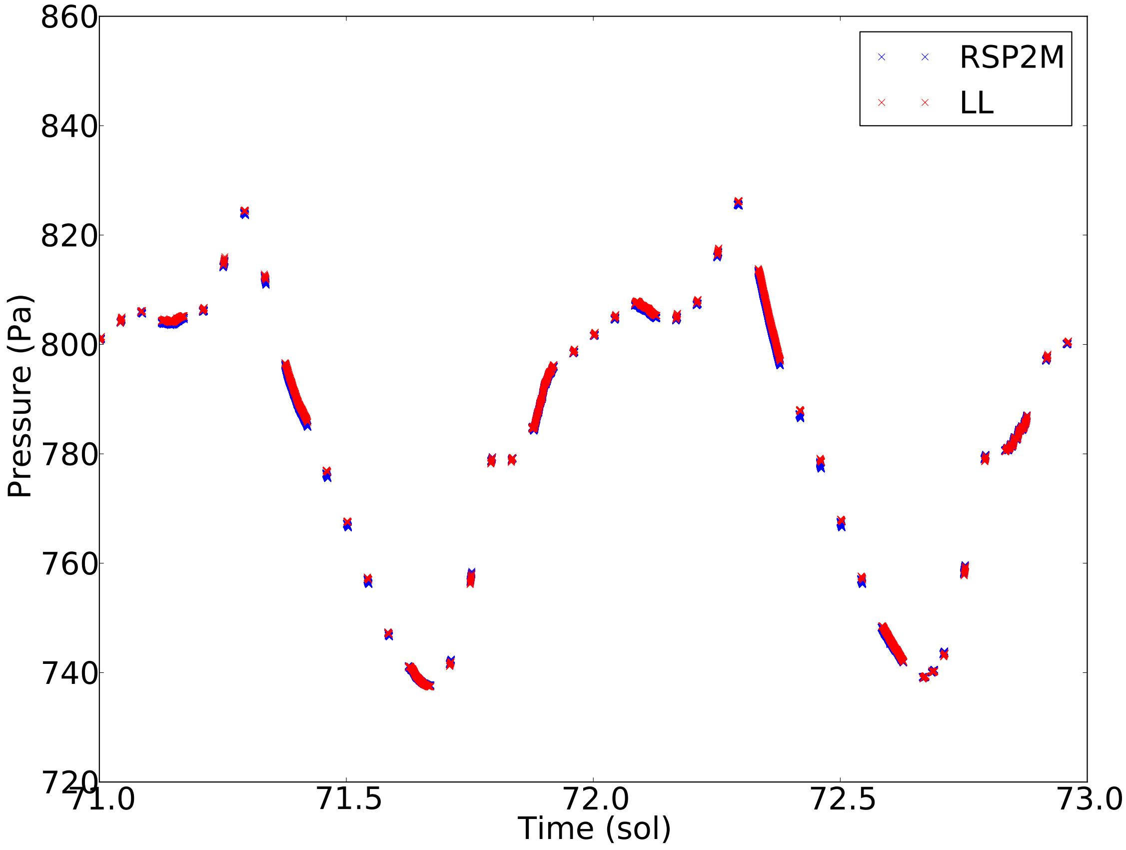

Figure 2. The diurnal pressure cycle over sols 71-74 with about 10 % diurnal pressure variation, and showing also the pressure disturbances during the evening hours, most likely caused by local circulation phenomena.

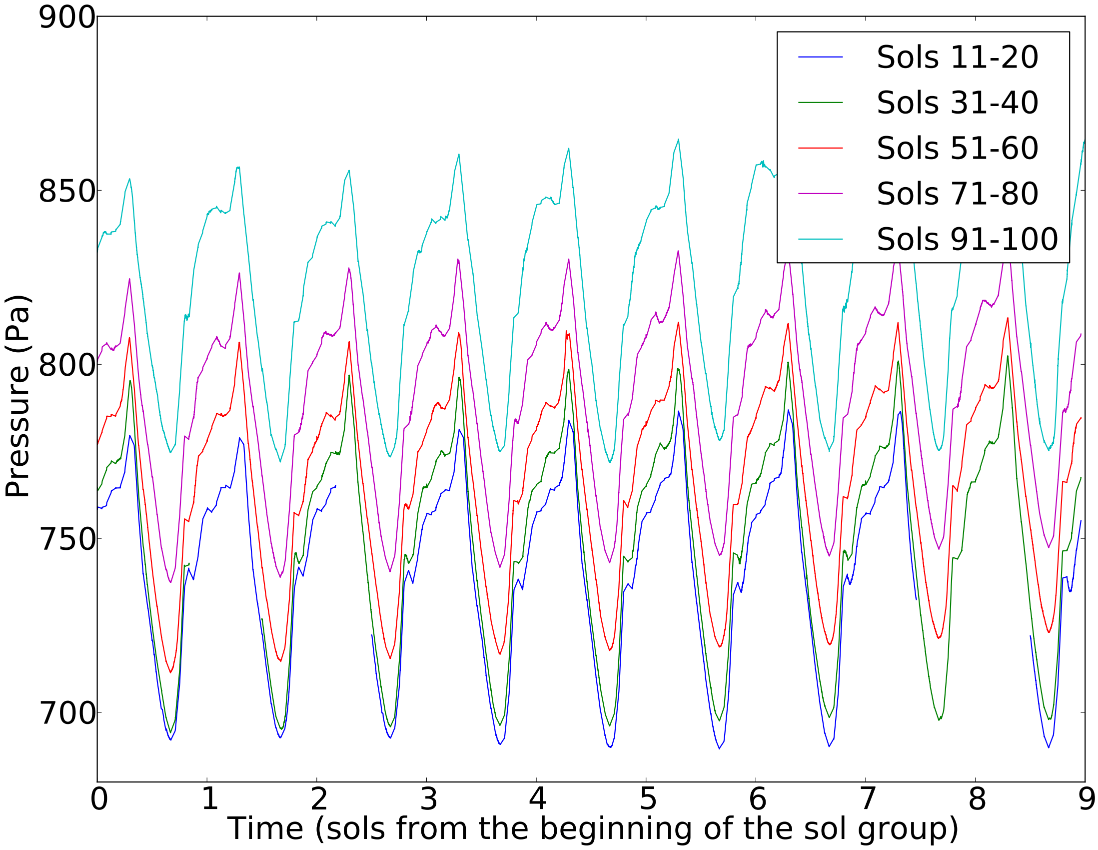

Figure 3. Diurnal pressure variation over the first 100 sols of MSL operations measured by the LL-type Barocap®. There are five groups of diurnal pressure cycles showing data from sols 11-20, 31-40, 51-60, 71-80 and 91-100. The gradually advancing season is evident through increasing pressure from group to group.

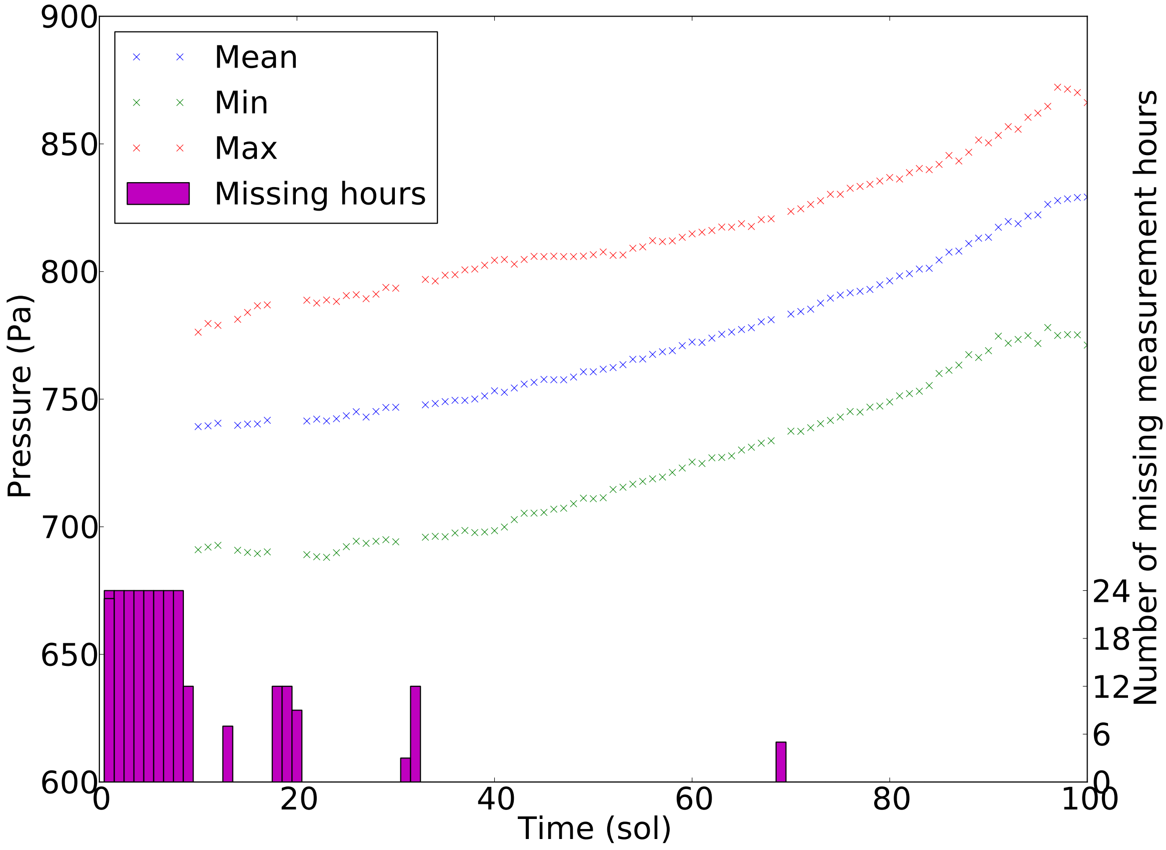

Figure 4. Diurnal maxima, means and minima observed by REMS-P LL-type Barocap®. The bars at the bottom of the chart show the number of missing (hourly) observation sessions for each sol.

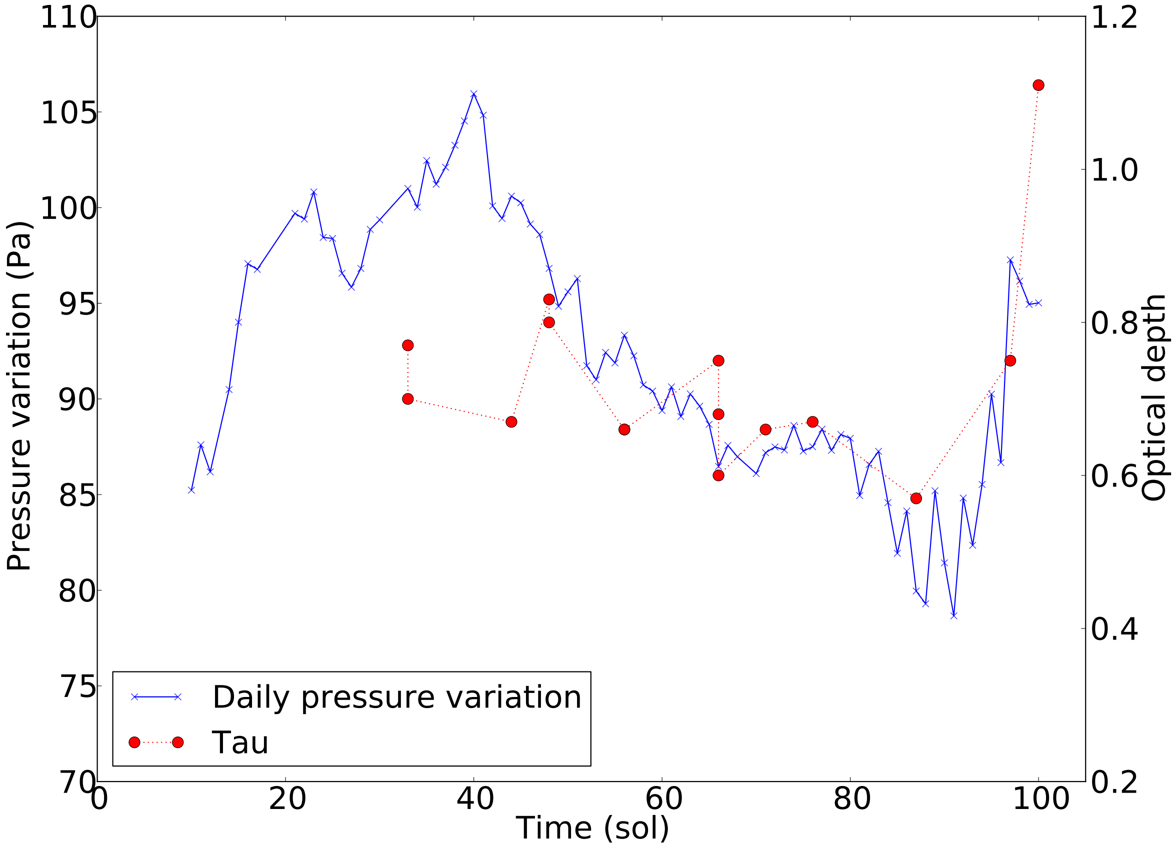

Figure 5. The effect of the atmospheric optical depth on the atmospheric pressure variation (difference between daily maximum and minimum pressure values).

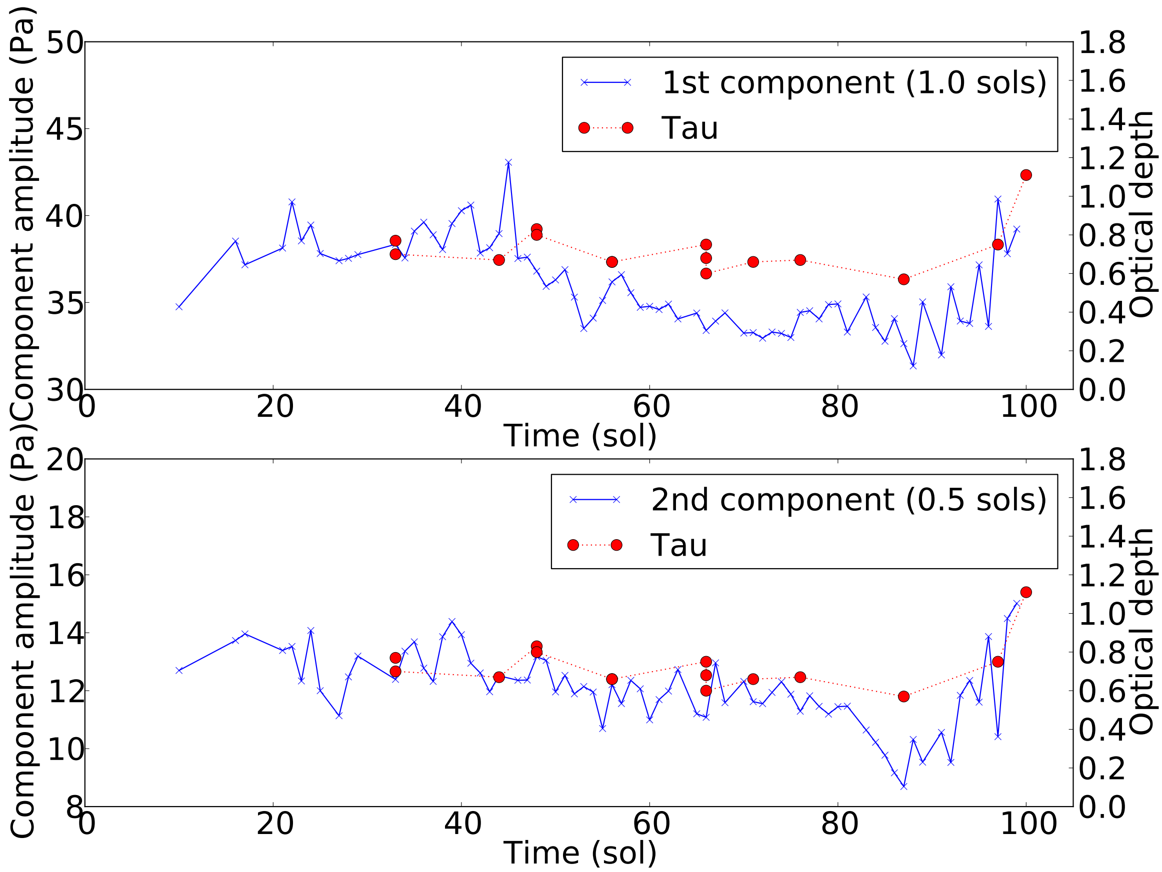

Figure 6. The atmospheric optical depth and the 24-hour pressure harmonic (upper pane) and 12-hour pressure harmonic (lower pane). There is a positive correlation between the pressure harmonics and the atmospheric optical depth, clearly visible during the last ten sols.

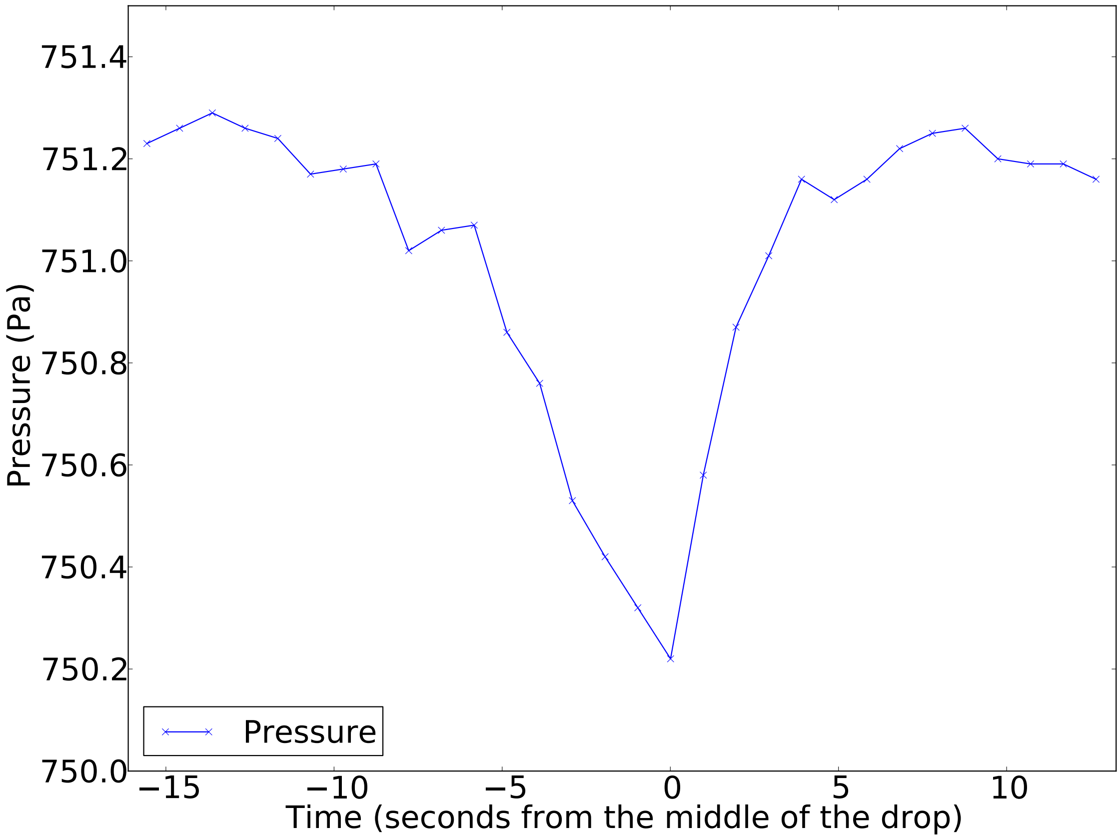

Figure 7. An example of a pressure drop (measured by RSP2M-type Barocap®), probably caused by a thermal vortex. This phenomenon takes place on the MSL sol 60 just after noon at about 1218 LT. There may also be a corresponding increase in atmospheric temperature, but this is still under evaluation. The abscissa is seconds, and the whole frame covers about 30 seconds.

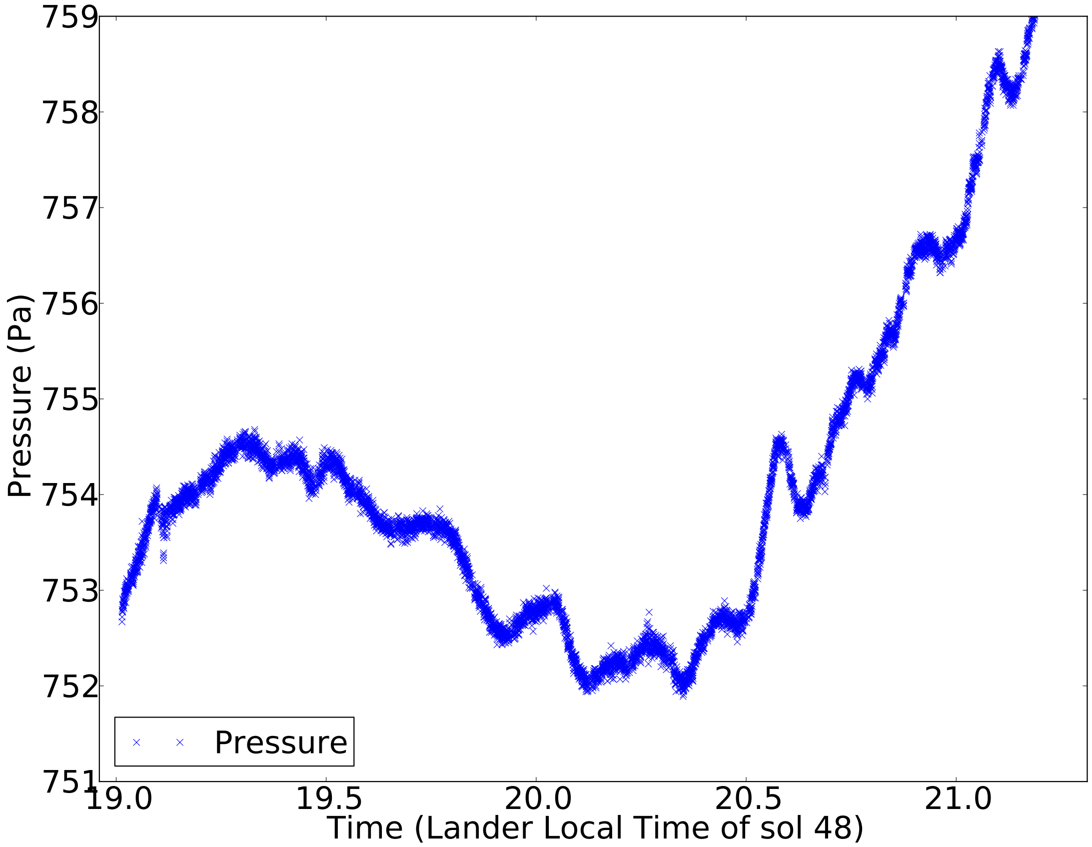

Figure 8. Pressure (RSP2M-type Barocap®) observations during local evening hours of 1900 LT to 2130 LT of sol 48. The observations exhibit oscillations that are likely caused by local circulation phenomena.

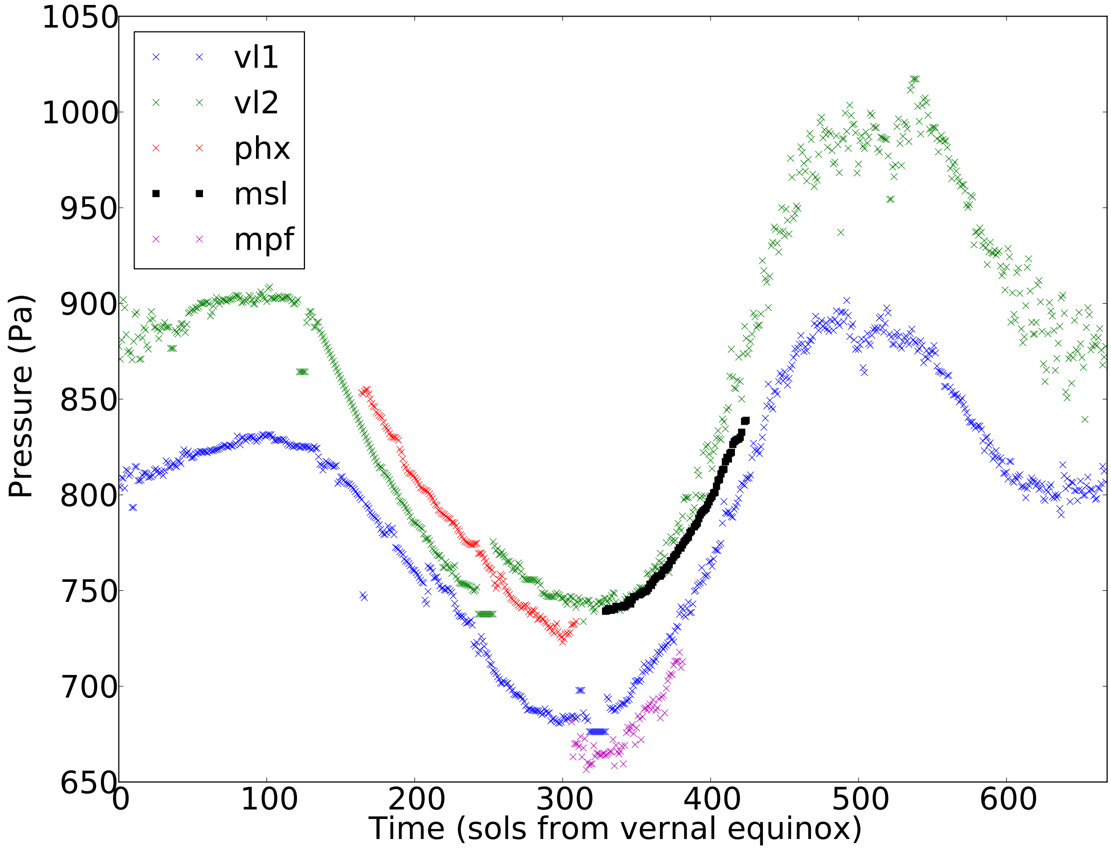

Figure 9. The sol-averaged surface pressure observed by earlier Mars landing missions and the MSL (black dots, LL-type Barocap®) as a function of sols starting from the vernal equinox.

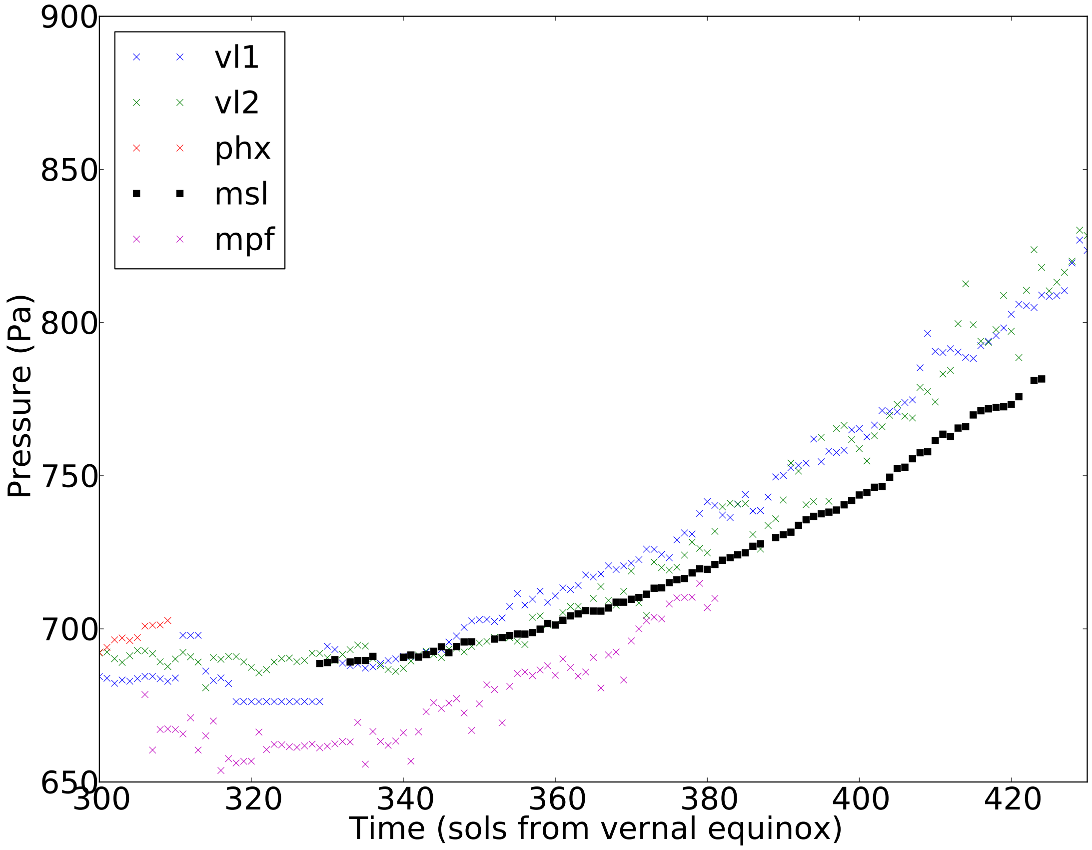

Figure 10. The sol-averaged surface pressure observed by MSL (black dots, LL-type Barocap®) and the earlier Mars landing missions. The pressures are adjusted for the elevation of VL1 to enable the comparison of the development of MSL pressure observations with the earlier missions.

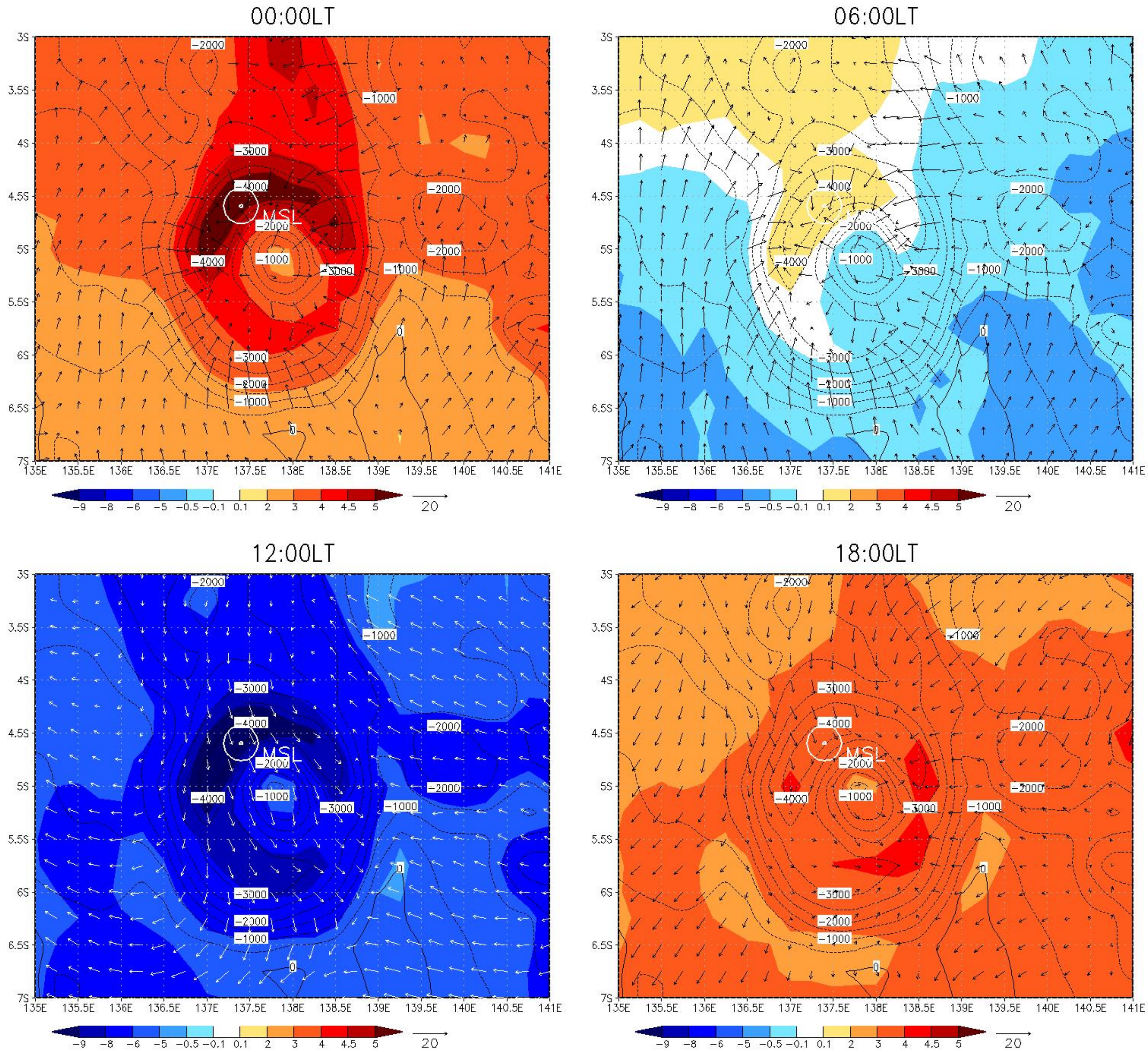

Figure 11. Surface geopotential (contours) and 30-sols mean of surface wind in m/s (vectors) and hourly surface pressure tendency in Pa/h (color bar) simulated by MLAM for 00, 06, 12, and 18 LT.