

GENS 4001 Astronomy

Part 1: The Solar System – The Sun

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The Sun – our local star



The Sun in X-rays



Table 18-1 Sun Data

Distance from the Earth:	Mean: 1 AU = 149,598,000 km
	Maximum: 152,000,000 km
	Minimum: 147,000,000 km
Light travel time to the Earth:	8.32 min
Mean angular diameter:	32 arcmin
Radius:	696,000 km = 109 Earth radii
Mass:	1.9891×10^{30} kg
	$= 3.33 \times 10^3$ Earth masses
Composition (by mass):	74% hydrogen
	25% helium
	1% other elements
Composition (by number of atoms):	92.1% hydrogen
	7.8% helium
	0.1% other elements
Mean density:	1410 kg/m^3
Mean temperatures:	Surface: 5800 K
	Center: 1.55×10^7 K
Luminosity:	3.86×10^{26} W
Distance from center of Galaxy:	8000 pc = 26,000 ly
Orbital period around center of Galaxy:	220 million years
Orbital speed around center of Galaxy:	220 km/s

(NOAO)

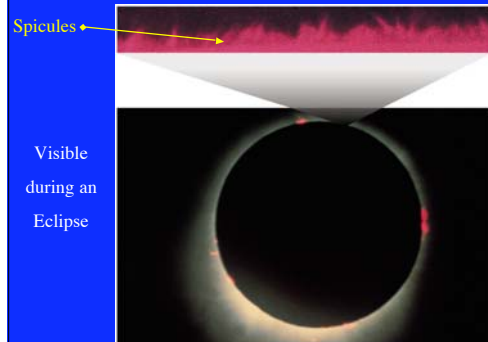
The Photosphere



- “Surface” Temperature ~6,000°C
- Opaque to light
- Sunspots

Just a ball of hot gas (a “plasma”)!

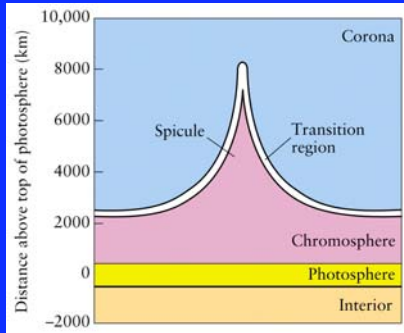
The Chromosphere: The Solar “Atmosphere”



Spicules

Visible during an Eclipse

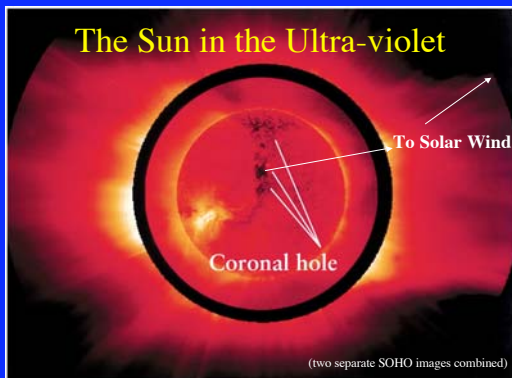
Structure of the "surface" layers



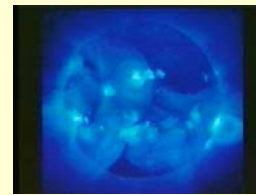
The Corona

- Temperature ~2 million °C
- Becomes the "Solar Wind"
- Extends throughout the Solar System

The Sun in the Ultra-violet

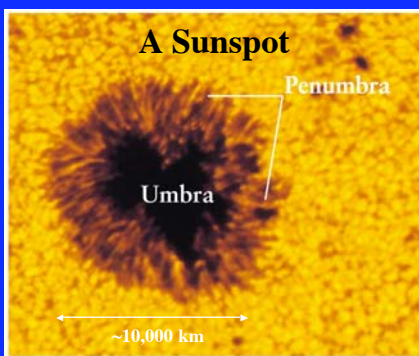


3 Weeks in the life of the Corona



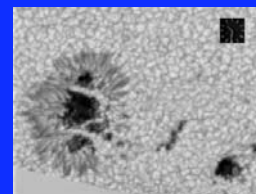
- Loops on top of sunspots
- Seen in X-rays
- Japanese Yohkoh satellite

A Sunspot



Low temperature regions of the photosphere ($T \sim 4,500$ °C)

3.5 Hours in the life of a Sunspot



Convection in seething granules

