HOW TO RECONCILE MARTIAN TIME AND EARTH TIME

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MARS SOCIETY
SWITZERLAND

1. Short Time scale

(2) Long time scale / (3) Other time considerations / (4) Calendars

The Problem

Solar day on Mars (« sol ») = **24h39m** 35 sec.244147

To be compared to

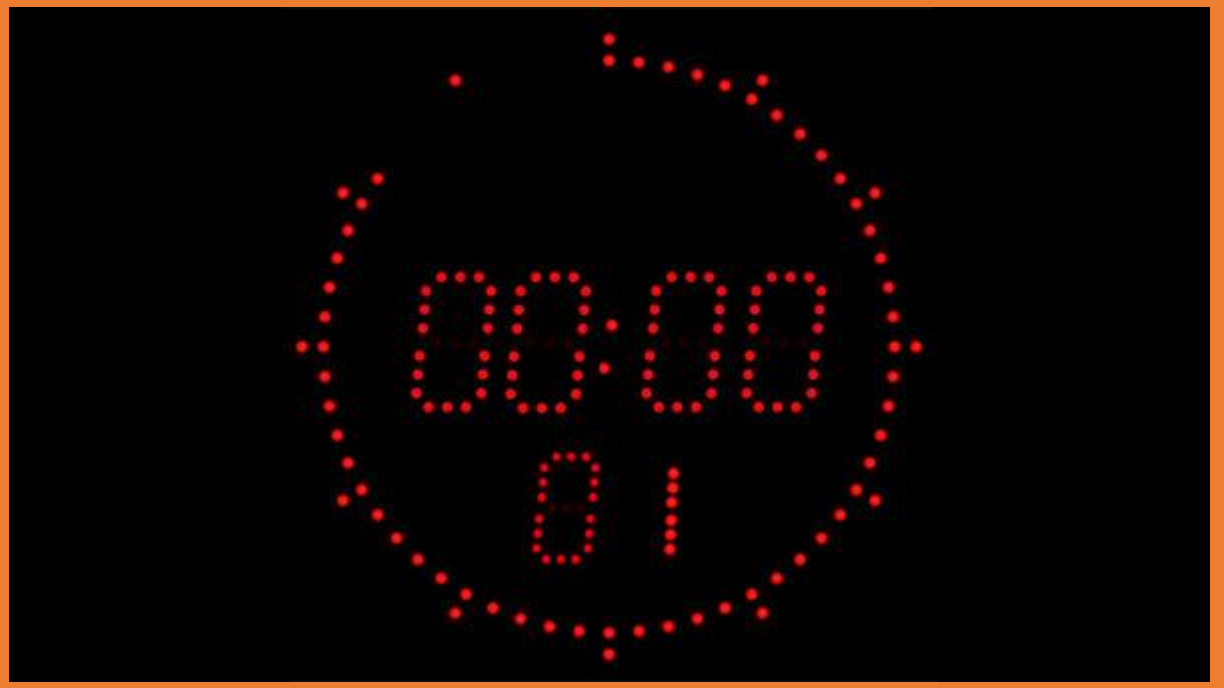
Solar day on Earth = **24h00m** 00sec. 002

i.e

Conversion factor **1.027**5 days / sol

And…

Only One Solid Universal Base Reference : the Second



the **second** has been **defined** as 9,192,631,770 times the period of the radiation corresponding to the transition between the two hyperfine levels F3 and F4 of the $^{6}S_{1/2}$ ground state of the caesium-133 atom

Possible Solutions

(a*) Keep using the terrestrial time reference and adjust it to the length of the Martian day by 39 ’35’’.24 every night*

But
Problem of time zones on Mars
Problem of Earth imported machines functioning on clocks, applied to measuring Martian days or fraction of Martian days

(b) *Use a Martian hour = 1/24th of a Martian day (x 1,0275% times an Earth day)*

But
Problem for using equipment functioning on Earth referenced clocks
Problem for communicating with Earth
Problem of adaptation to any other « local » time outside Earth

➔ ***Realistic Solution***:

Use both time measurement systems

2. Long Time scale

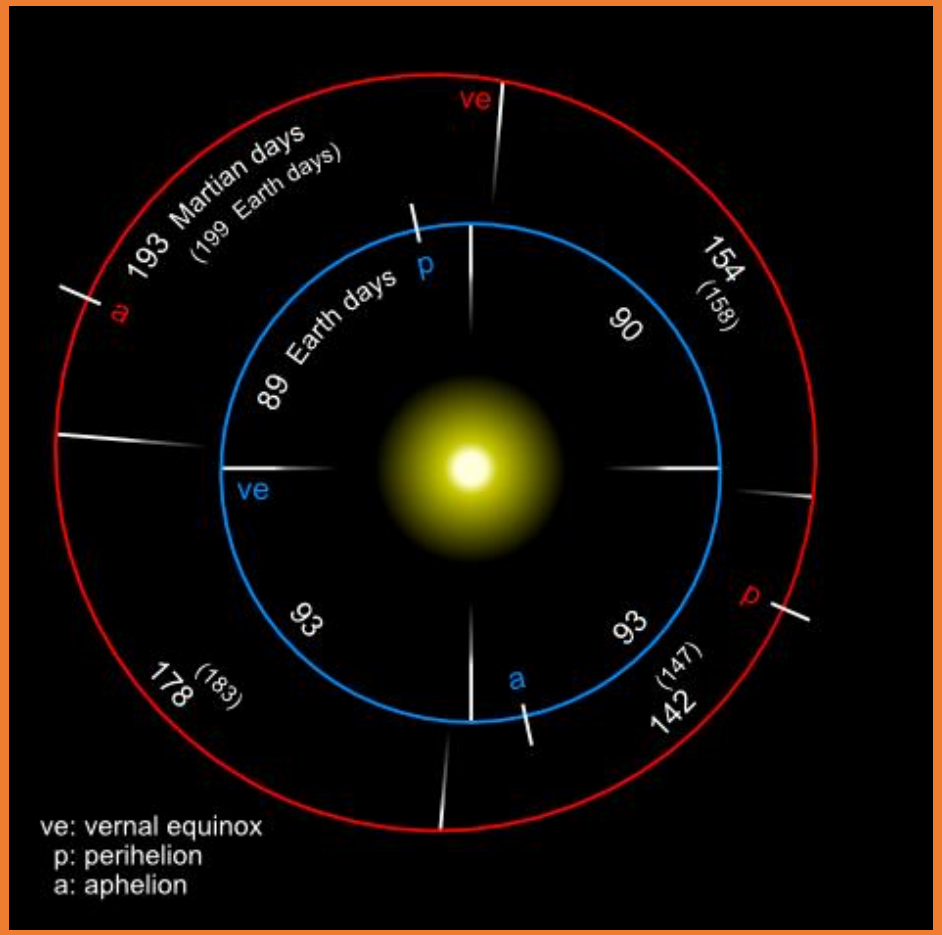
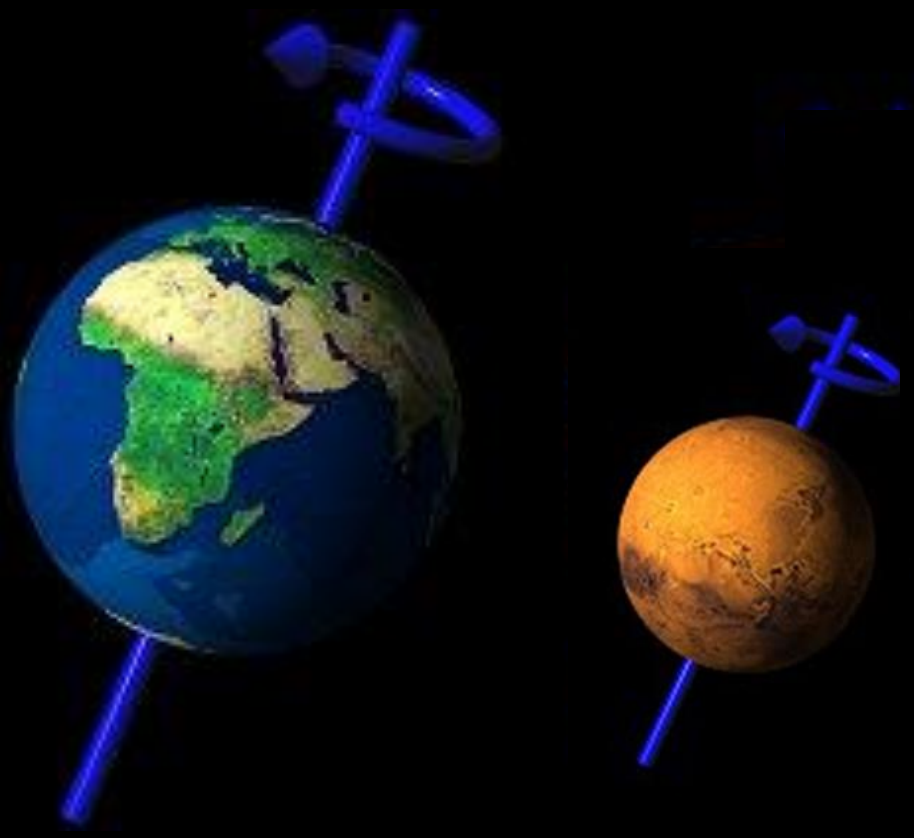


Image credit: NASA/JPL-Caltech/MSSS/Texas A&M Univ.

Obliquity = Seasons!

23°44



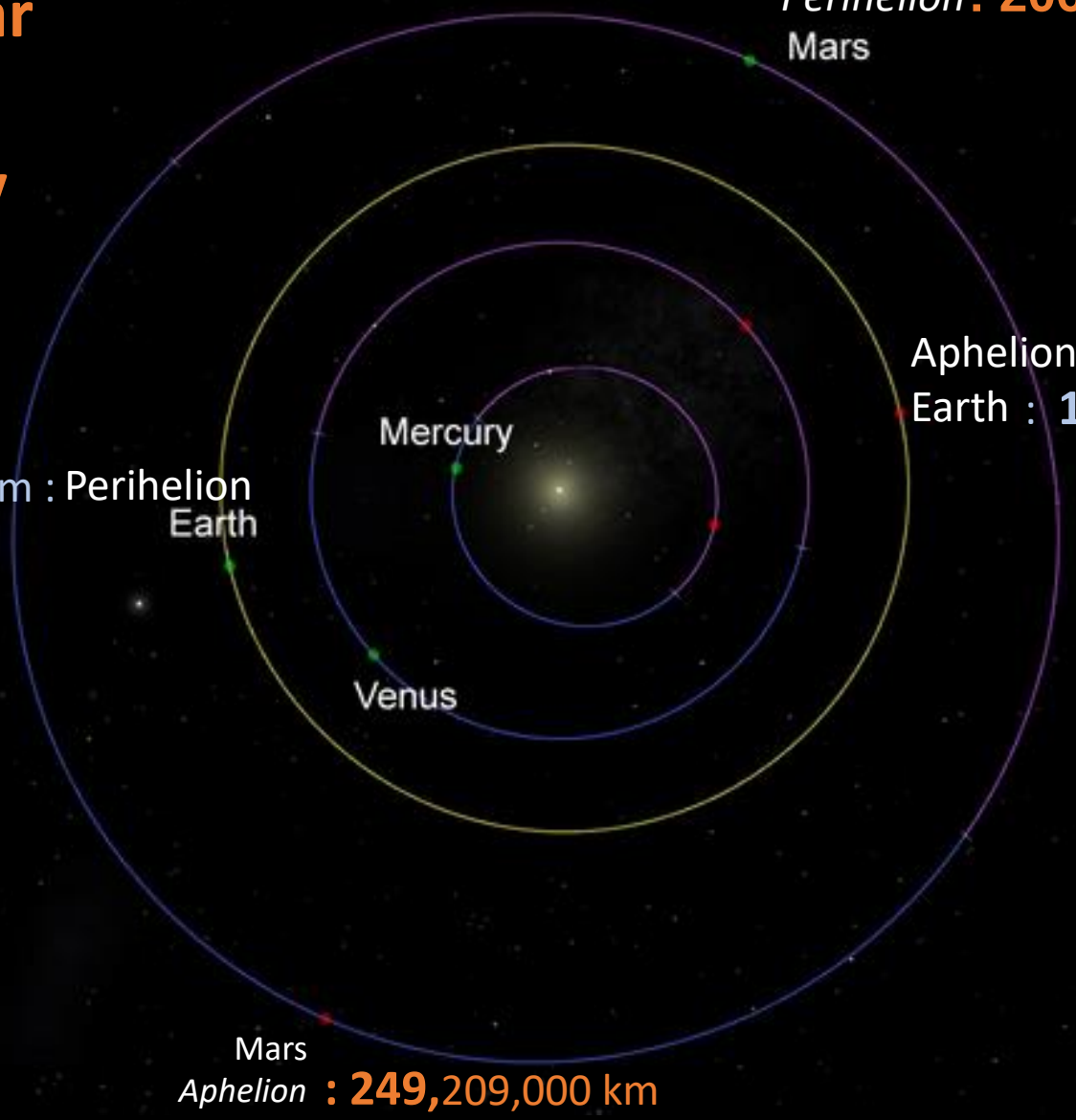
25°20

Today, October 26th, 2018, we just passed the Winter solstice (Oct. 16th NH)

But
Mars has a longer year
&
a higher eccentricity

Earth
Revolution speed:
Average : **29.79** km/s

147.098.000 km : Perihelion
Earth



Perihelion : **206,**669,000 km
Mars

Aphelion
Earth : **152**.097.000 km

Mars
Revolution speed
Average : **24.077** km/s

Terrestrial year :
365 days i.e. 355 sols

Martian year:
668 sols i.e. 688 days

Seasons (days):
89 90 93 93

Mars
Aphelion : **249,**209,000 km

Seasons SH (sols):
Spring 144 Sum 155
Fall 194 W 177

Seasons in the Northern Hemisphere
The dates!

Spring equinox	Summer solstice	Fall equinox	Winter solstice
May 05 2017	Nov 20 2017	May 22 2018	**Oct 16 2018**
March 23 2019	Oct 08 2019	April 08 2020	Sept 02 2020

Solutions

(a) *Keep using terrestrial months*

But
They would cover only 53% of the Martian year
Only the first half of the first month would have a shared meaning.

(b) *Divide the year in 4 seasons and 12 months to follow the evolution of the Martian climate along the year*

But
Keep the terrestrial reference to interact with Earth;
Keep the terrestrial reference to follow the evolution of our own biologic time;

➔ **Solution**:
Use both measures of Time

3. Other Time considerations

Reference points

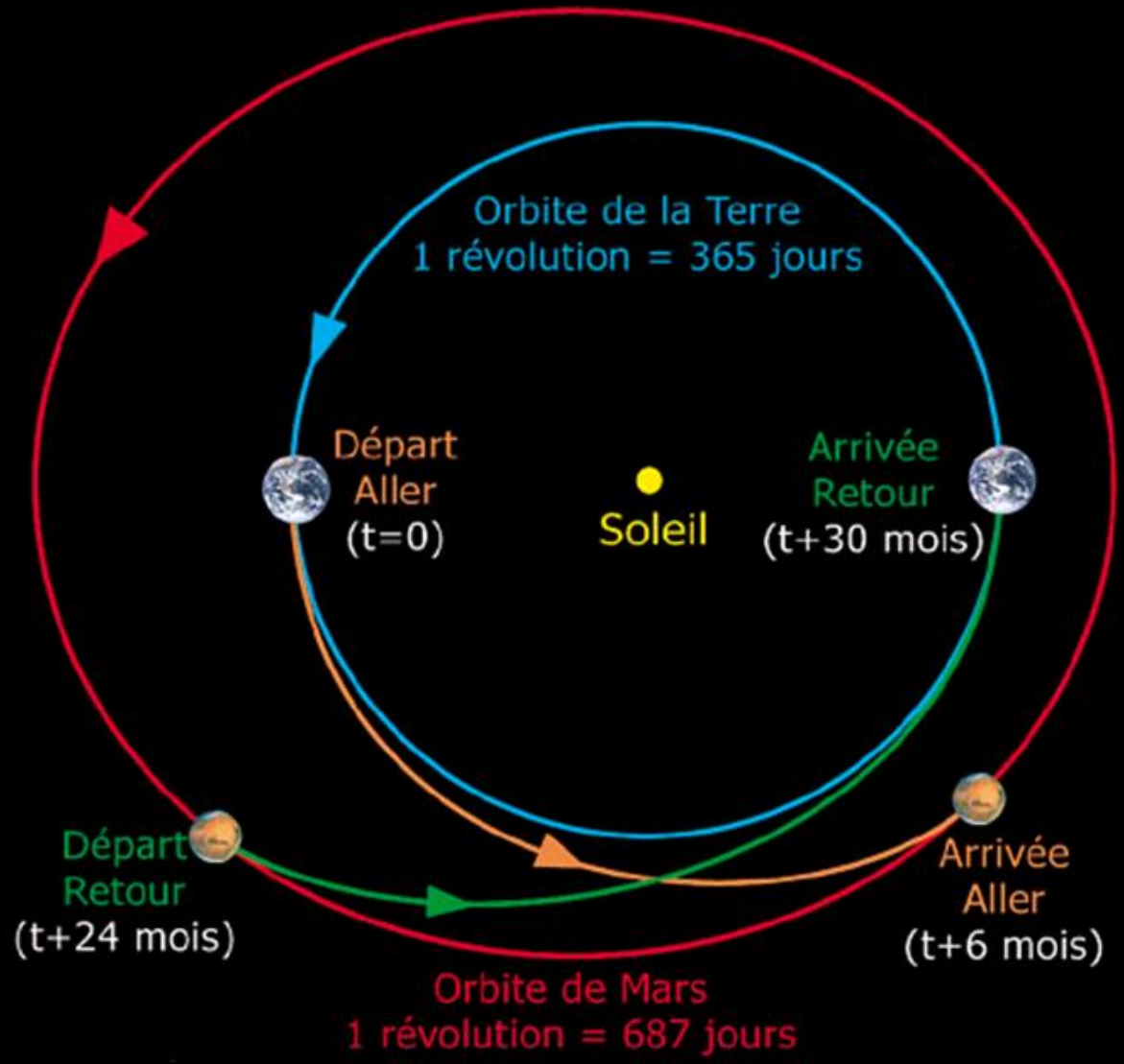
Choice of year-zero:
For some people, Dec. 29th, 1873, as chosen by Royal-astronomer, Sir George Biddell Airy;
In practice, for each mission, a time count from landing;
For the Colony, most likely a time count from the date of landing of the **Founding Flight**,
The universal time count, from the official birth of Jesus-Christ, will remain in force.

Beginning of the year:
Most likely the vernal point in the NH (no terrestrial logic to take into account)

Meridian Zero:
Located in Crater “Airy-0”, in the Sinus Meridiani area
Latitude 5,1 ° S, in the North-West of Noachis Terra, South of Meridiani Planum;
Chosen in 1969 by Merton Davies, a Mars cartographer, on the basis of Mariners’ photos.
This crater does not present any particular features

A LONG TRIP…POSSIBLE ONLY WHEN A WINDOW OPENS

The launch window opens only every **26** months



You must stay on Mars either one month or **18** months

Special events

Departures dates from Earth (N-6)

Arrival dates from Earth (N)

Departure dates towards Earth (N+18)

Conjunction weeks of Earth with Sun every 26 months

Influence of climate
on daily, seasonnal, annual activities

Normal daily radiations variations

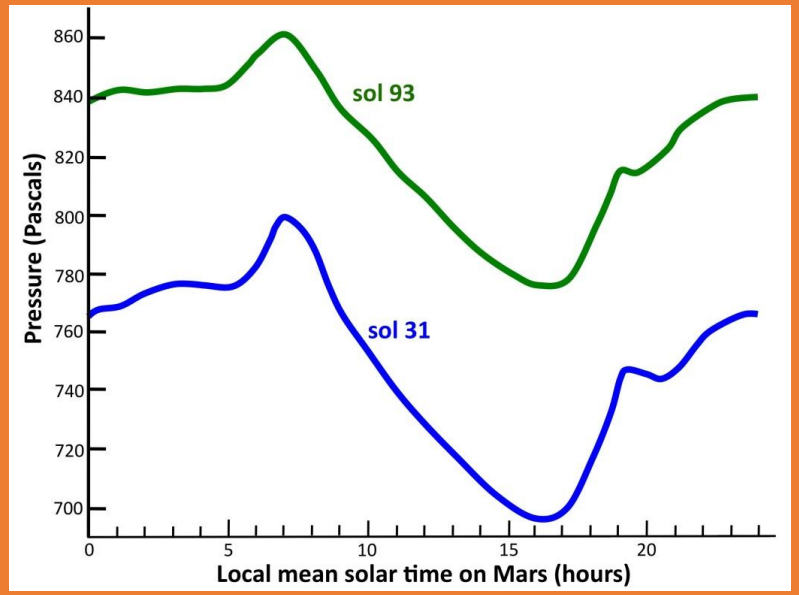
Seasonal irradiance variations

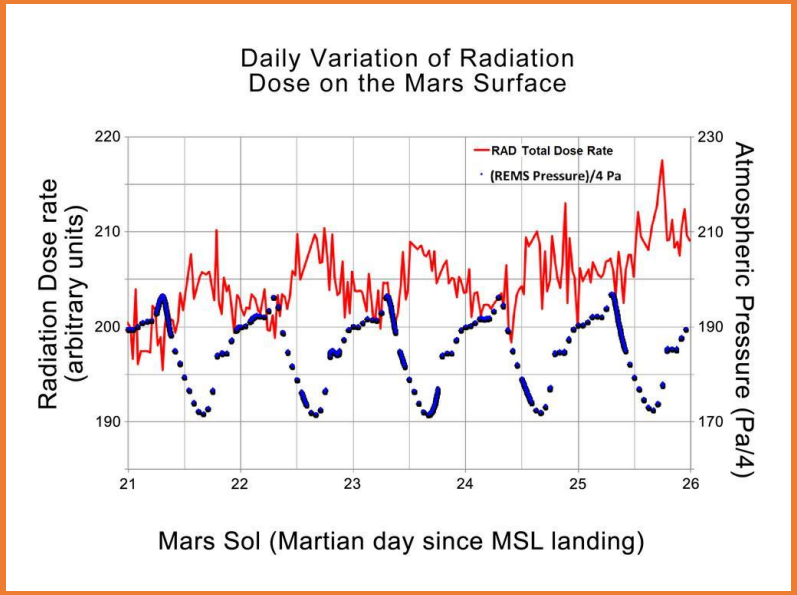
Solar maximum (5 Martian years cycle) ± 11 Earth years

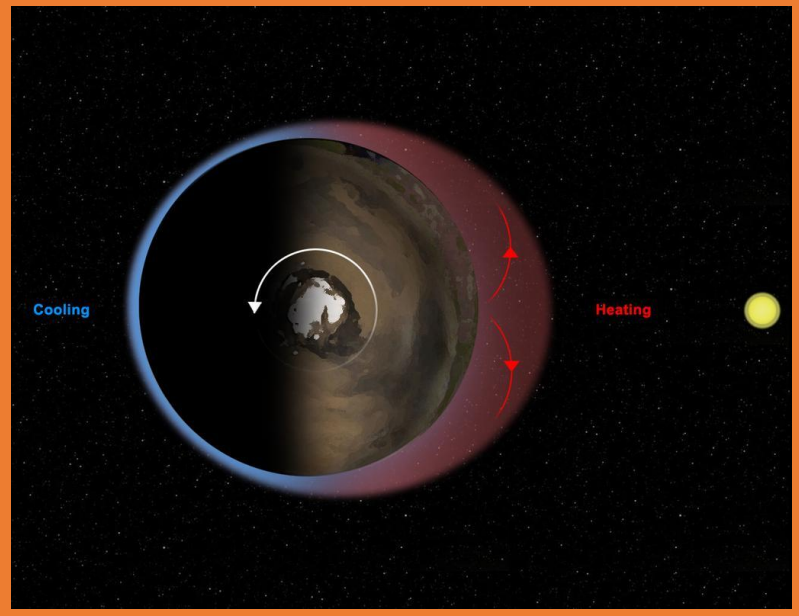
Dust global storms (± 3 Martian years cycle)

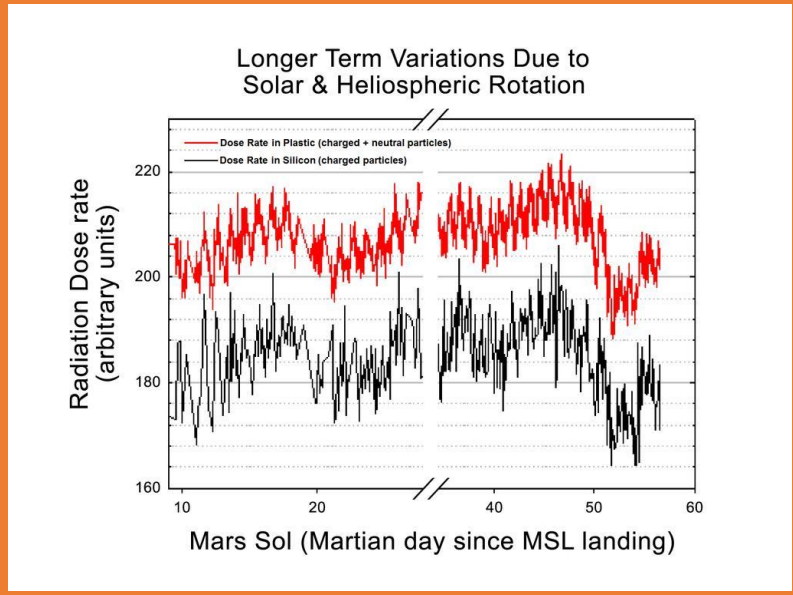
If you want to do EVA, do it early morning

Radiations

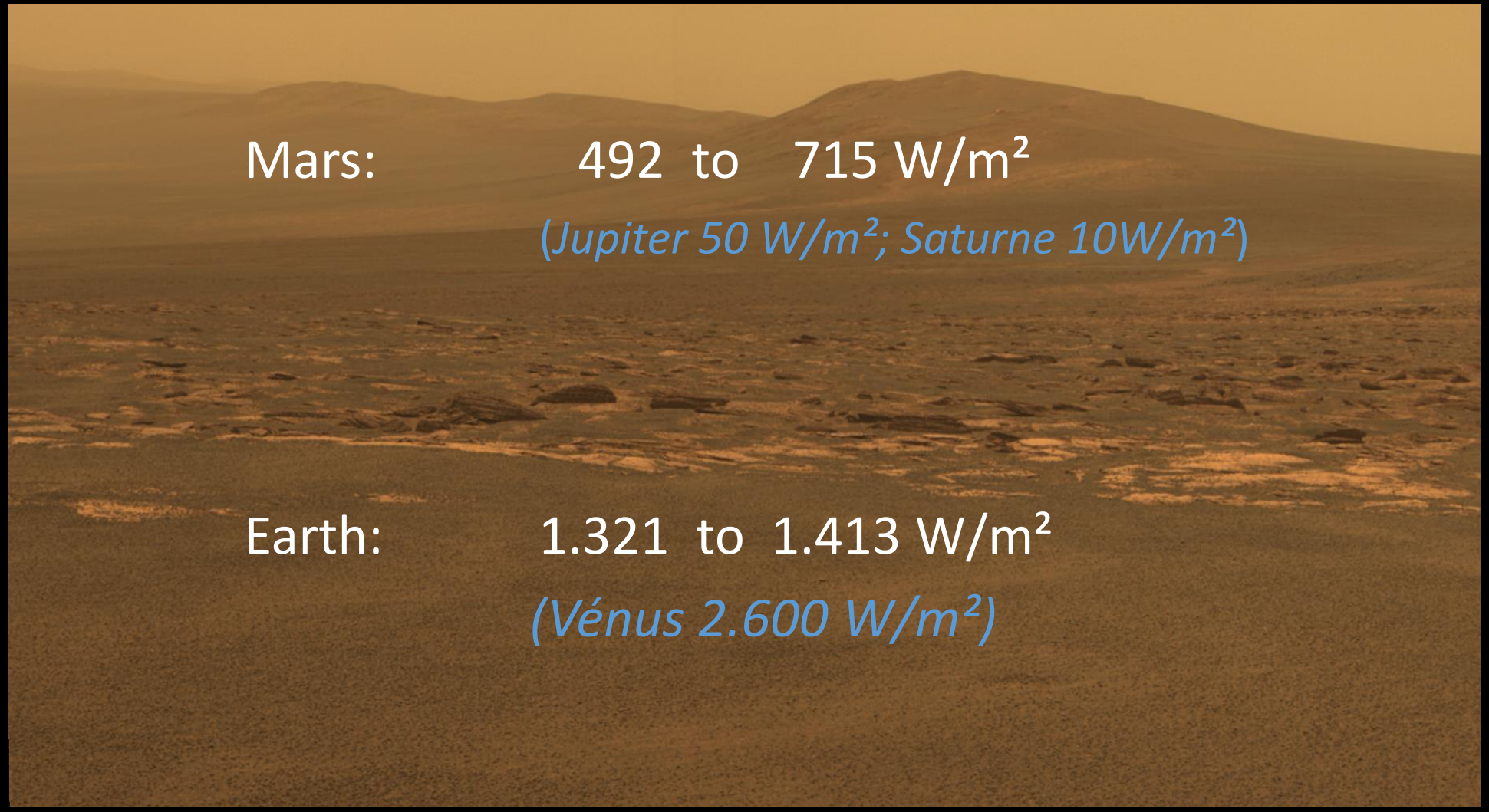








If you want to use Sun's energy, do it in Summer in the SH!



Cratère Endeavour, bord occidental.
Crédit: NASA/JPL-Caltech/Cornell/ASU

4. Calendars

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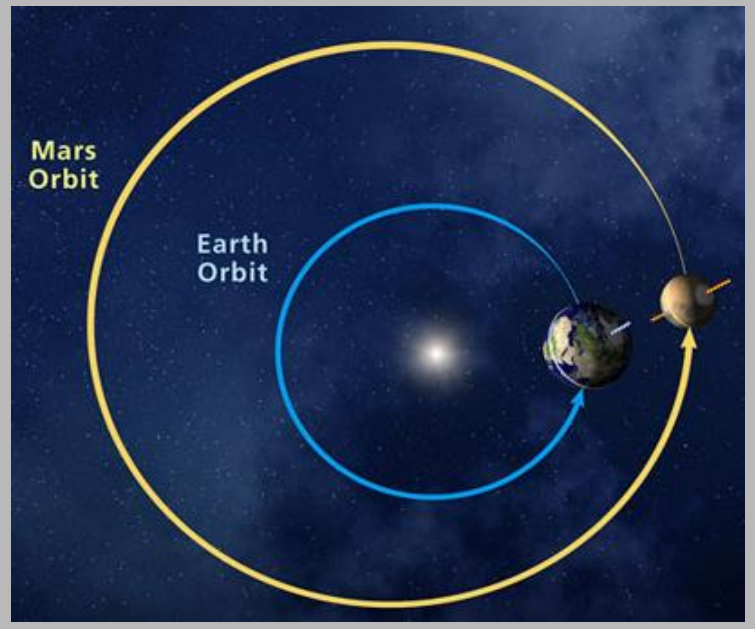
Proposal of martian clock and calendar

Division of the martian year :

Month	Odd year [marsols]	Total	Even year [marsols]	Total
1	28	28	28	28
2	28	56	28	56
3	28	84	28	84
4	28	112	28	112
5	28	140	28	140
6	27	167	27	167
7	28	195	28	195
8	28	223	28	223
9	28	251	28	251
10	28	279	28	279
11	28	307	28	307
12	27	334	27	334
13	28	362	28	362
14	28	390	28	390
15	28	418	28	418
16	28	446	28	446
17	28	474	28	474
18	27	501	27	501
19	28	529	28	529
20	28	557	28	557
21	28	585	28	585
22	28	613	28	613
23	28	641	28	641
24	27	668	28	669



Advantages:

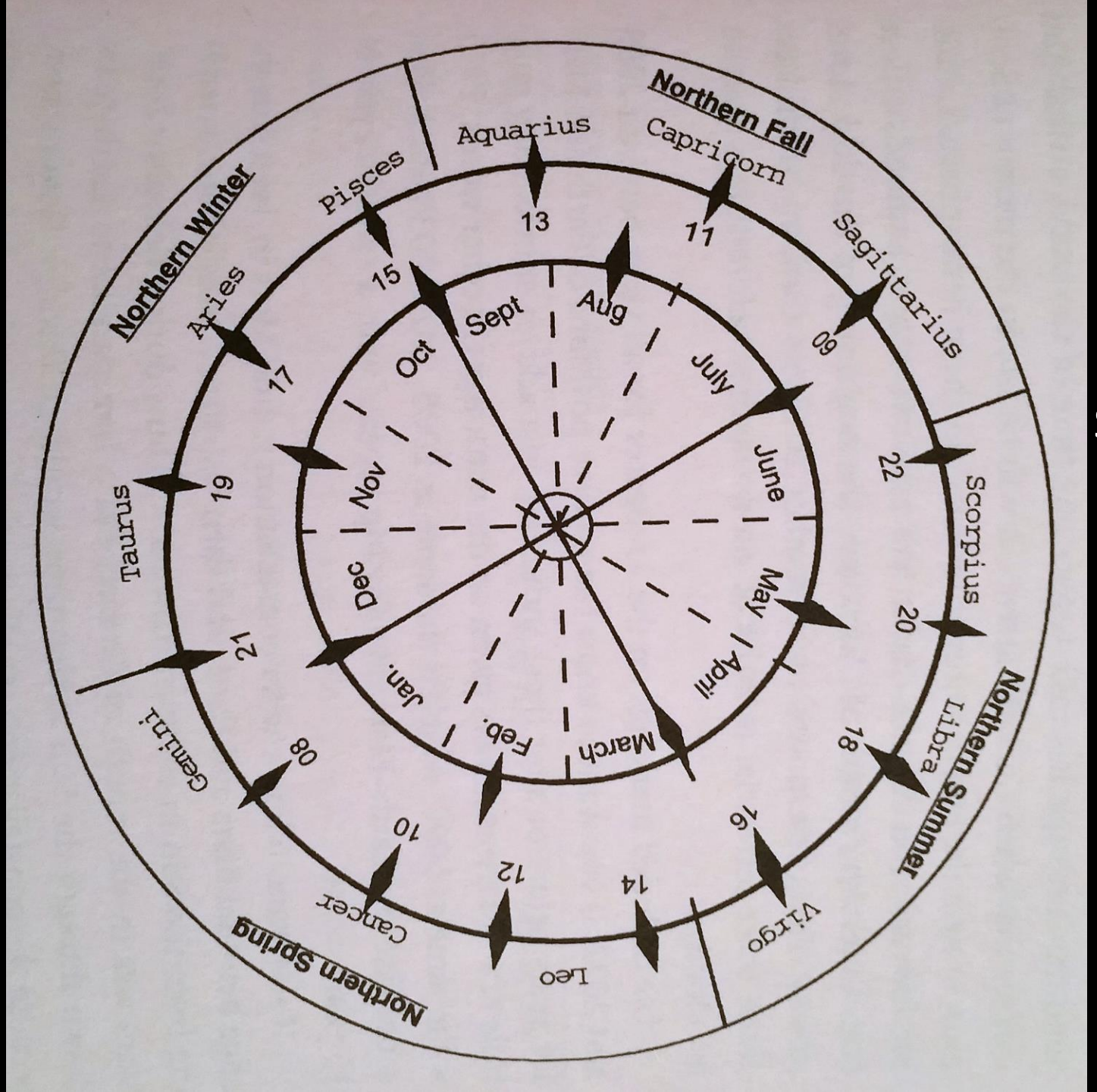
- simple (good regularity)
- close to the terrestrial months
- suitable with monthly schedules (e.g.: salary)
- good agreement with the real martian year

Mars unequal seasons

Year divided
in quarters
From equinoxes
to solstices

Each quarters
divided
In three months

Names of
Zodiac
constellations



Rotation Speeds

Mars

26.5 km/s at perihelion

21.9 km/s at aphelion

Earth

29.79 km/s

Southern Hemisphere
Mars:

Spring 144 sols

Summer 155 sols

Fall 194 sols

Winter 177 sols

My own proposal for a Martian calendar

Stick to the Martian seasons (= Mars climatic reality)

Stick to the « good old » twelve months system

Split each season in three months, equal in length between themselves

	48	51	64	59

Split each month into halves, « ascending » and « descending » periods

	24	25/26	32	29/30
Sh/Nh	S/W	F/Spr	W/S	Spr/F

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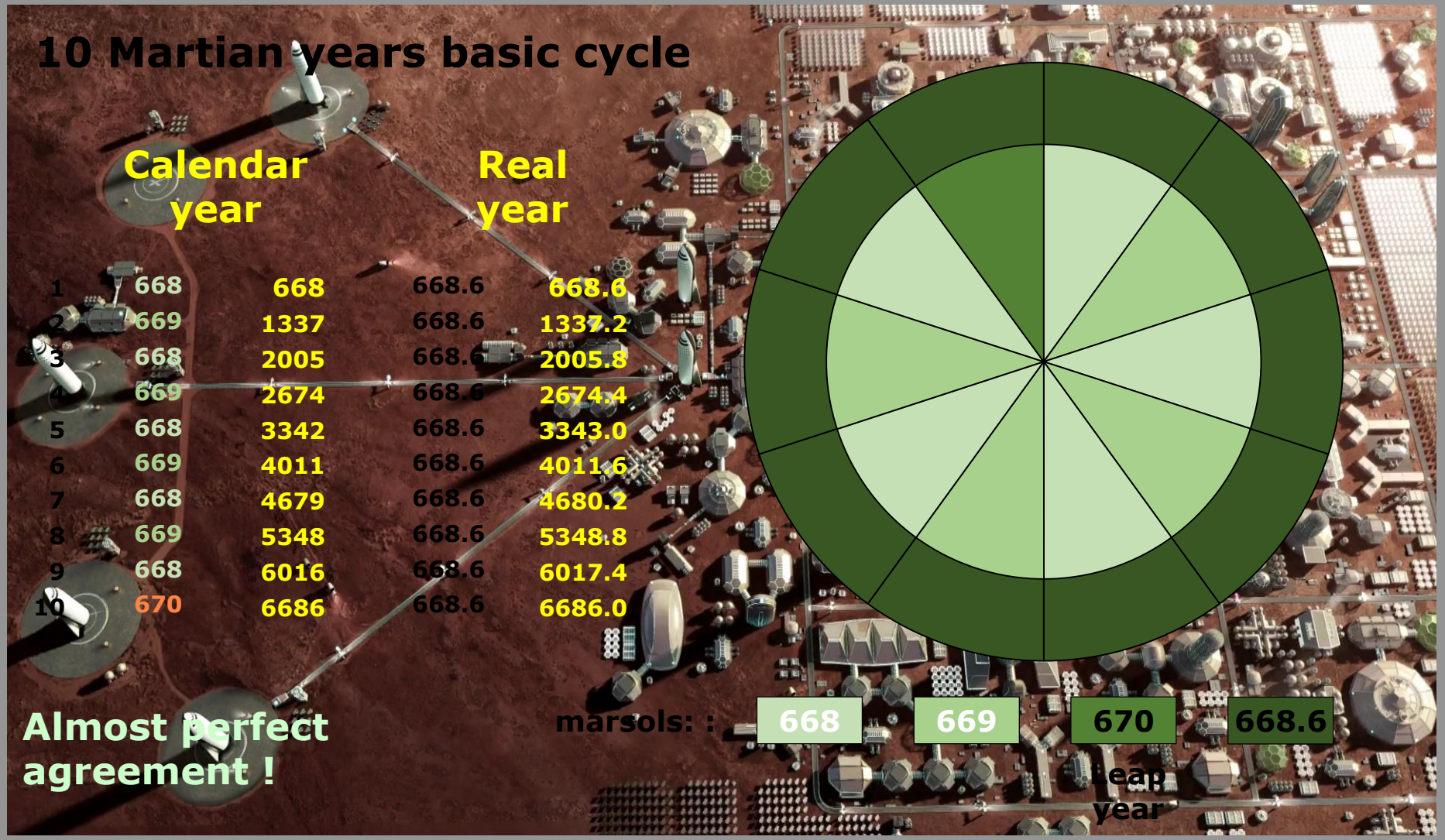
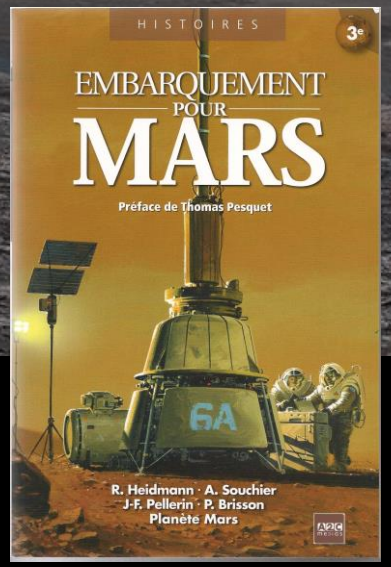


See you there!



EXPLORATION SPATIALE

https://blogs.letemps.ch/pierre-brisson/