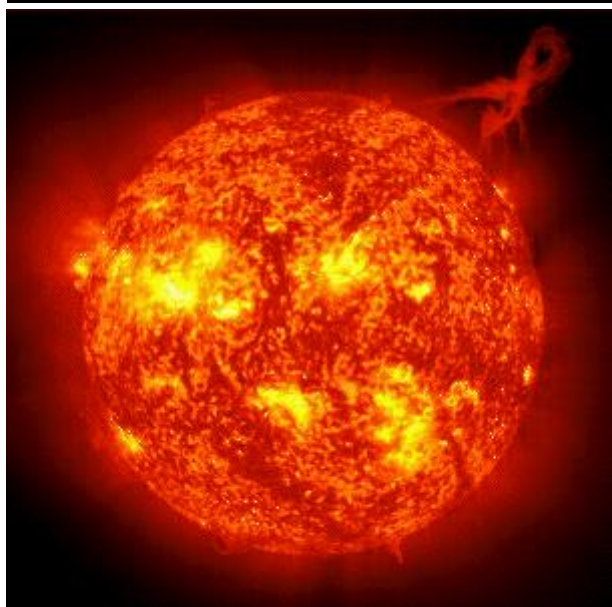


# Sun Fact Sheet



## Sun/Earth Comparison

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### Bulk parameters

	Sun	Earth	Ratio (Sun/Earth)
Mass ( $10^{24}$ kg)	1,988,500.	5.9724	333,000.
GM (x $10^6$ km <sup>3</sup> /s <sup>2</sup> )	132,712.	0.39860	333,000.
Volume ( $10^{12}$ km <sup>3</sup> )	1,412,000.	1.083	1,304,000.
Volumetric mean radius (km)	695,700.	6371.	109.2
Mean density (kg/m <sup>3</sup> )	1408.	5514.	0.255
Surface gravity (eq.) (m/s <sup>2</sup> )	274.0	9.78	28.0
Escape velocity (km/s)	617.6	11.19	55.2
Ellipticity	0.00005	0.0034	0.015
Moment of inertia (I/MR <sup>2</sup> )	0.070	0.3308	0.212
Visual magnitude V(1,0)	-26.74	-3.86	-
Absolute magnitude	+4.83		
Luminosity ( $10^{24}$ J/s)	382.8		
Mass conversion rate ( $10^6$ kg/s)	4260.		

**Mean energy production ( $10^{-3}$  J/kg)** 0.1925

**Surface emission ( $10^6$  J/m<sup>2</sup>s)** 62.94

**Spectral type** G2 V

Model values at center of Sun:

Central pressure:  $2.477 \times 10^{11}$  bar

Central temperature:  $1.571 \times 10^7$  K

Central density:  $1.622 \times 10^5$  kg/m<sup>3</sup>

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## Rotational and Orbital parameters

	Sun	Earth	Ratio (Sun/Earth)
<b>Sidereal rotation period (hrs)*</b>	609.12	23.9345	25.449
<b>Obliquity to ecliptic (deg.)</b>	7.25	23.44	0.309
<b>Speed relative to nearby stars (km/s)</b>	19.4		

\*This is the adopted period at 16 deg. latitude - the actual rotation rate varies with latitude L as:

(  $14.37 - 2.33 \sin^2 L - 1.56 \sin^4 L$  ) deg/day

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## North Pole of Rotation

Right Ascension: 286.13

Declination : 63.87

Reference Date : 1.5 Jan 2000 (JD 2451545.0)

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## Sun Observational Parameters

Apparent diameter from Earth

At 1 A.U.(seconds of arc) 1919.

Maximum (seconds of arc) 1952.

Minimum (seconds of arc) 1887.

Distance from Earth

Mean ( $10^6$  km) 149.6

Minimum ( $10^6$  km) 147.1

Maximum ( $10^6$  km) 152.1

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## Solar Magnetic Field

Typical magnetic field strengths for various parts of the Sun

Polar Field: 1 - 2 Gauss

Sunspots: 3000 Gauss

Prominences: 10 - 100 Gauss

Chromospheric plages: 200 Gauss

Bright chromospheric network: 25 Gauss  
Ephemeral (unipolar) active regions: 20 Gauss

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## Solar Atmosphere

Surface Gas Pressure (top of photosphere): 0.868 mb  
Pressure at bottom of photosphere (optical depth = 1): 125 mb  
Effective temperature: 5772 K  
Temperature at top of photosphere: 4400 K  
Temperature at bottom of photosphere: 6600 K  
Temperature at top of chromosphere: ~30,000 K  
Photosphere thickness: ~500 km  
Chromosphere thickness: ~2500 km  
Sun Spot Cycle: 11.4 yr.

Photosphere Composition:

Major elements: H - 90.965%, He - 8.889%  
Minor elements (ppm): O - 774, C - 330, Ne - 112, N - 102  
Fe - 43, Mg - 35, Si - 32, S - 15

## Earth Fact Sheet



### Bulk parameters

Mass ( $10^{24}$ kg)	5.9723
Volume ( $10^{10}$ km <sup>3</sup> )	108.321
Equatorial radius (km)	6378.137
Polar radius (km)	6356.752
Volumetric mean radius (km)	6371.008
Core radius (km)	3485
Ellipticity (Flattening)	0.00335
Mean density (kg/m <sup>3</sup> )	5514
Surface gravity (m/s <sup>2</sup> )	9.798
Surface acceleration (m/s <sup>2</sup> )	9.780
Escape velocity (km/s)	11.186
GM ( $\times 10^6$ km <sup>3</sup> /s <sup>2</sup> )	0.39860
Bond albedo	0.306
Geometric albedo	0.434
V-band magnitude V(1,0)	-3.99
Solar irradiance (W/m <sup>2</sup> )	1361.0

Black-body temperature (K)	254.0
Topographic range (km)	20.4
Moment of inertia ( $I/MR^2$ )	0.3308
$J_2$ ( $\times 10^{-6}$ )	1082.63
Number of natural satellites	1
Planetary ring system	No

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## Orbital parameters

Semimajor axis ( $10^6$ km)	149.60
Sidereal orbit period (days)	365.256
Tropical orbit period (days)	365.242
Perihelion ( $10^6$ km)	147.09
Aphelion ( $10^6$ km)	152.10
Mean orbital velocity (km/s)	29.78
Max. orbital velocity (km/s)	30.29
Min. orbital velocity (km/s)	29.29
Orbit inclination (deg)	0.000
Orbit eccentricity	0.0167
Sidereal rotation period (hrs)	23.9345
Length of day (hrs)	24.0000
Obliquity to orbit (deg)	23.44
Inclination of equator (deg)	23.44

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## Earth Mean Orbital Elements (J2000)

Semimajor axis (AU)	1.00000011
Orbital eccentricity	0.01671022
Orbital inclination (deg)	0.00005
Longitude of ascending node (deg)	-11.26064
Longitude of perihelion (deg)	102.94719
Mean Longitude (deg)	100.46435

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## North Pole of Rotation

Right Ascension: 0.00 - 0.641T  
 Declination : 90.00 - 0.557T  
 Reference Date : 12:00 UT 1 Jan 2000 (JD 2451545.0)  
 T = Julian centuries from reference date

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## Terrestrial Magnetosphere

### Model GSFC-1283

Dipole field strength: 0.306 Gauss- $R_e^3$   
 Dipole tilt to rotational axis: 11.2  
 Longitude of tilt: 70.8 degrees  
 Dipole offset: 0.076  $R_e$   
 Surface (1  $R_e$ ) field strength: 0.24 - 0.66 Gauss

Re denotes Earth model radius, here defined to be 6,378 km

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## Terrestrial Atmosphere

Surface pressure: 1014 mb

Surface density: 1.217 kg/m<sup>3</sup>

Scale height: 8.5 km

Total mass of atmosphere:  $5.1 \times 10^{18}$  kg

Total mass of hydrosphere:  $1.4 \times 10^{21}$  kg

Average temperature: 288 K (15 C)

Diurnal temperature range: 283 K to 293 K (10 to 20 C)

Wind speeds: 0 to 100 m/s

Mean molecular weight: 28.97

Atmospheric composition (by volume, dry air):

Major : 78.08% Nitrogen (N<sub>2</sub>), 20.95% Oxygen (O<sub>2</sub>),

Minor (ppm): Argon (Ar) - 9340; Carbon Dioxide (CO<sub>2</sub>) - 400

Neon (Ne) - 18.18; Helium (He) - 5.24; CH<sub>4</sub> - 1.7

Krypton (Kr) - 1.14; Hydrogen (H<sub>2</sub>) - 0.55

Numbers do not add up to exactly 100% due to roundoff and uncertainty

Water is highly variable, typically makes up about 1%

## Moon Fact Sheet



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## Moon/Earth Comparison

### Bulk parameters

	Moon	Earth	Ratio (Moon/Earth)
Mass (10 <sup>24</sup> kg)	0.07346	5.9724	0.0123
Volume (10 <sup>10</sup> km <sup>3</sup> )	2.1968	108.321	0.0203
Equatorial radius (km)	1738.1	6378.1	0.2725

<b>Polar radius (km)</b>	1736.0	6356.8	0.2731
<b>Volumetric mean radius (km)</b>	1737.4	6371.0	0.2727
<b>Ellipticity (Flattening)</b>	0.0012	0.00335	0.36
<b>Mean density (kg/m<sup>3</sup>)</b>	3344	5514	0.606
<b>Surface gravity (m/s<sup>2</sup>)</b>	1.62	9.80	0.165
<b>Surface acceleration (m/s<sup>2</sup>)</b>	1.62	9.78	0.166
<b>Escape velocity (km/s)</b>	2.38	11.2	0.213
<b>GM (x 10<sup>6</sup> km<sup>3</sup>/s<sup>2</sup>)</b>	0.00490	0.39860	0.0123
<b>Bond albedo</b>	0.11	0.306	0.360
<b>Geometric albedo</b>	0.12	0.434	0.28
<b>V-band magnitude V(1,0)</b>	-0.08	-3.99	-
<b>Solar irradiance (W/m<sup>2</sup>)</b>	1361.0	1361.0	1.000
<b>Black-body temperature (K)</b>	270.4	254.0	1.065
<b>Topographic range (km)</b>	13	20	0.650
<b>Moment of inertia (I/MR<sup>2</sup>)</b>	0.394	0.3308	1.191
<b>J<sub>2</sub> (x 10<sup>-6</sup>)</b>	202.7	1082.63	0.187

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#### **Orbital parameters (for orbit about the Earth)**

	<b>Moon</b>
<b>Semimajor axis (10<sup>6</sup> km)</b>	0.3844
<b>Perigee (10<sup>6</sup> km)*</b>	0.3633
<b>Apogee (10<sup>6</sup> km)*</b>	0.4055
<b>Revolution period (days)</b>	27.3217
<b>Synodic period (days)</b>	29.53
<b>Mean orbital velocity (km/s)</b>	1.022
<b>Max. orbital velocity (km/s)</b>	1.082
<b>Min. orbital velocity (km/s)</b>	0.970
<b>Inclination to ecliptic (deg)</b>	5.145
<b>Inclination to Earth equator (deg)</b>	18.28 - 28.58
<b>Orbit eccentricity</b>	0.0549
<b>Sidereal rotation period (hrs)</b>	655.728
<b>Obliquity to orbit (deg)</b>	6.68
<b>Recession rate from Earth (cm/yr)</b>	3.8

Mean values at opposition from Earth

Distance from Earth (equator, km) 378,000

Apparent diameter (seconds of arc)	1896
Apparent visual magnitude	-12.74

\* These represent mean apogee and perigee for the lunar orbit.  
The orbit changes over the course of the year so the distance  
from the Moon to Earth roughly ranges from 357,000 km to 407,000 km.

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## Lunar Atmosphere

Diurnal temperature range (equator): 95 K to 390 K (~ -290 F to +240 F)  
Total mass of atmosphere: ~25,000 kg  
Surface pressure (night):  $3 \times 10^{-15}$  bar ( $2 \times 10^{-12}$  torr)  
Abundance at surface:  $2 \times 10^5$  particles/cm<sup>3</sup>

Estimated Composition (night, particles per cubic cm):

Helium 4 (<sup>4</sup>He) - 40,000 ; Neon 20 (<sup>20</sup>Ne) - 40,000 ; Hydrogen (H<sub>2</sub>) - 35,000

Argon 40 (<sup>40</sup>Ar) - 30,000 ; Neon 22 (<sup>22</sup>Ne) - 5,000 ; Argon 36 (<sup>36</sup>Ar) - 2,000

Methane - 1000 ; Ammonia - 1000 ; Carbon Dioxide (CO<sub>2</sub>) - 1000

Trace Oxygen (O<sup>+</sup>), Aluminum (Al<sup>+</sup>), Silicon (Si<sup>+</sup>)

Possible Phosphorus (P<sup>+</sup>), Sodium (Na<sup>+</sup>), Magnesium (Mg<sup>+</sup>)

Composition of the tenuous lunar atmosphere is poorly known and variable, these are estimates of the upper limits of the nighttime ambient atmosphere composition. Daytime levels were difficult to measure due to heating and outgassing of Apollo surface experiments.