



# REMS DOS AÑOS EN MARTE

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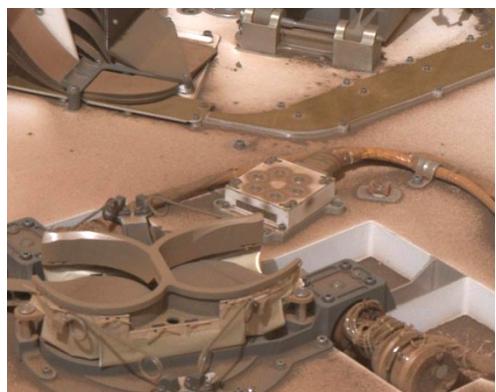
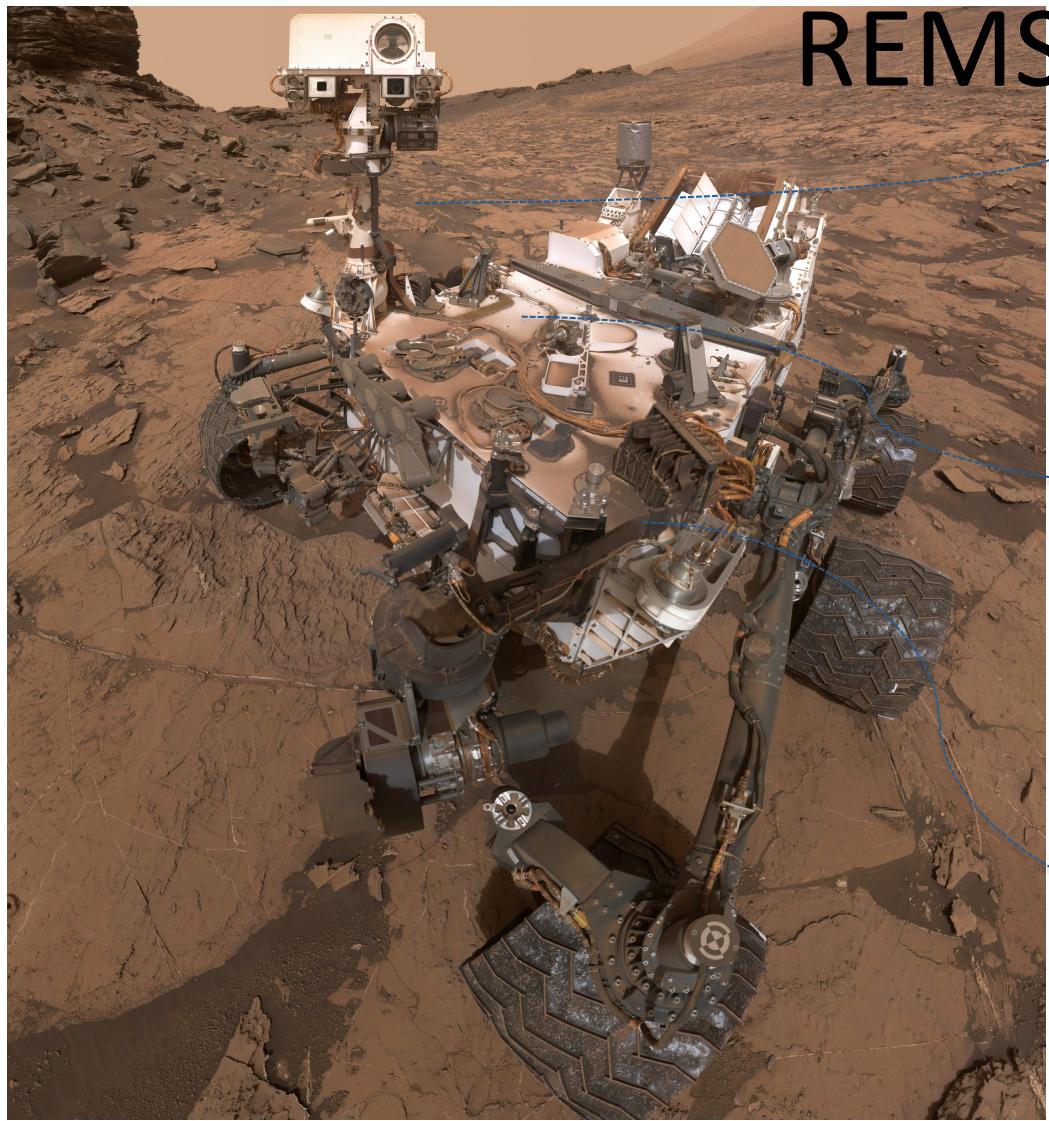


IMAGE CREDIT: NASA/JPL-CALTECH/MSSS



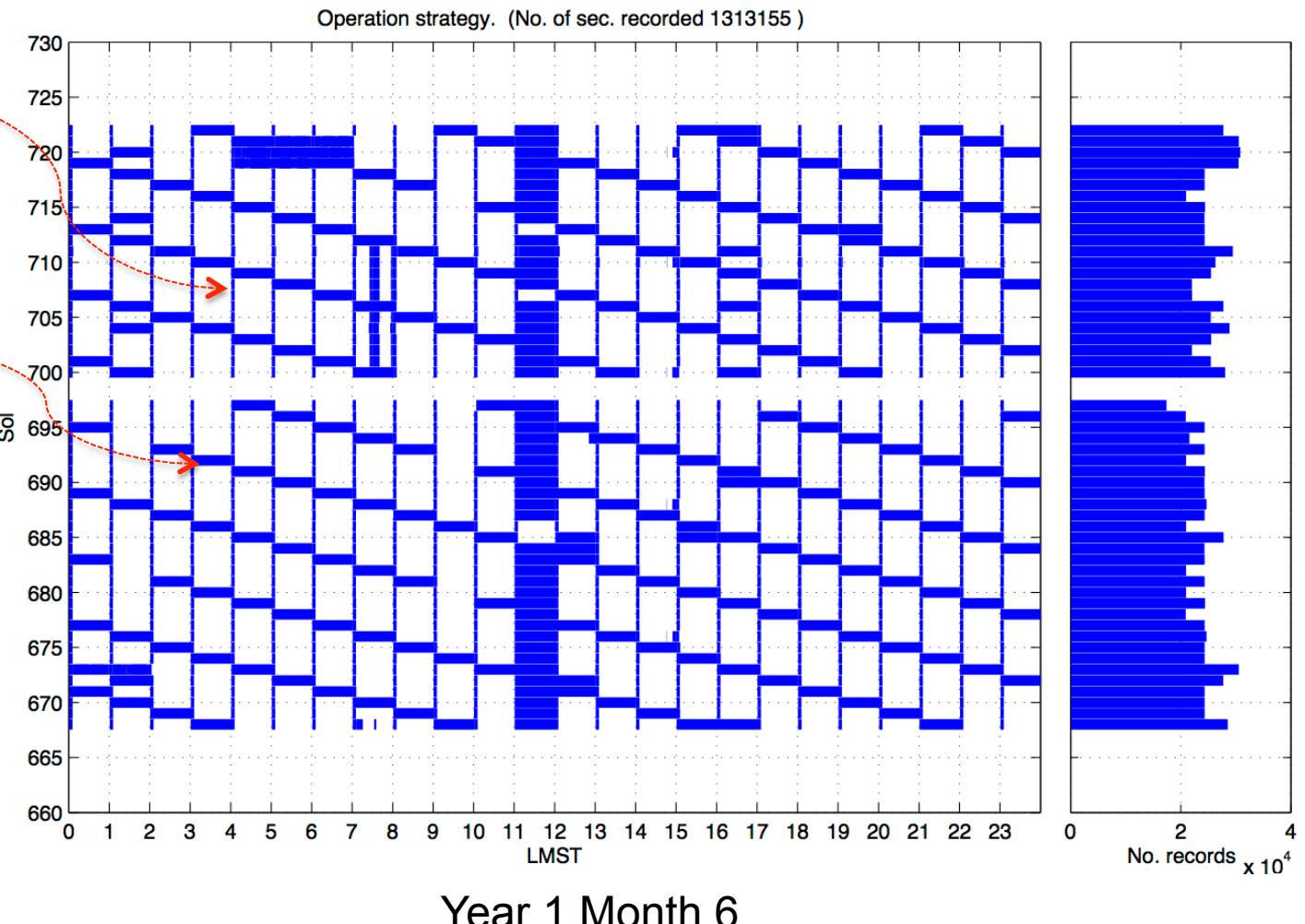
V Reunión de Ciencias Planetarias y Exploración del Sistema Solar (CPESS5)

# Operation

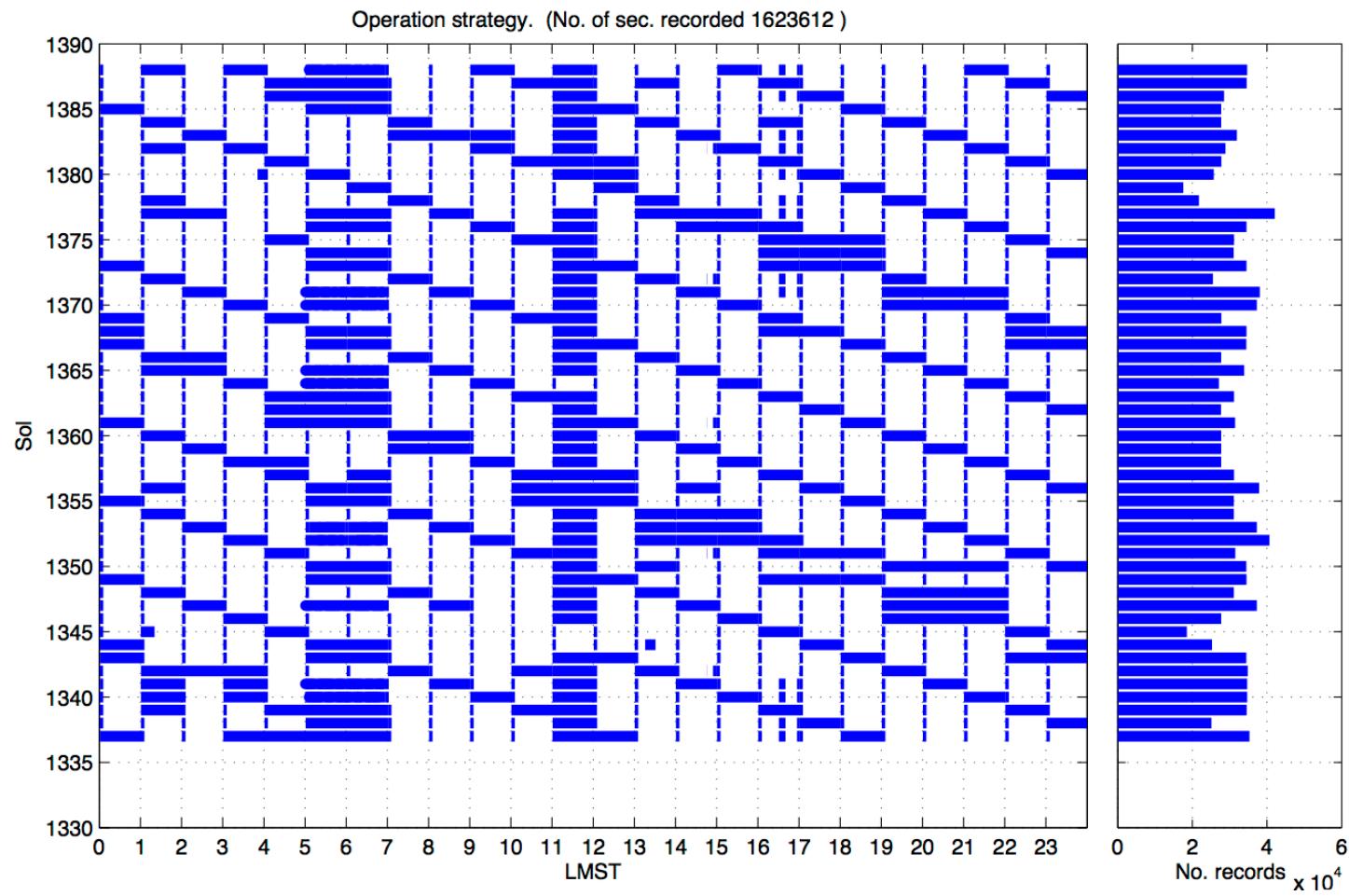
Regular 5  
minutes  
session

Extended  
session.  
1 hour

MSL-Env  
group  
decides  
every day  
how to  
distribute  
REMS time



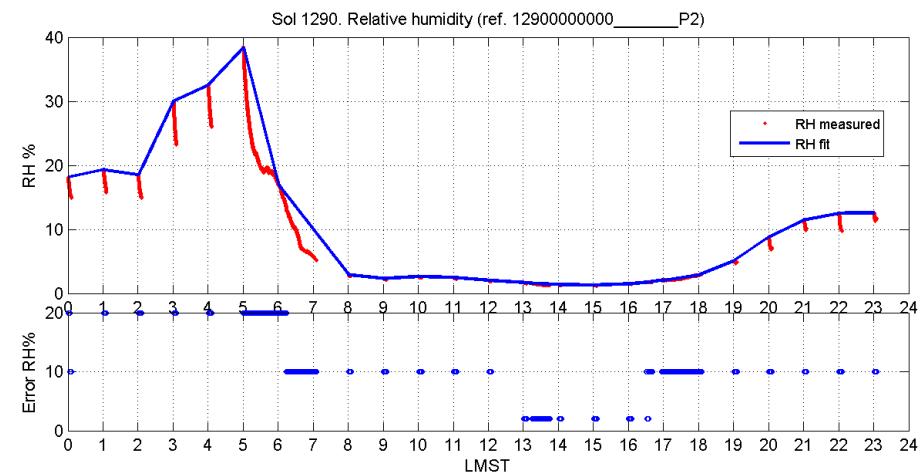
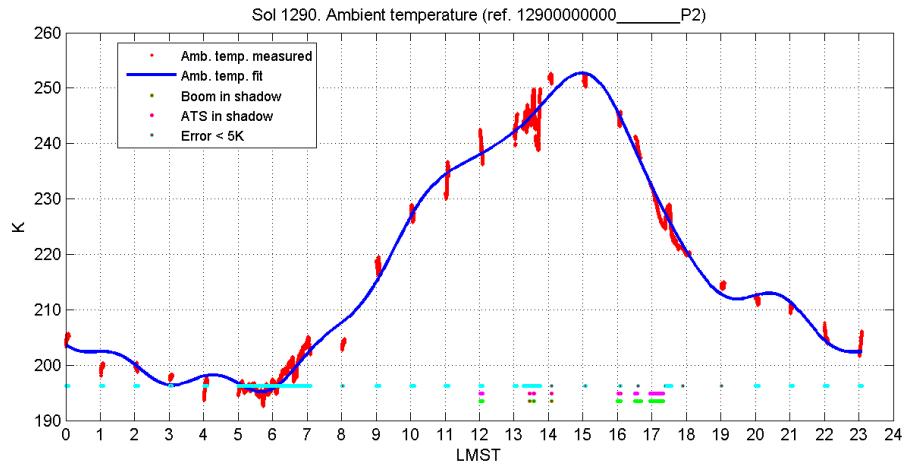
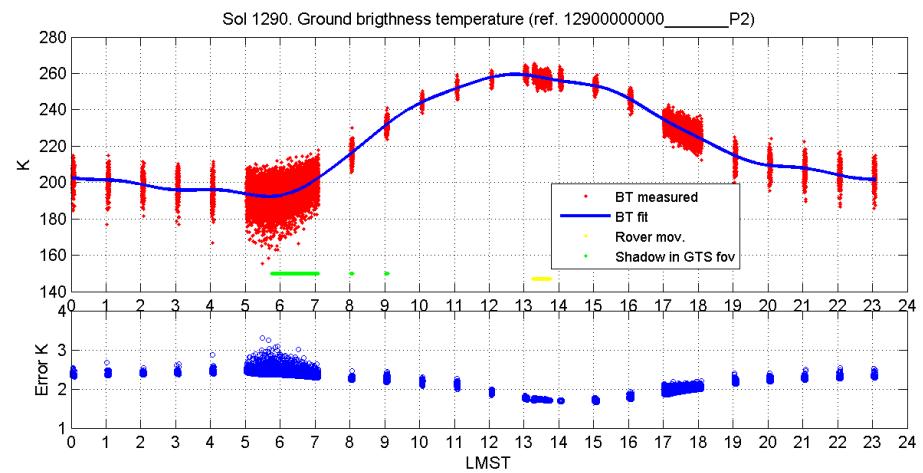
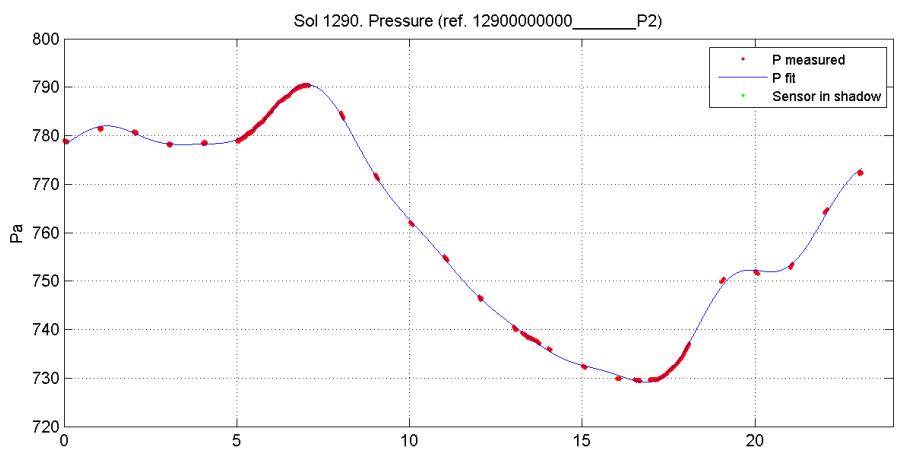
# Operation



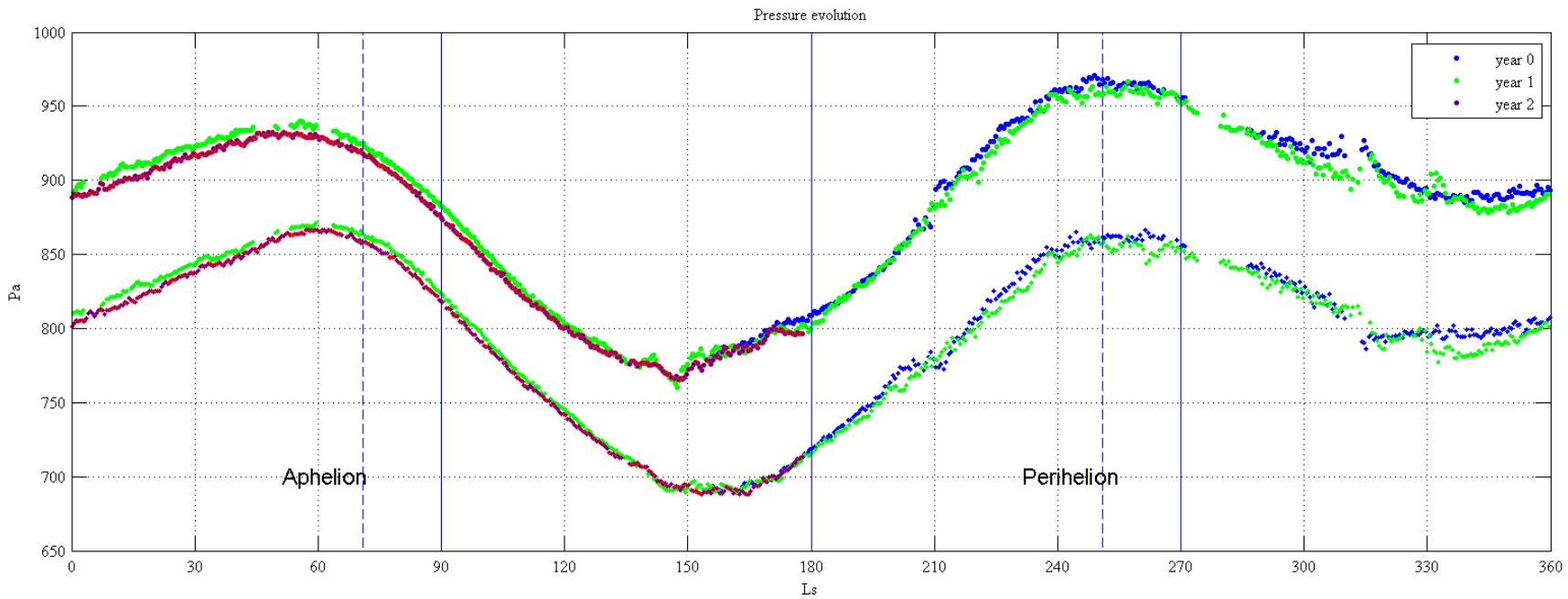
Year 2 Month 6



# Data Processing



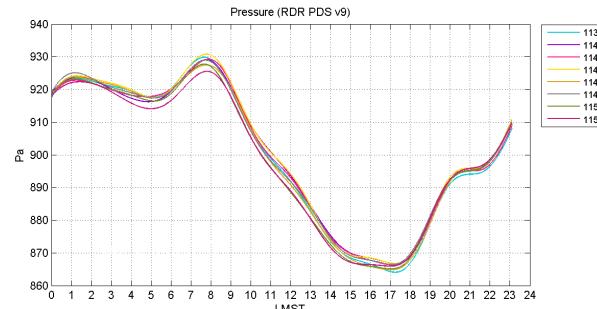
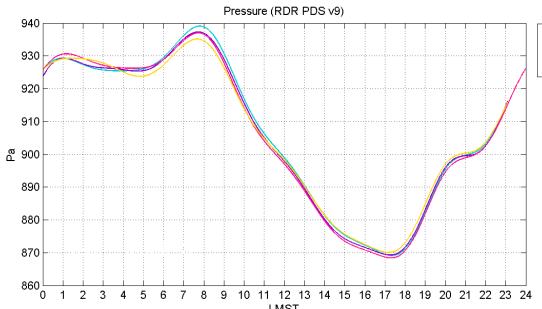
# Pressure



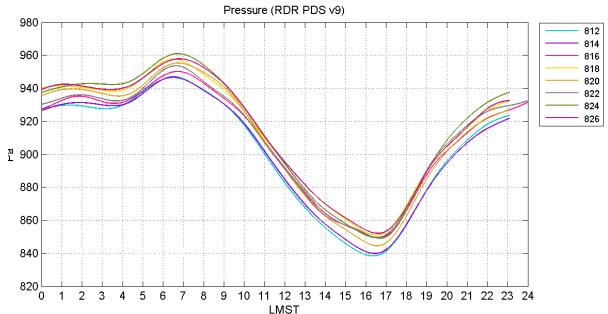
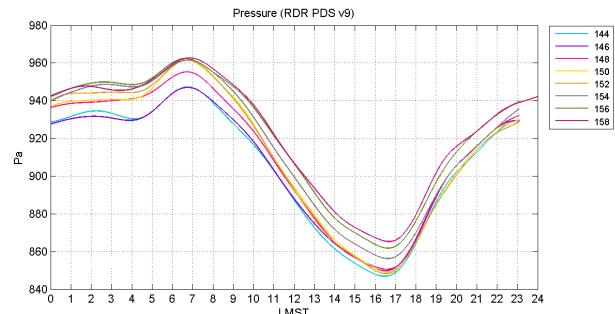
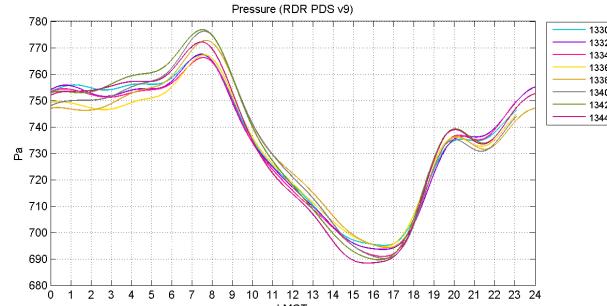
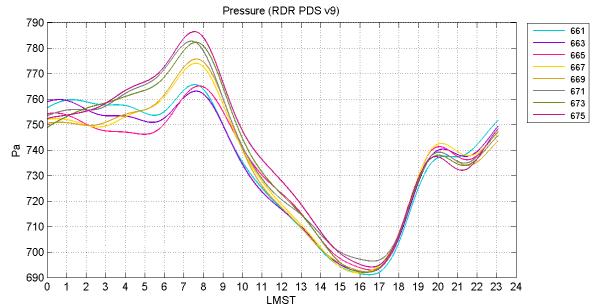
i) Southern autumn and winter with smooth variations in pressure, and its corresponding relative maximum at the end of autumn and annual minimum at the end of the winter – both related to the sublimation and deposition of the southern CO<sub>2</sub> polar cap -,

ii) The spring and summer (dust storm season) where the evolution shows a lot of fluctuations, even the pattern of a remote dust storm.

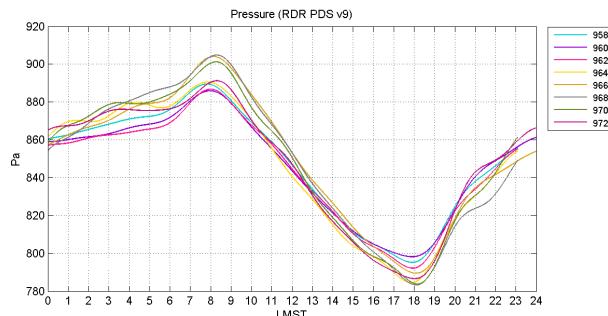
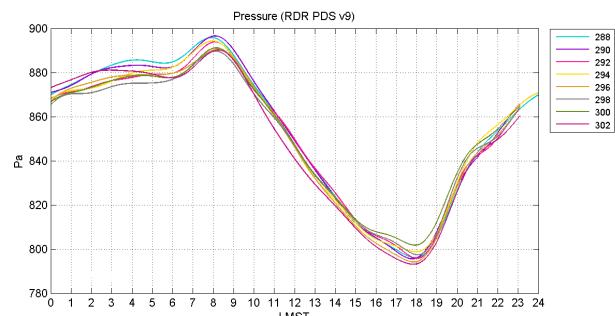
End of autumn  
 $\Delta p \approx 70 \text{ Pa}$   $\uparrow$



End of winter  
 $\Delta p \approx 90 \text{ Pa}$   $\uparrow$

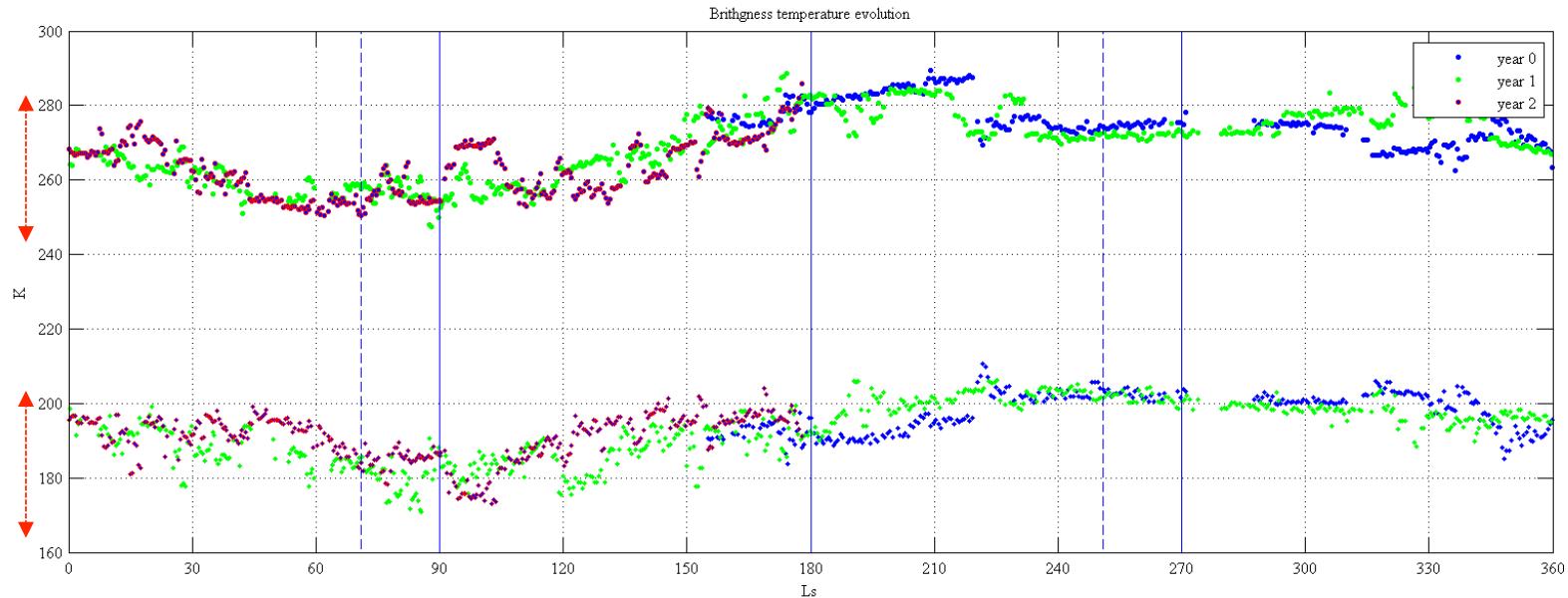


End of spring  
 $\Delta p \approx 120 \text{ Pa}$   $\uparrow$



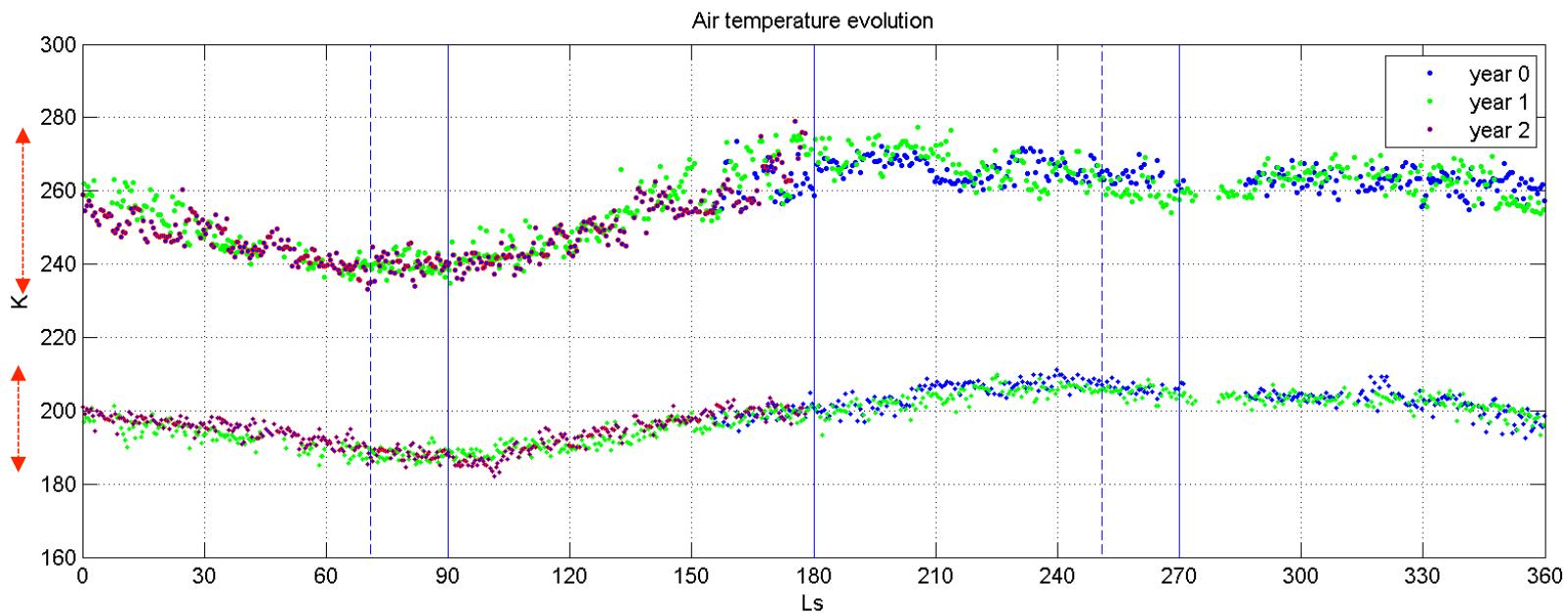
End of summer  
 $\Delta p \approx 120 \text{ Pa}$   $\downarrow$

# Ground Brightness Temp.



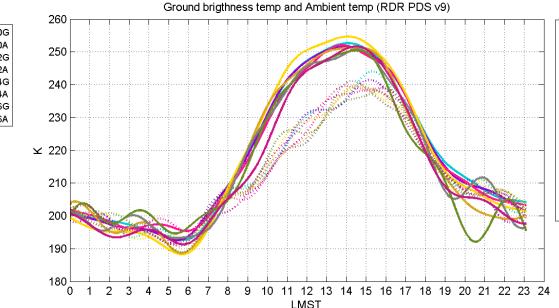
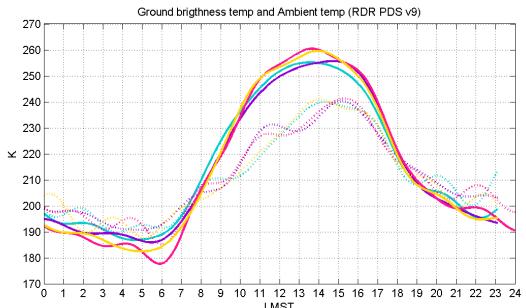
- Maximum temperature has a narrow range of variations, from circa 250 to 290 K.
- Similarly for the minimum spanning from 170 to 210 K.
- The second part of the year, spring and summer, maximum and minimum are quite stable.
- The oscillations (not seen in air data) are driven by the soil materials and their thermal inertia, and it determines the difference between maximum and minimum.

# Air Temperature

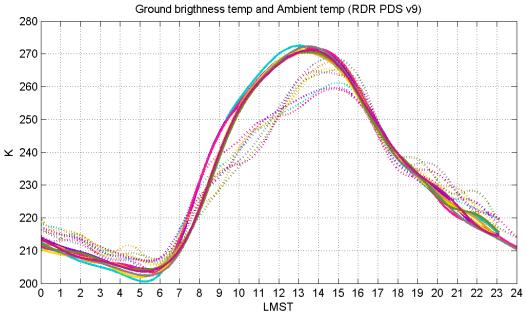
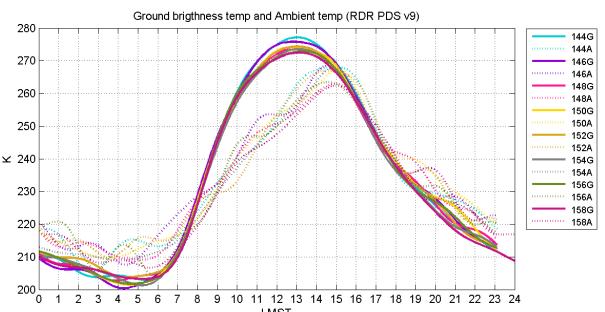
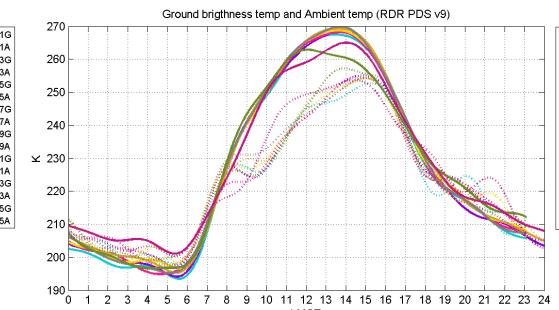
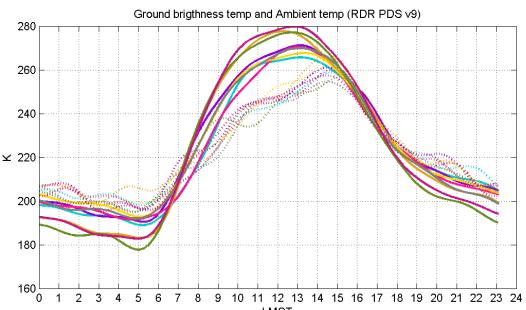


- Maximum temperature has a range of variations, from circa 230 to 280 K.
- Minimum values have a narrow range: from 185 to 210 K (high electronic noise during nights).
- As for the ground temperatures the second part of the year, spring and summer, maximum and minimum are quite stable.

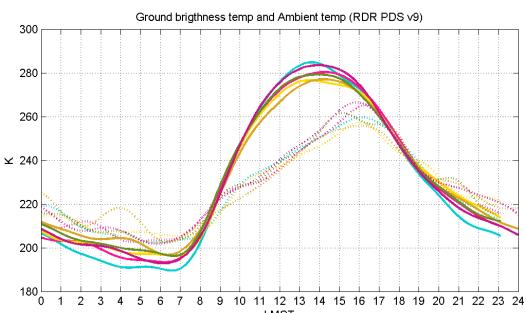
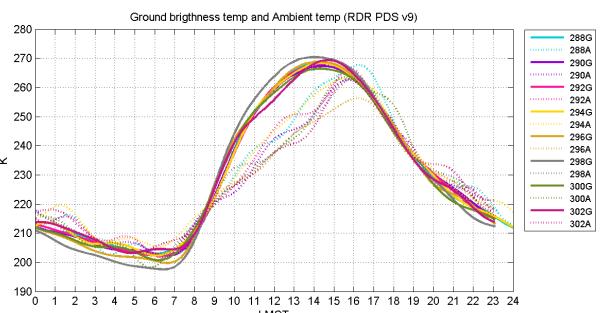
# End of autumn



# End of winter



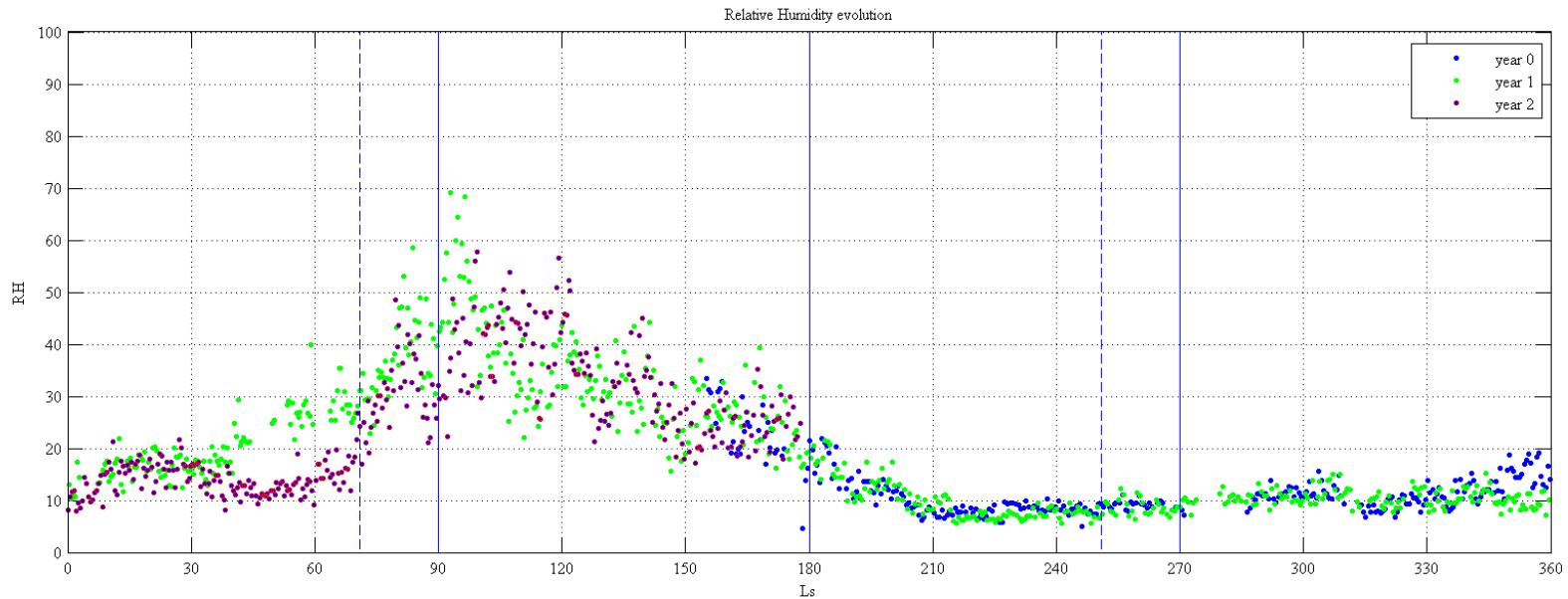
# End of spring



# End of summer

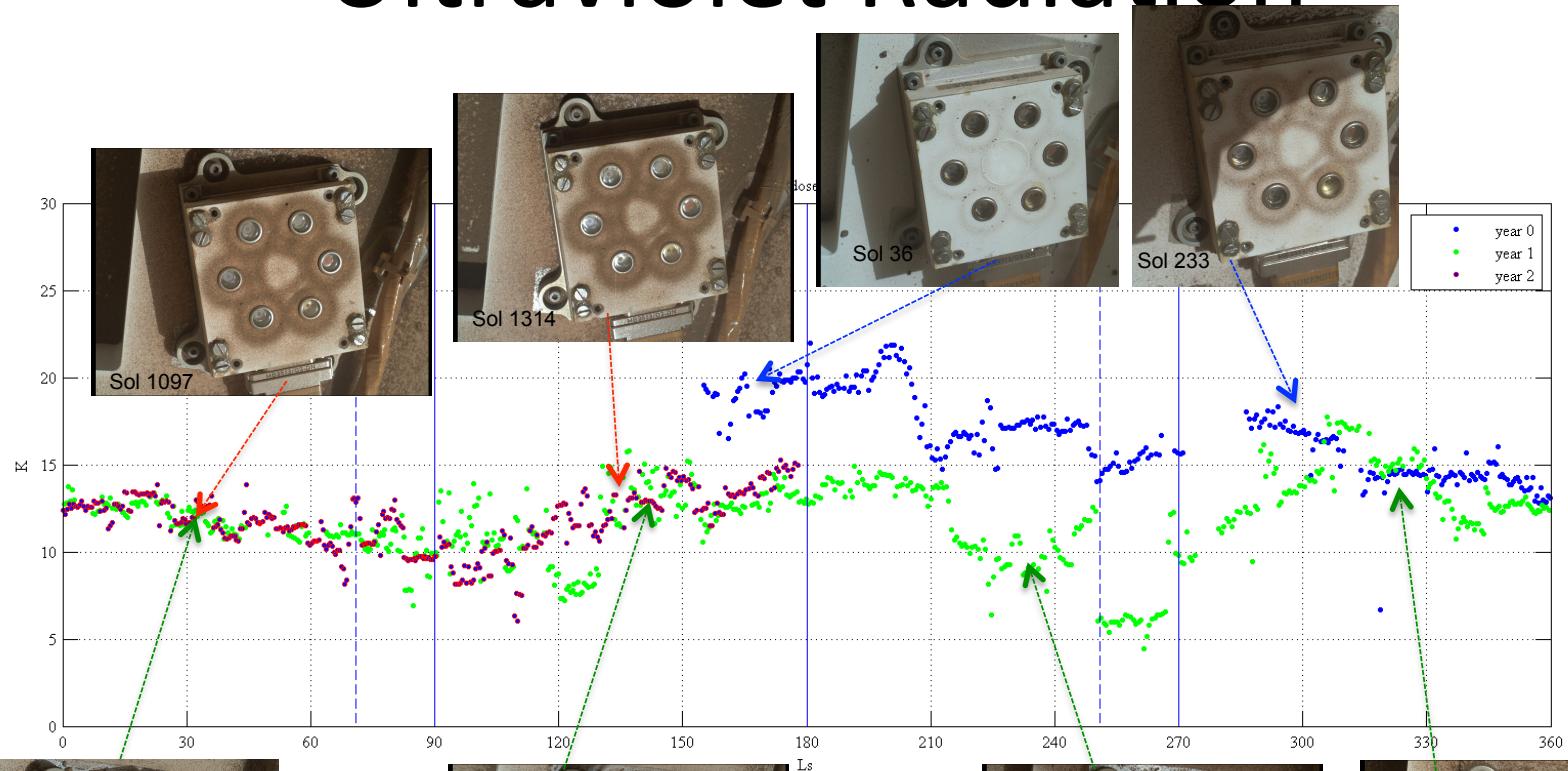


# Relative Humidity



Relative humidity(Harri 2014) shows two periods too. Nevertheless, it needs to be considered that there is a correlation between relative humidity and air temperatures. At low temperatures, the capability of the Mars atmosphere to absorb water is small and that causes those high values in the first part of the year.

# Ultraviolet Radiation



IMAGES CREDIT: NASA/JPL-CALTECH/MSSS



# Wind

Due to the landing issues, the REMS WS only measures winds from the rover front and it has a reduced capability to estimate wind direction from the rover back.

The rover has moved by plains in the 12 months and by a more complicated orography in second 12 months.

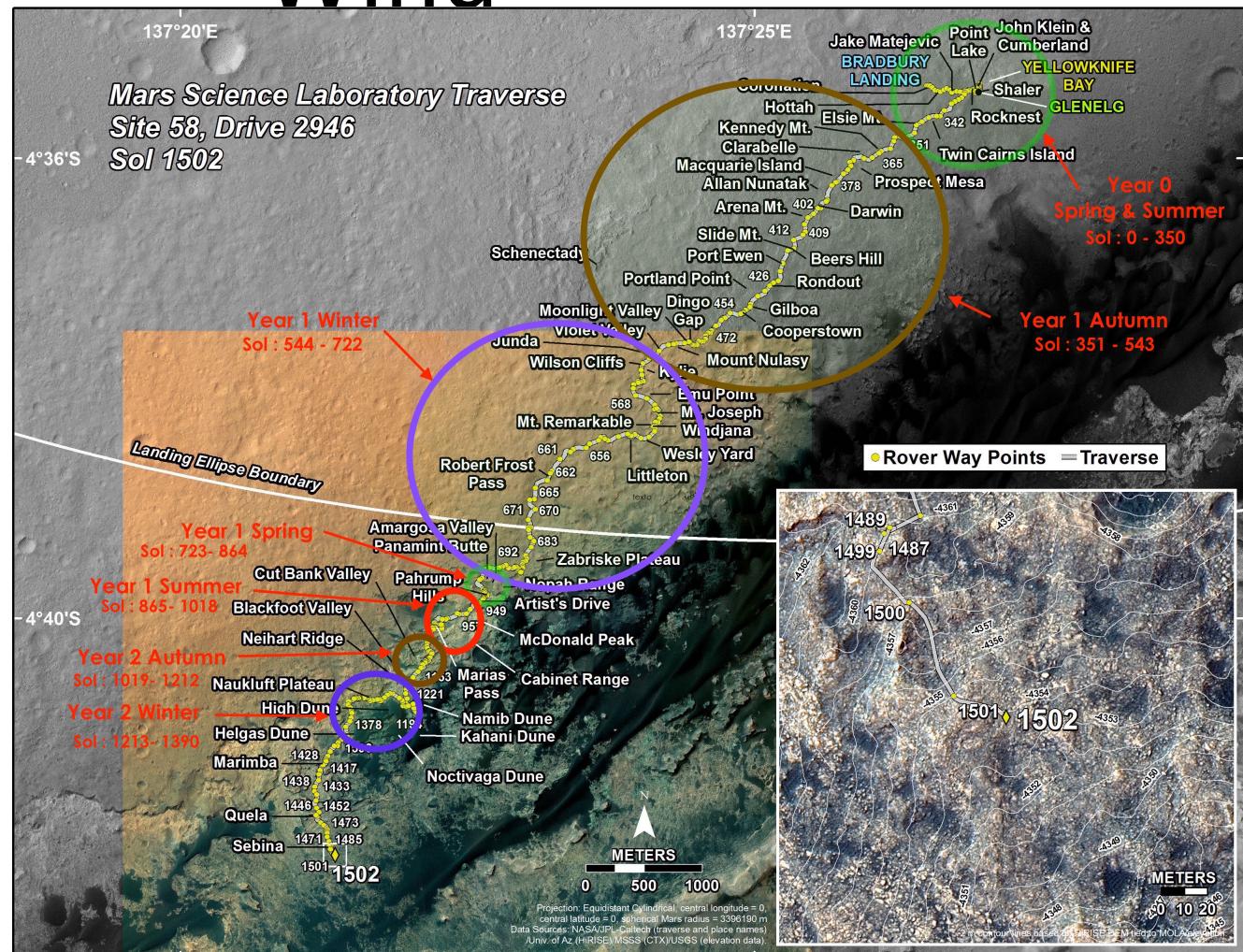
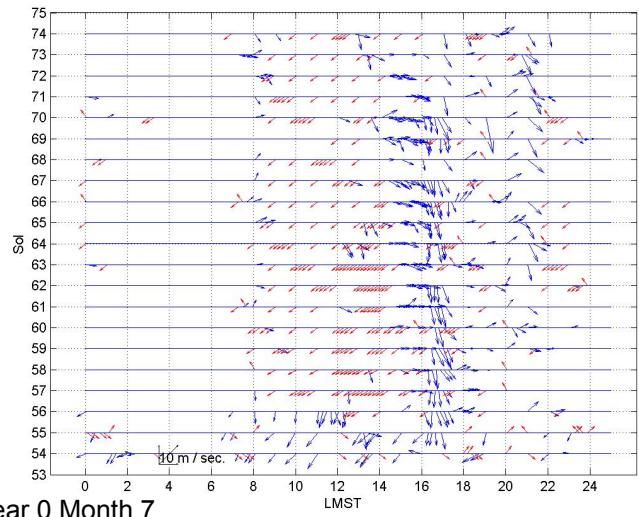
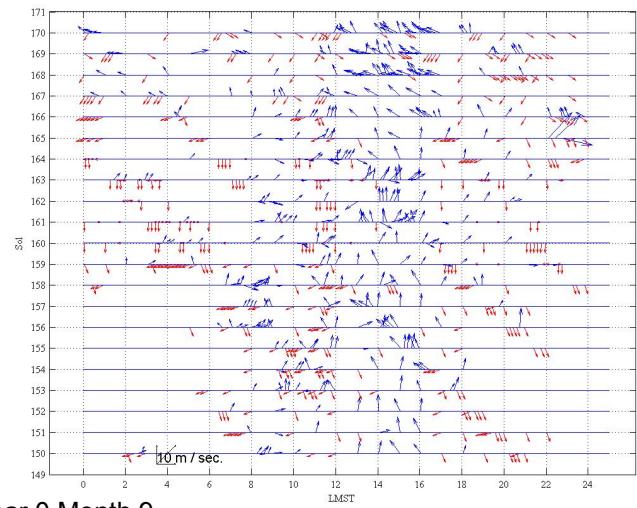


IMAGE CREDIT: NASA/JPL-CALTECH/UNIV. OF ARIZONA

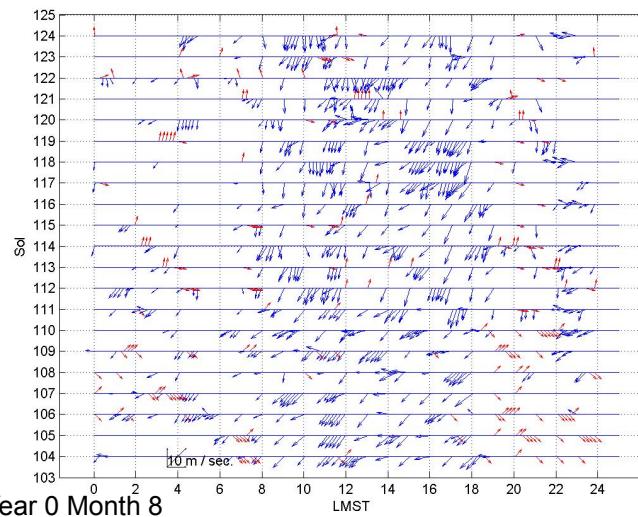




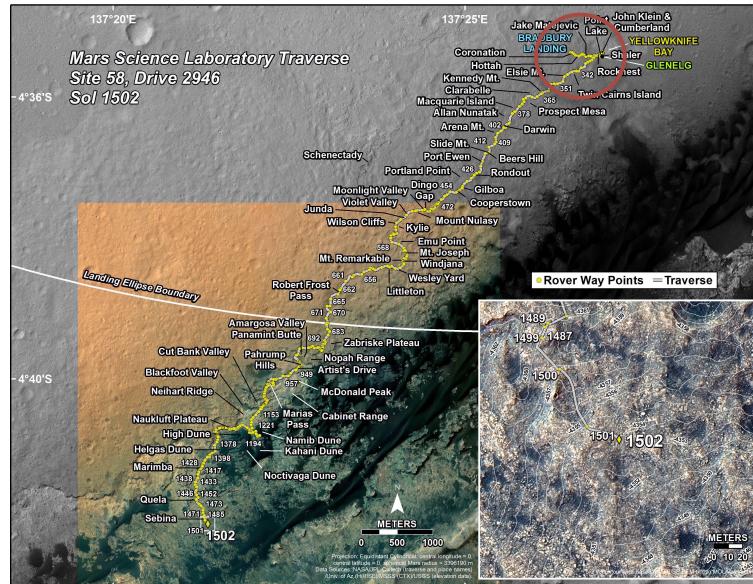
Year 0 Month 7



Year 0 Month 9



Year 0 Month 8

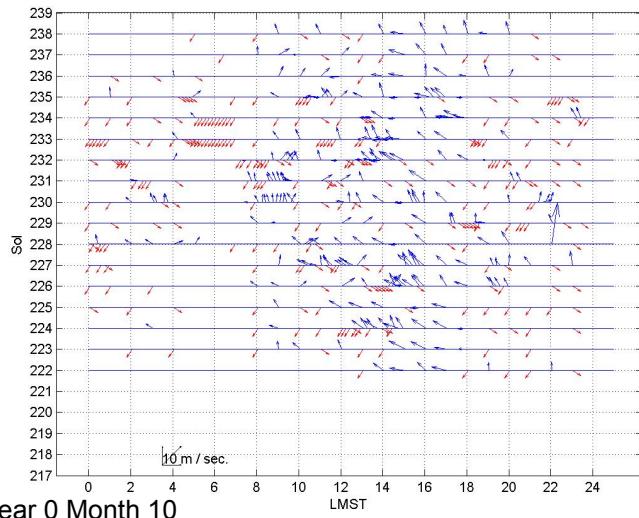


Year 0 - Spring

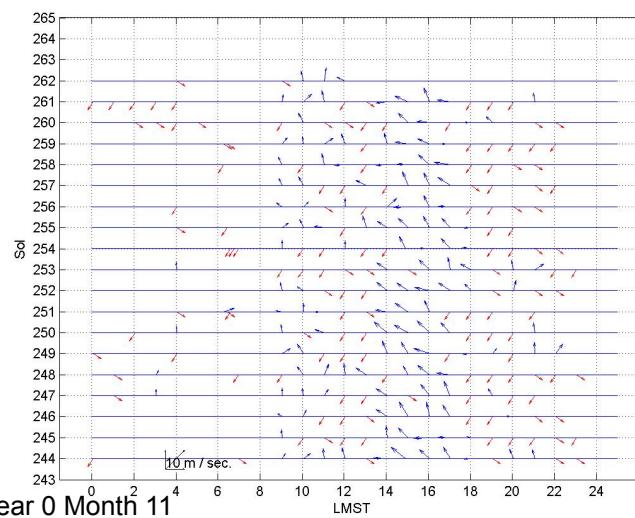
Red arrows indicate that most winds in each 5 minute period came from the rear of the rover and show only wind direction (with an error of +/- 45°) with no information about speed. Blue arrows indicate that the dominant winds came from the hemisphere to the front of the rover, and indicate wind direction

(statistically, the mode over the 5 minute period) and speed. The lack of information during cold periods (overnight) is due to electronic noise of the conditioning electronics that makes the sensor signal unusable.

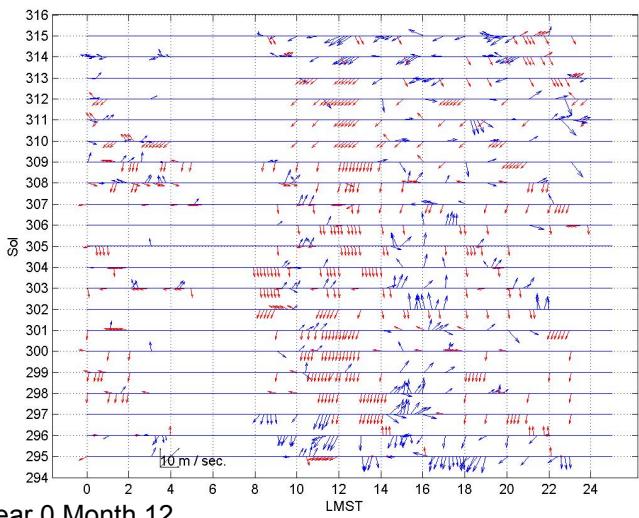




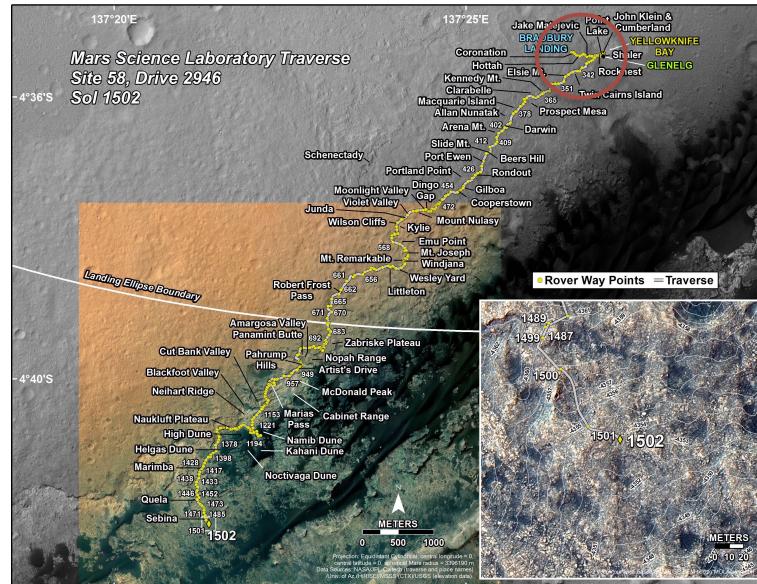
Year 0 Month 10



Year 0 Month 11

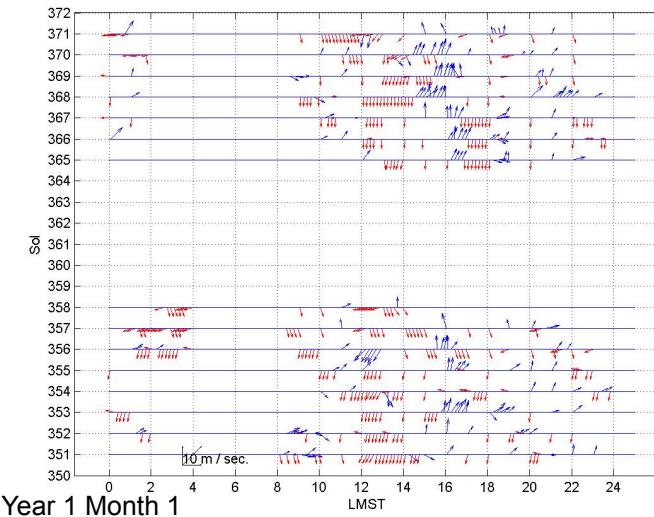


Year 0 Month 12

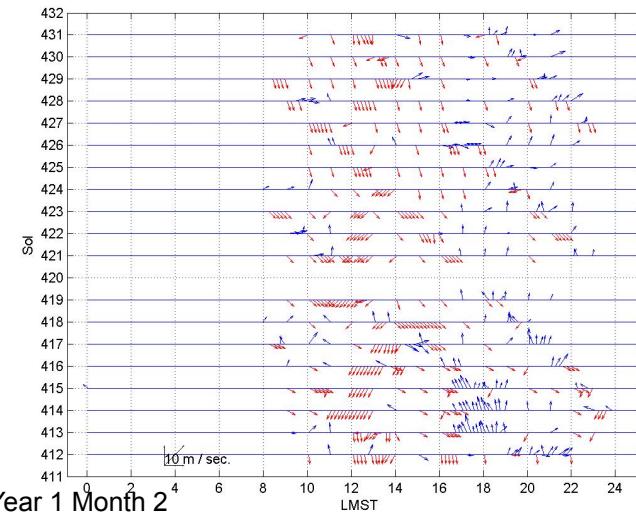


Year 0 - Summer

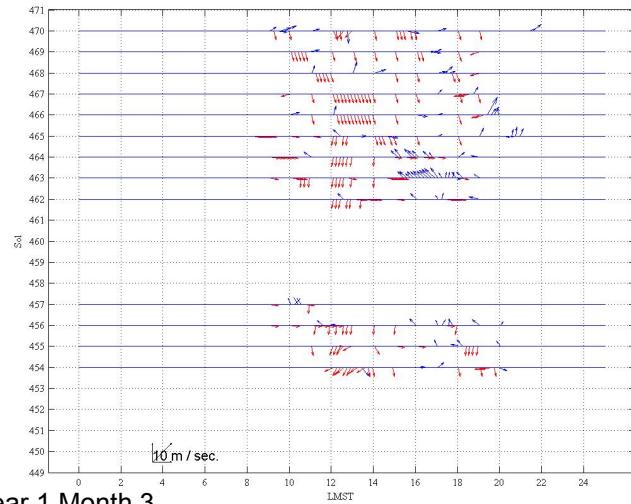




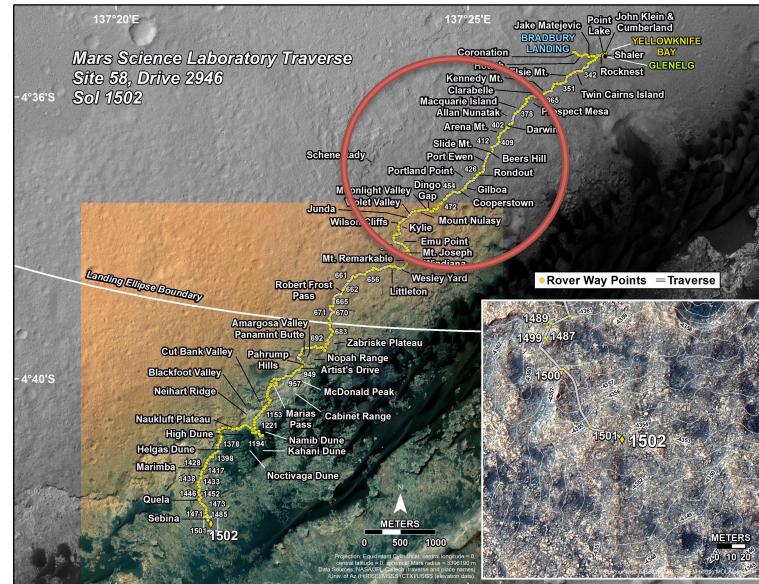
Year 1 Month 1



Year 1 Month 2



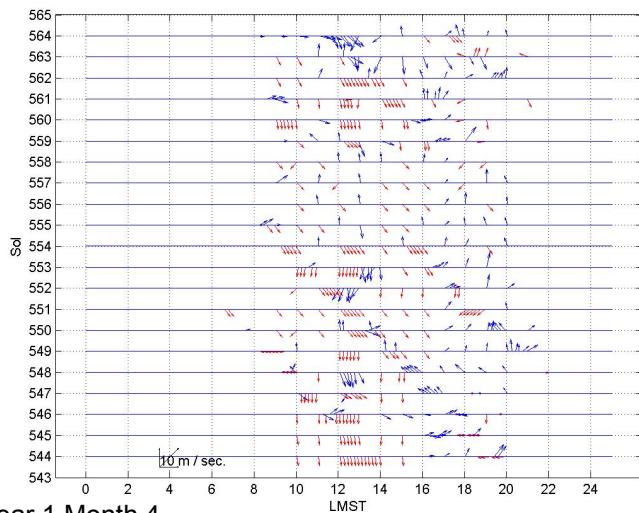
Year 1 Month 3



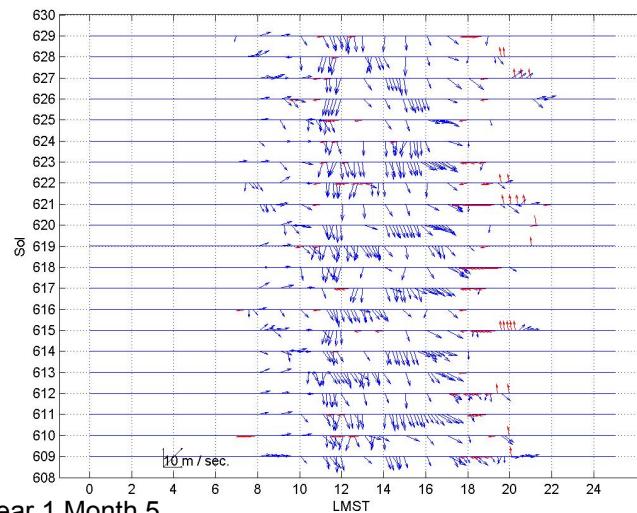
Year 1 - Autumn



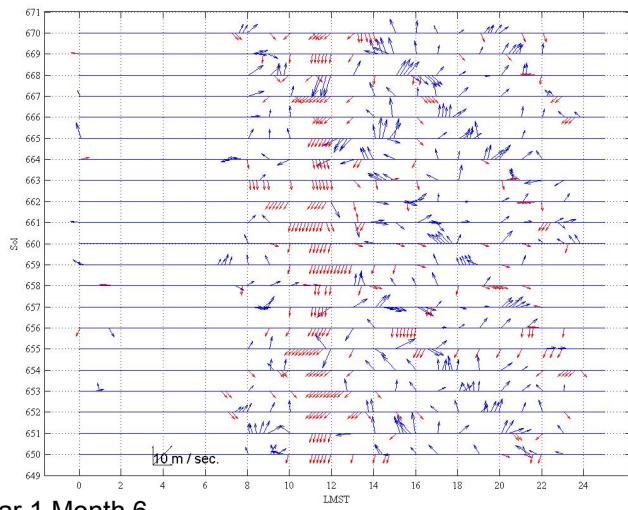
V Reunión de Ciencias Planetarias y Exploración del Sistema Solar (CPESS5)



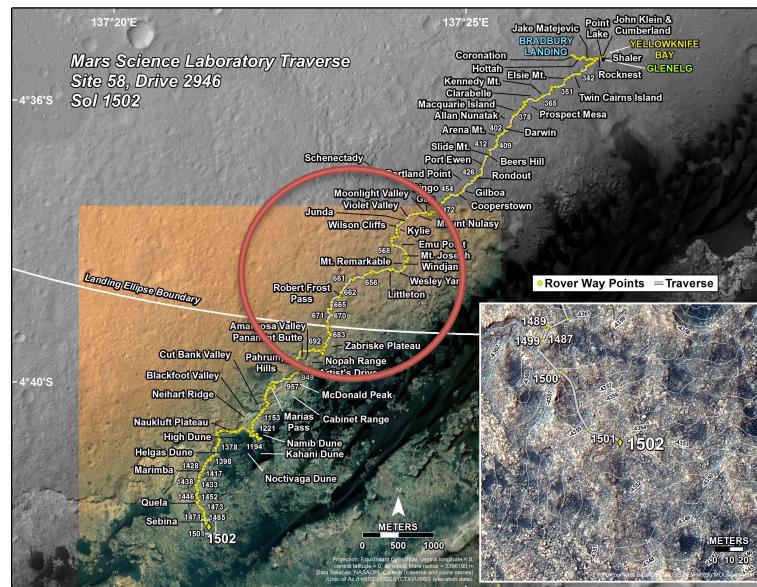
Year 1 Month 4



Year 1 Month 5

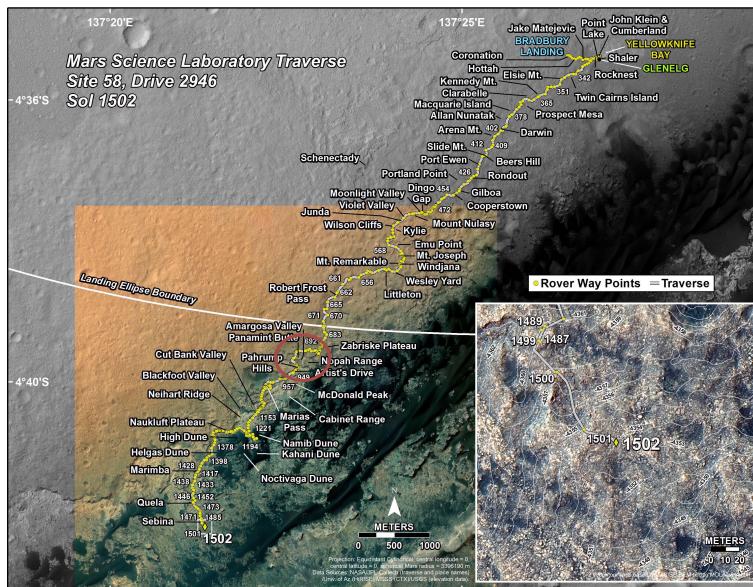
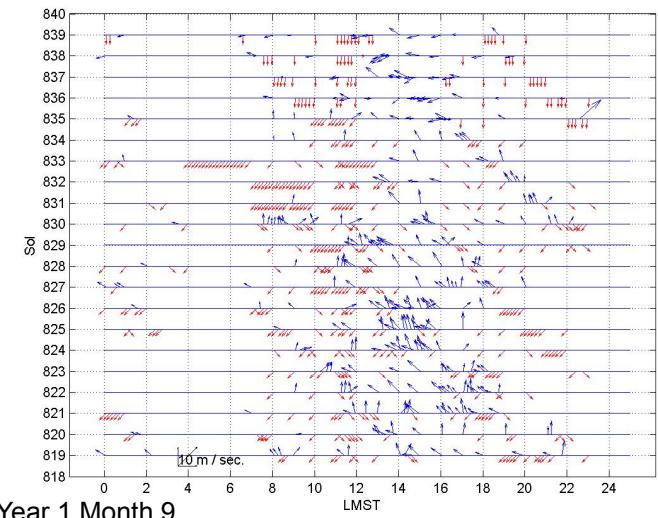
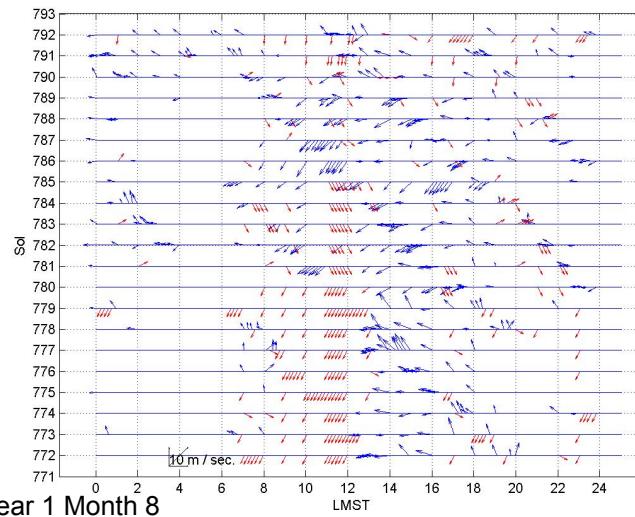
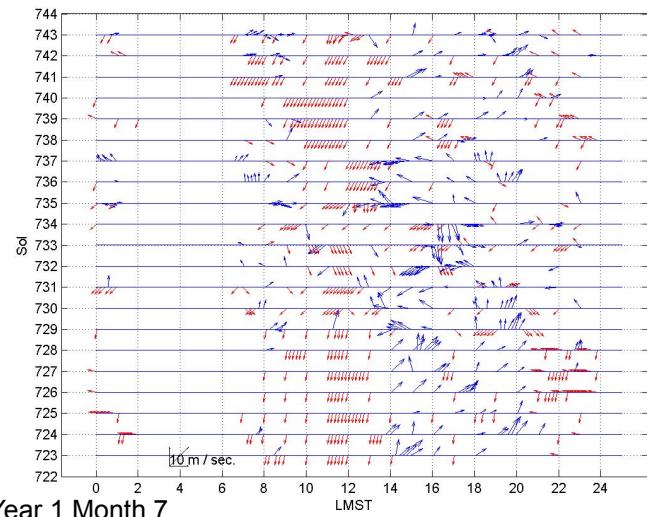


Year 1 Month 6



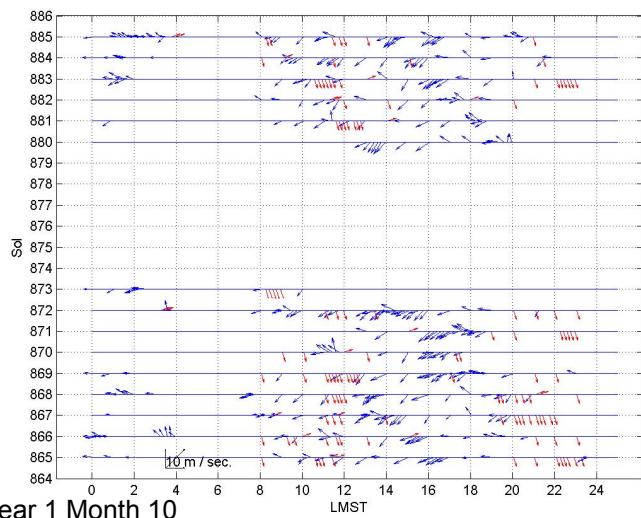
Year 1 - Winter



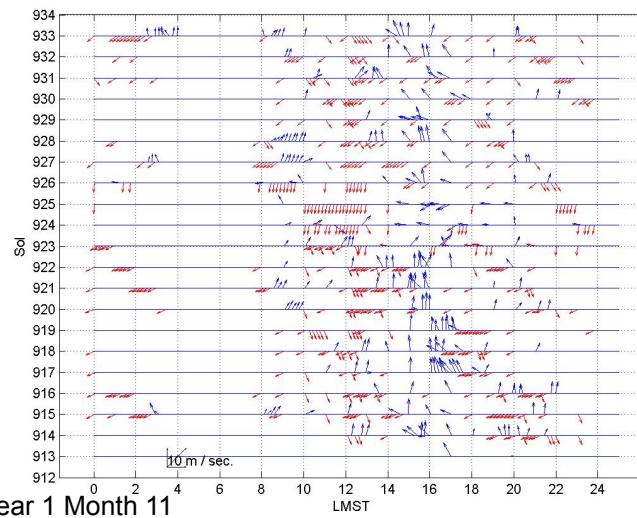


## Year 1 - Spring

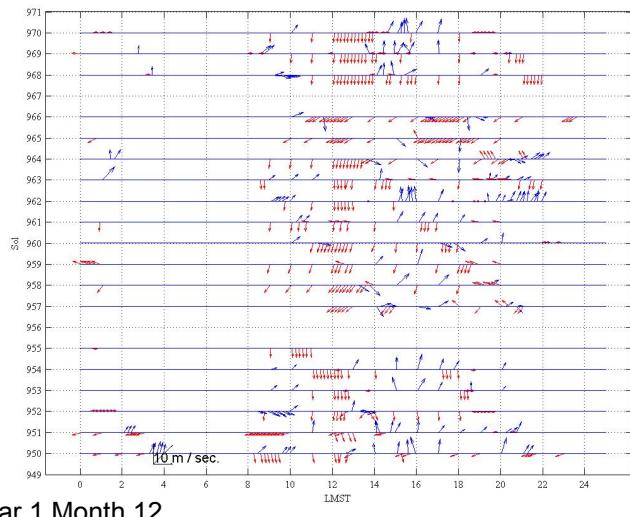




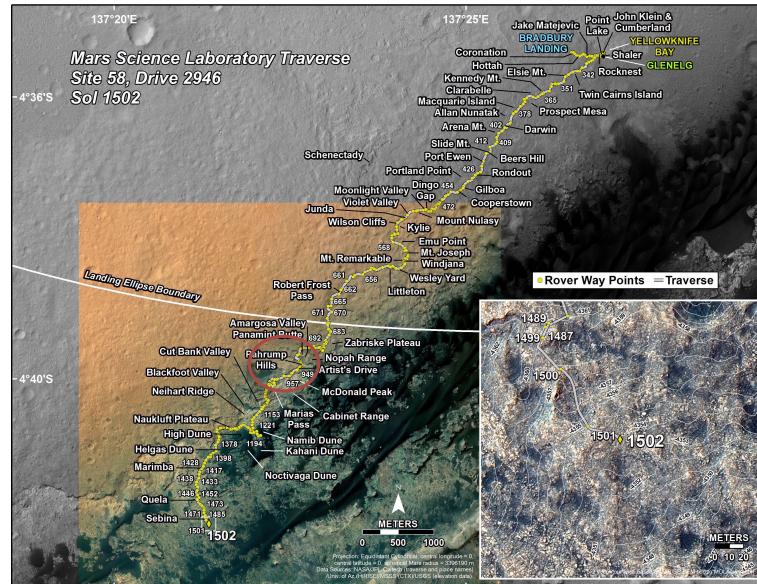
Year 1 Month 10



Year 1 Month 11



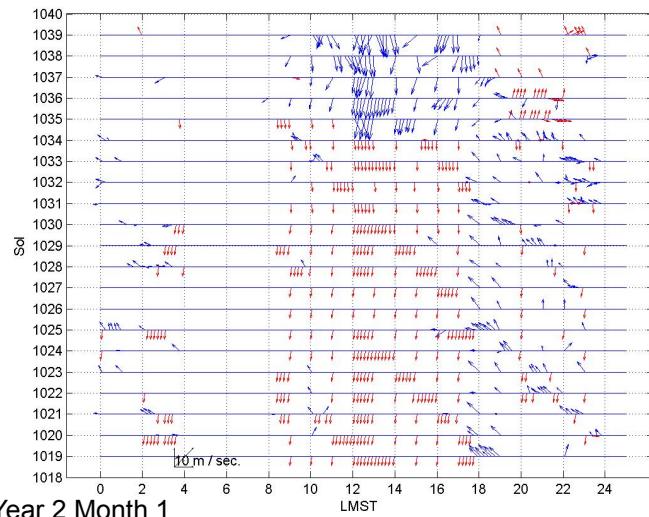
Year 1 Month 12



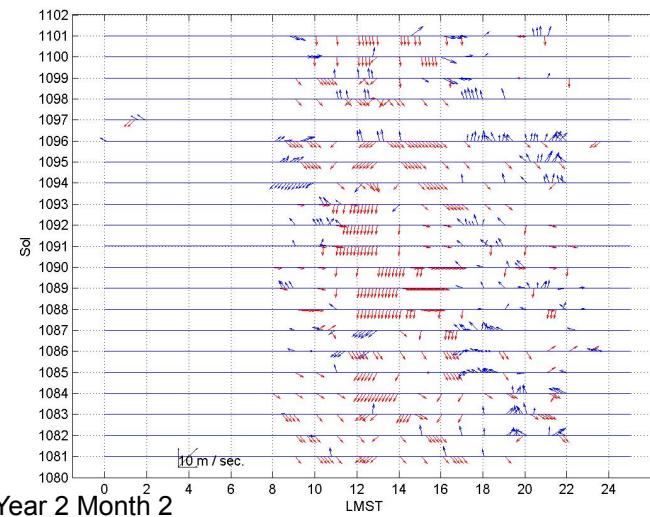
Year 1 - Summer



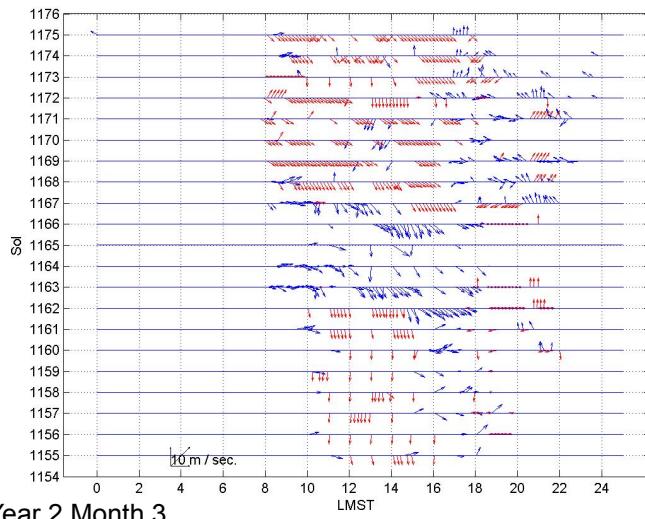
V Reunión de Ciencias Planetarias y Exploración del Sistema Solar (CPESS5)



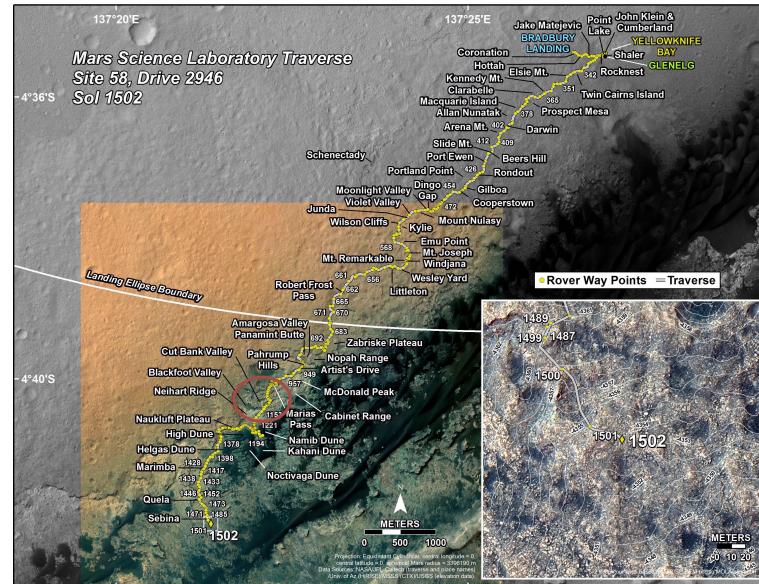
Year 2 Month 1



Year 2 Month 2

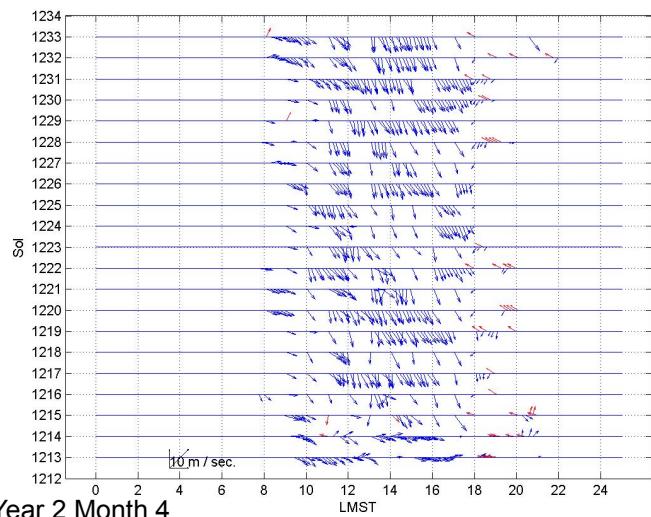


Year 2 Month 3

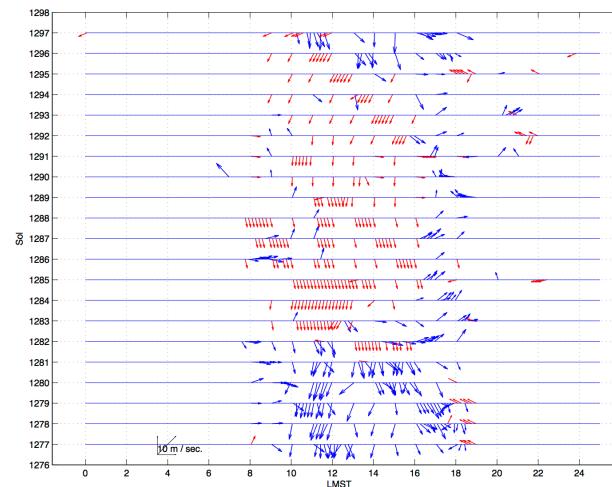


## Year 2 - Autumn

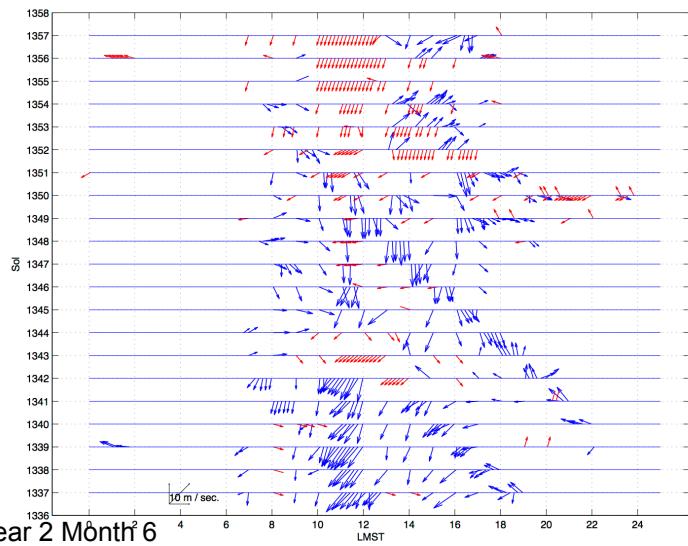




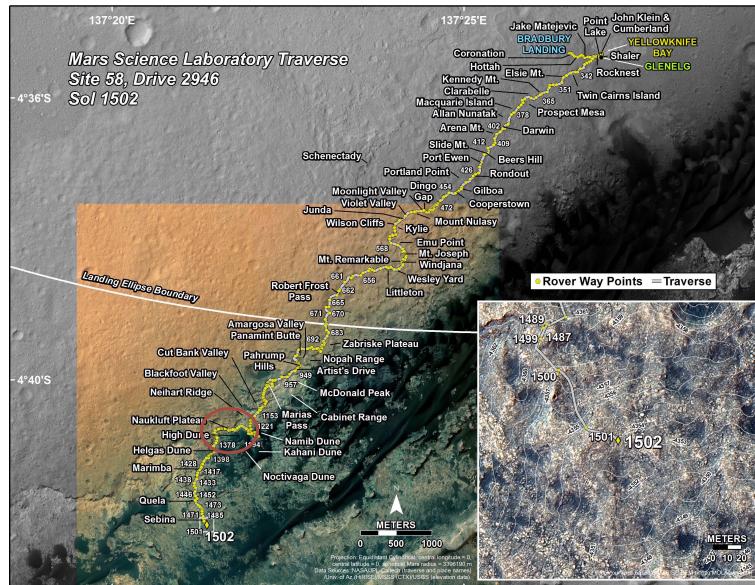
Year 2 Month 4



Year 2 Month 5



Year 2 Month 6



## Year 2 - Winter



# CONCLUSIONS

- REMS sensors have been recording the variations of the main Martian atmosphere parameters for two (Martian) years, since the beginning of Mars Science Laboratory mission. In these two years a strong inter annual repeatability is observed, with a “calmer” first half of the year and a second half in which the atmosphere appears to be more active.