

Partnerships and Acknowledgements



sunrise.umich.edu



radiojove.gsfc.nasa.gov

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Training Module 0.2

Solar Atmosphere



Prerequisites for Training Modules

1. High School Reading Comprehension and General Science
2. Electromagnetic Spectrum
3. Speed, Wavelength, Frequency, and Energy of Waves
4. Graphical Interpretation of Data
5. Training Modules 0.0, 0.1



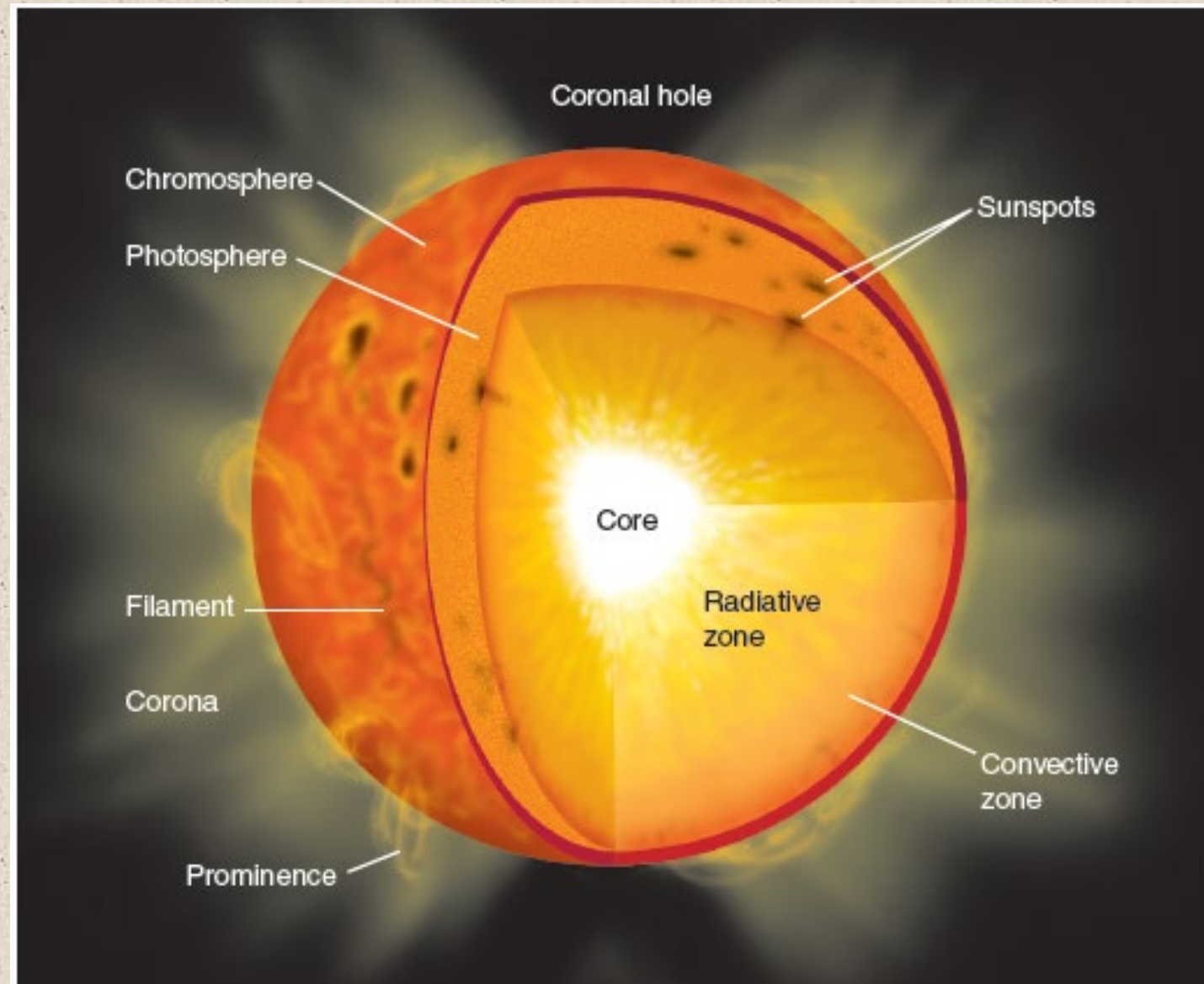
Learning Objectives

1. The structure of the Sun
2. Features of the Solar Atmosphere

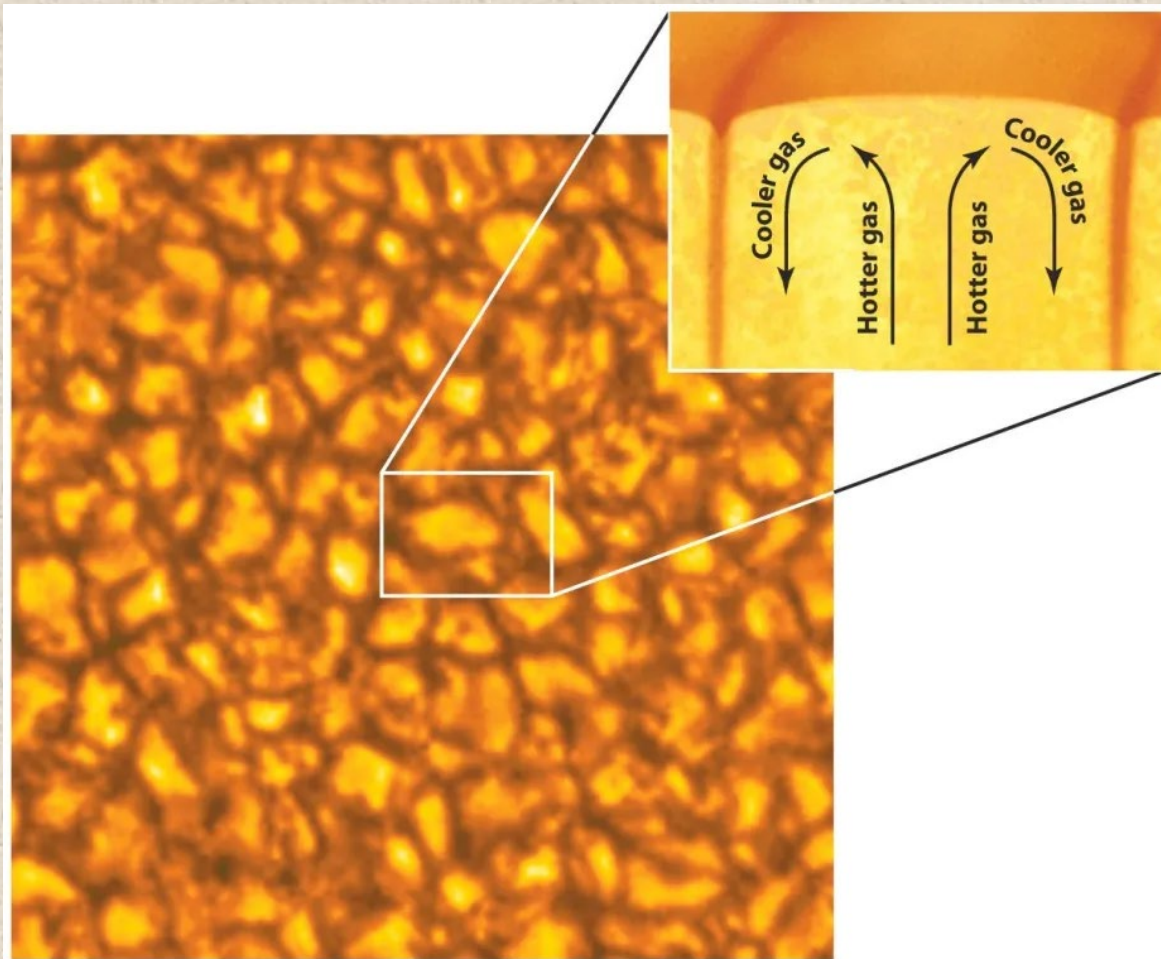
Sun - Structure

Structure

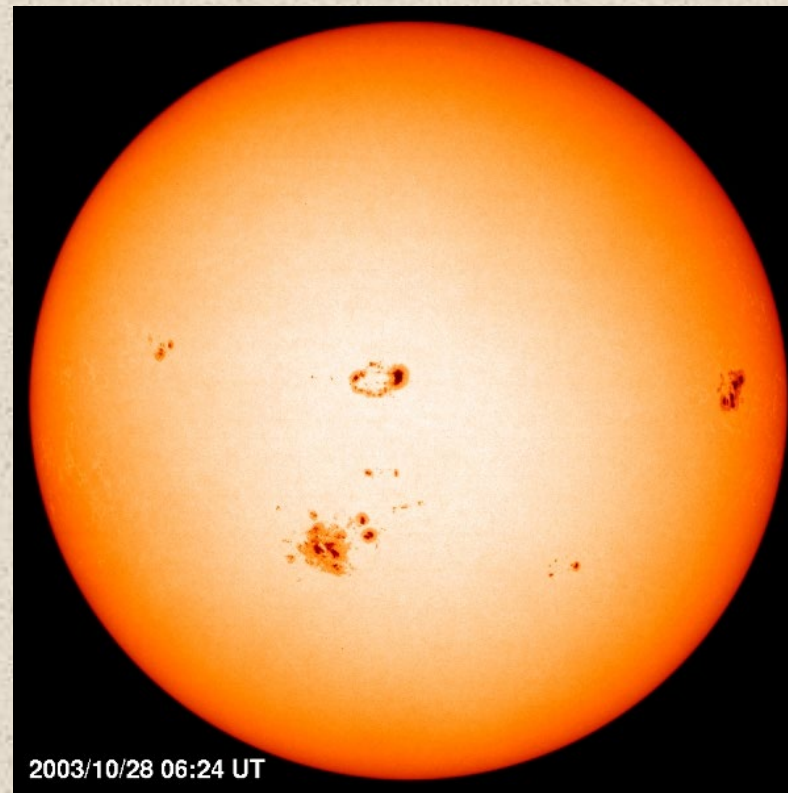
1. Interior
 - a. Core
 - b. Radiative Zone
 - c. Convection Zone
2. "Surface"
 - a. Photosphere
3. Atmosphere
 - a. Chromosphere
 - b. Transition Zone
 - c. Corona



Photosphere

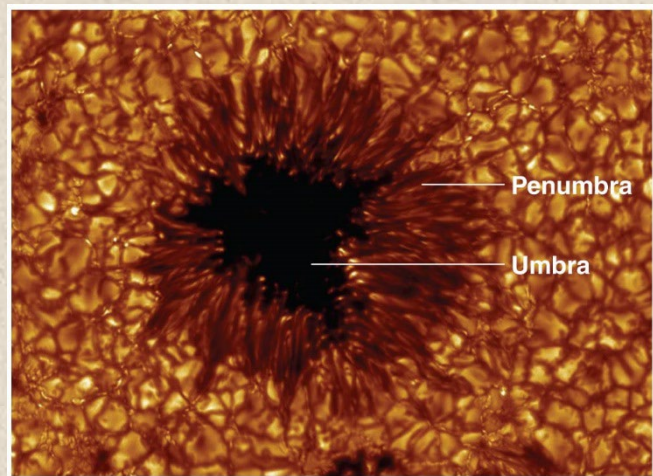


Granulation at the surface of the Sun is caused by convection currents within the Sun's interior. Patrick Hall, York University

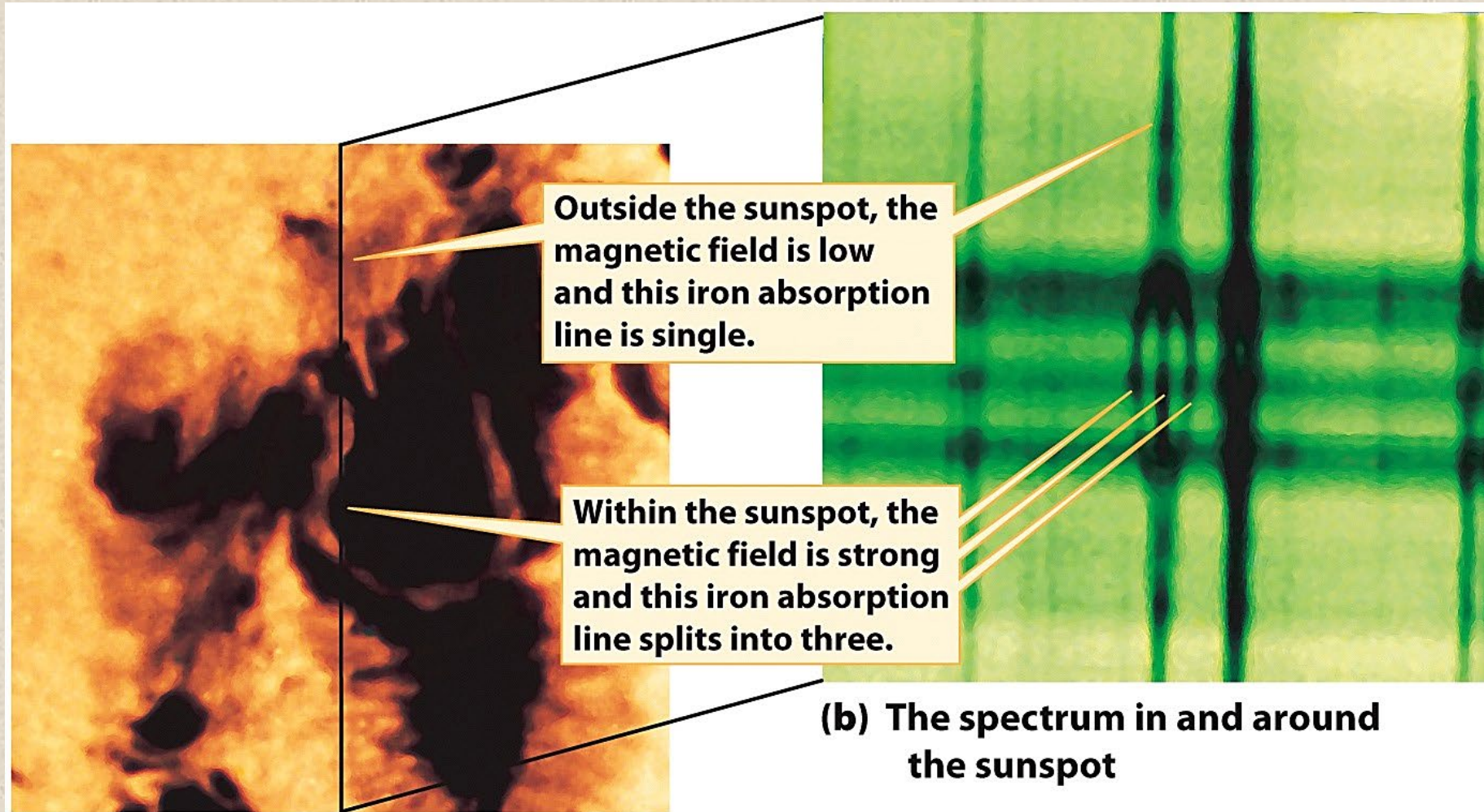


2003/10/28 06:24 UT

SOHO, NASA & ESA



Sunspot Magnetic Fields



(a) A sunspot

Figure 16-21
Universe, Tenth Edition
NOAO



Chromosphere

Chromosphere – reddish-colored layer above the photosphere

Contains

Filaments – dark, thread-like features

Plages – bright patches surrounding sunspots

Spicules – small flame-like structures

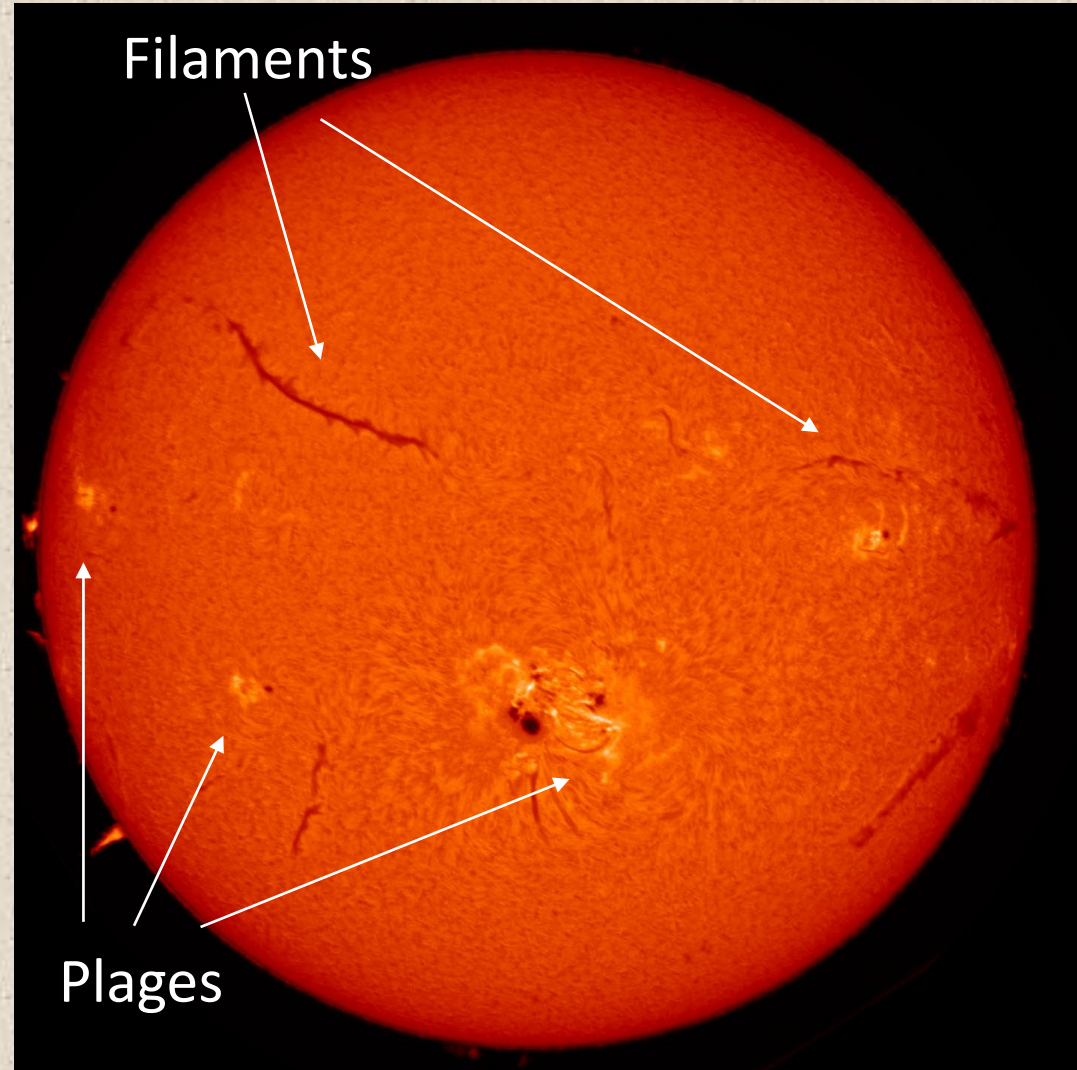
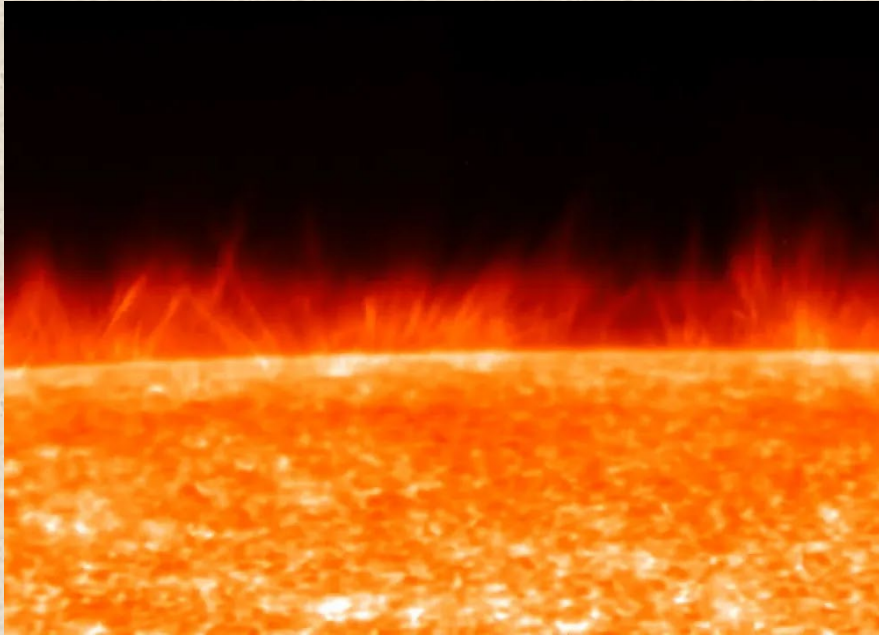


Image Credit: NSO/AURA/NSF with contribution from NOAA

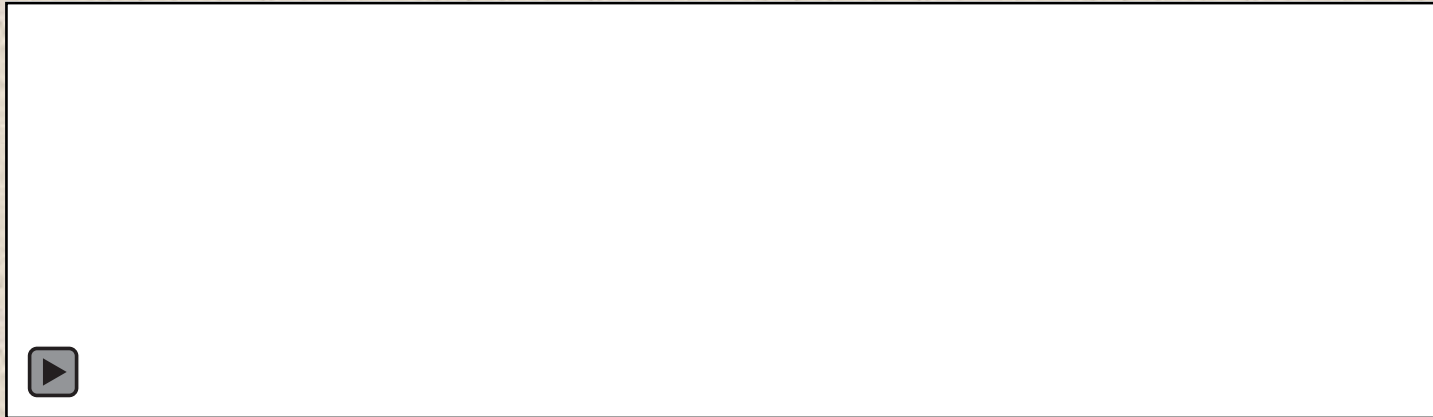


Chromosphere



Spicules
↙

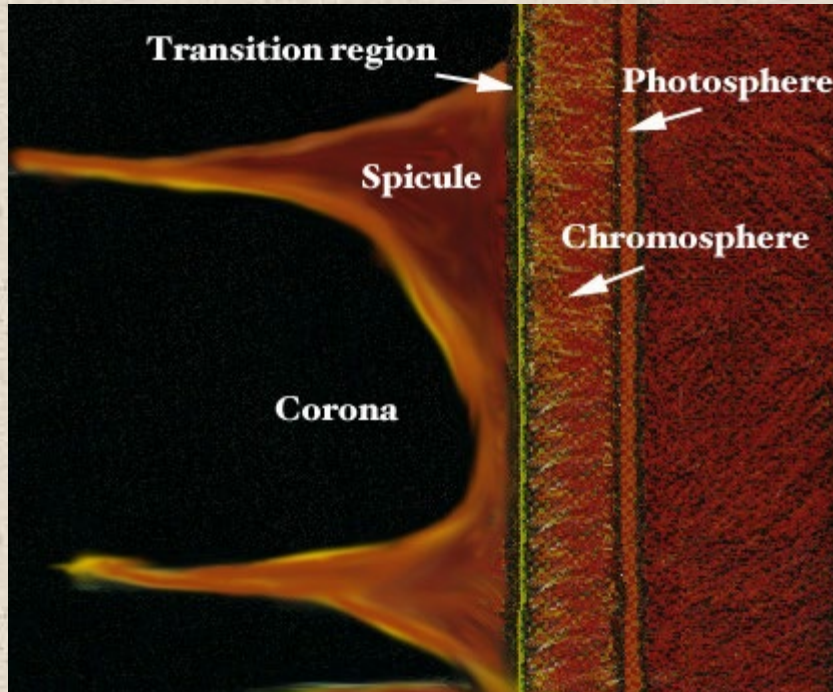
JAXA/NASA



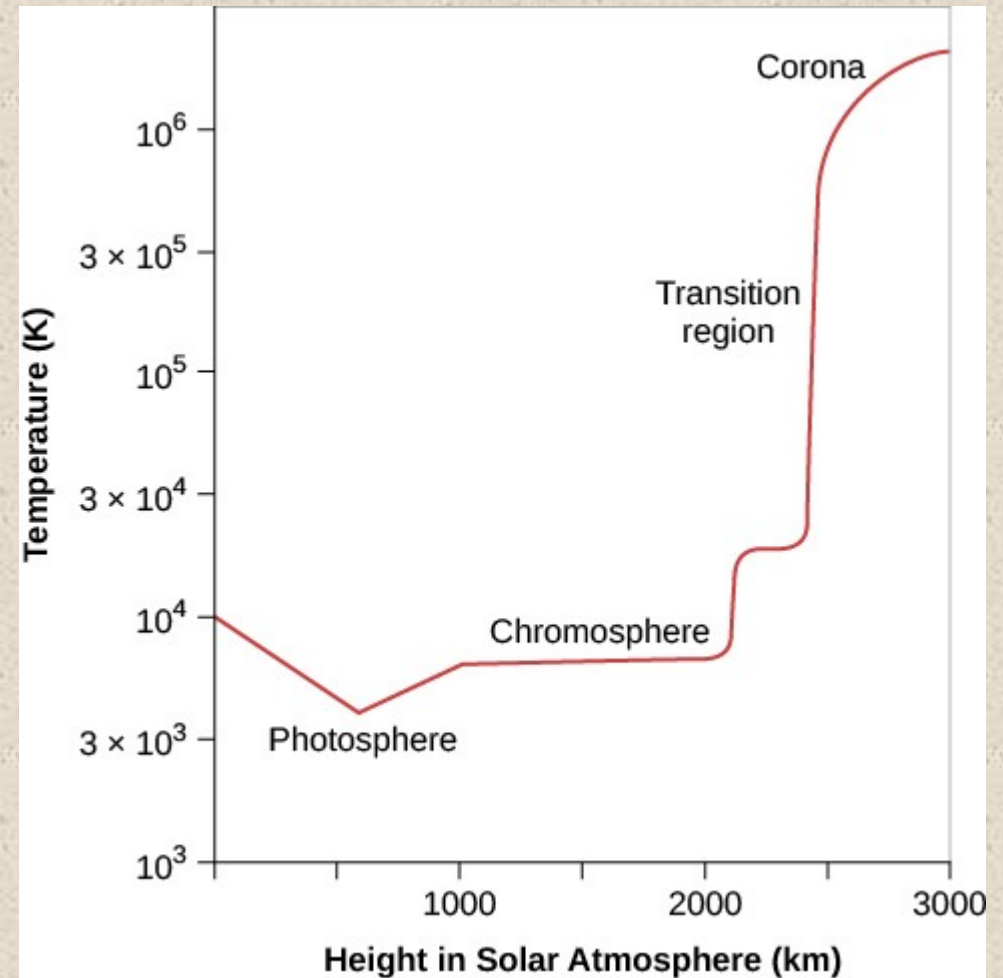
NASA/SDO

Transition Region

The transition region is a very thin region where the temperature changes from thousand of degrees to millions of degrees.

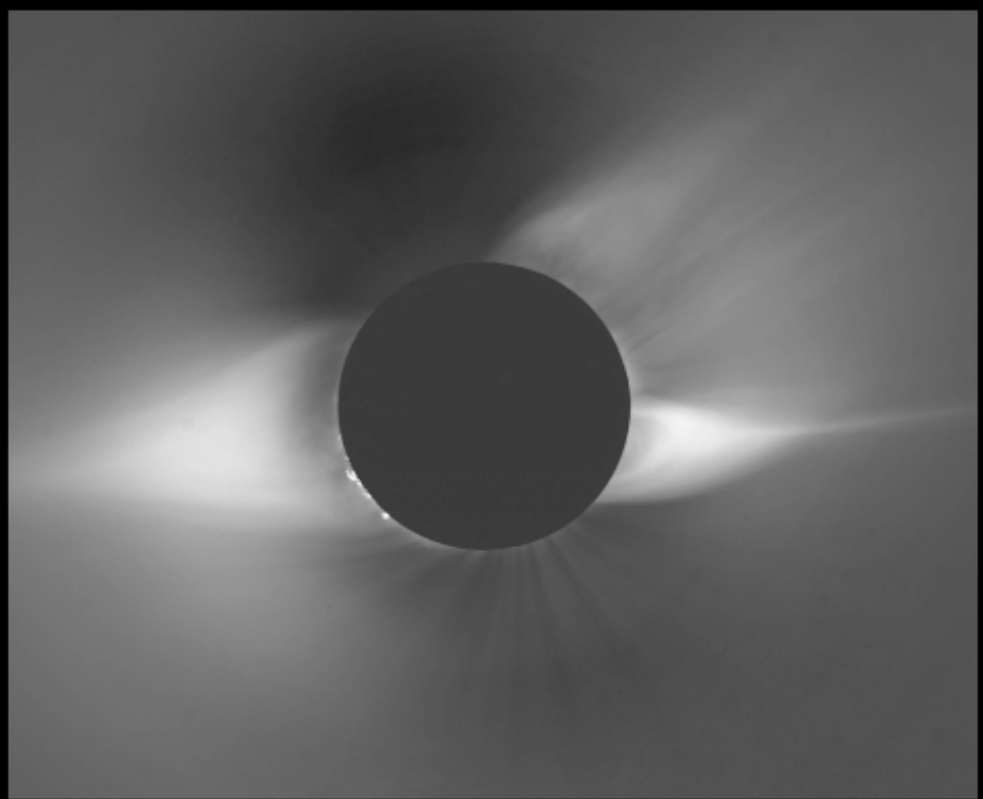


Credit: <http://solar-center.stanford.edu/>

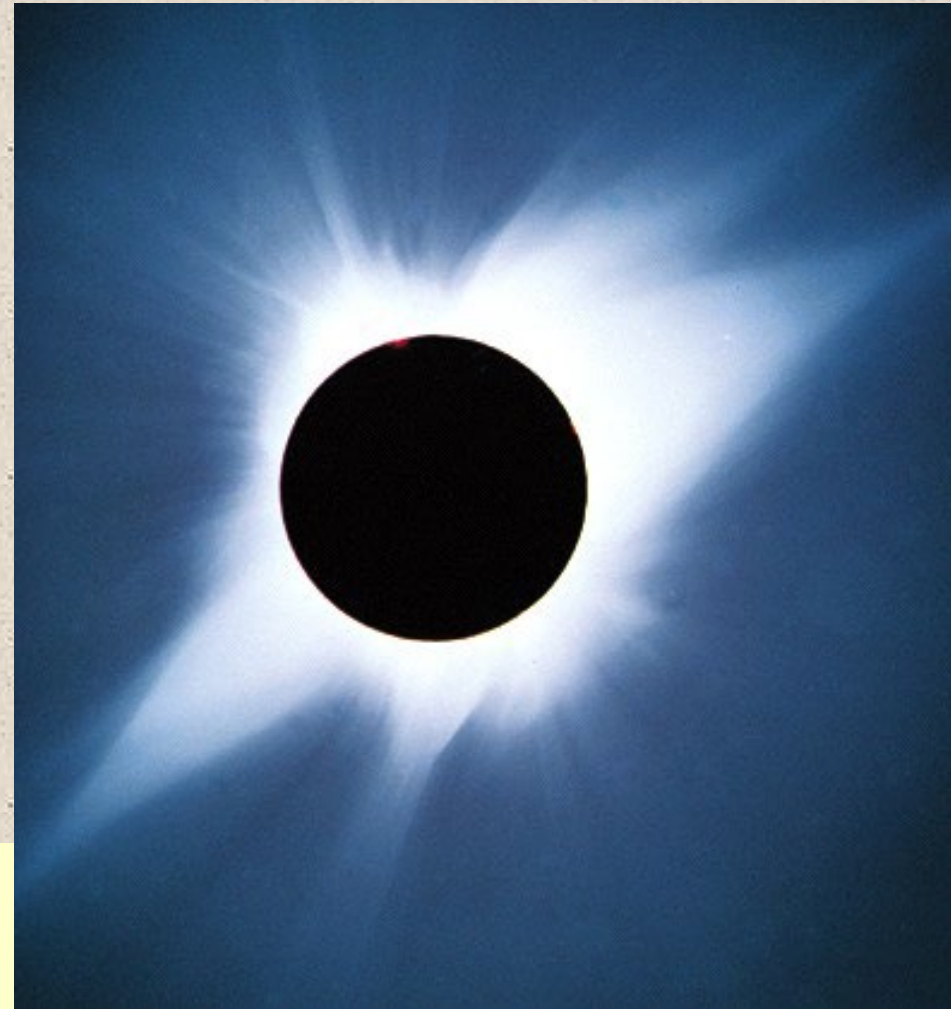


Credit Andrew Fraknoi, David Morrison, Sidney C. Wolff - <https://openstax.org/books/astronomy/>

Solar corona



Solar Corona at Eclipse, 3 Nov 1994, Putre, Chile.
High Altitude Observatory, NCAR, Boulder, Colorado, USA.

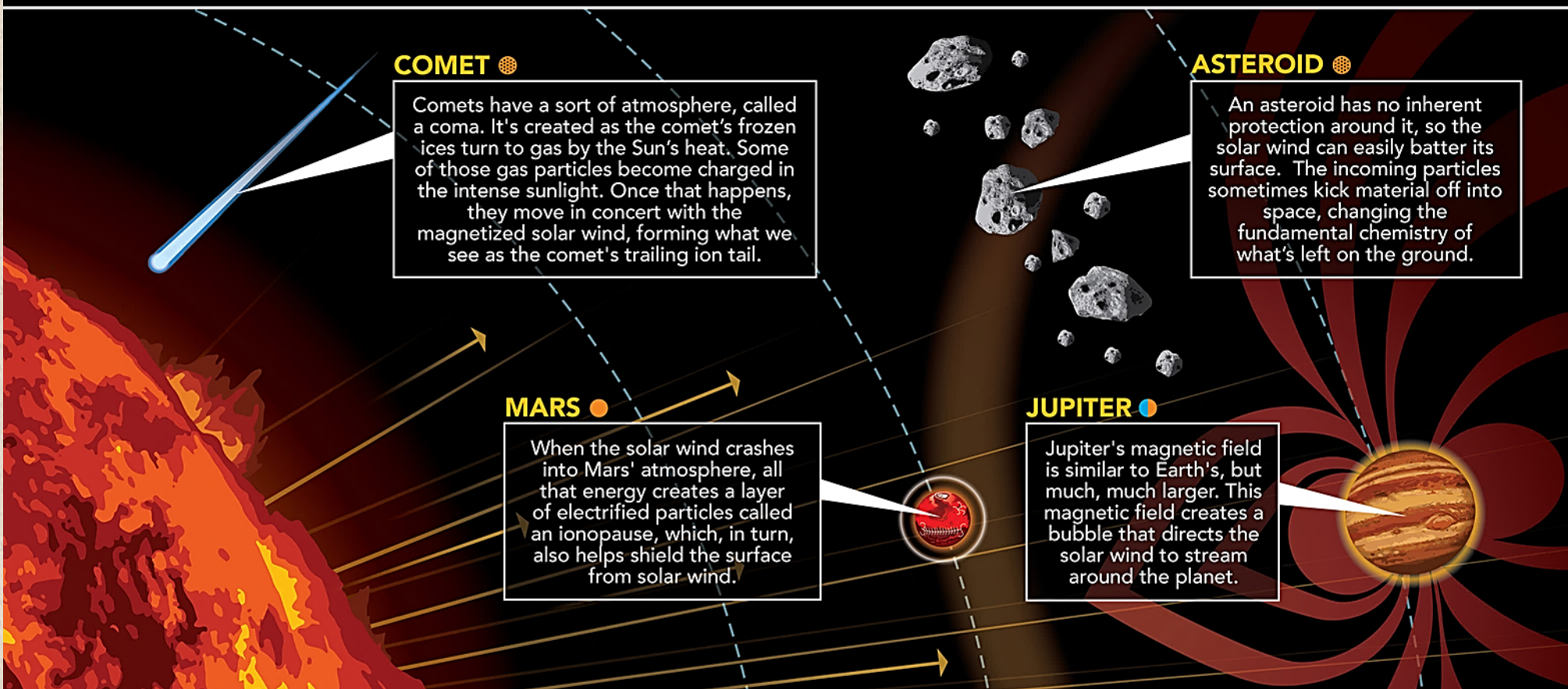


Corona

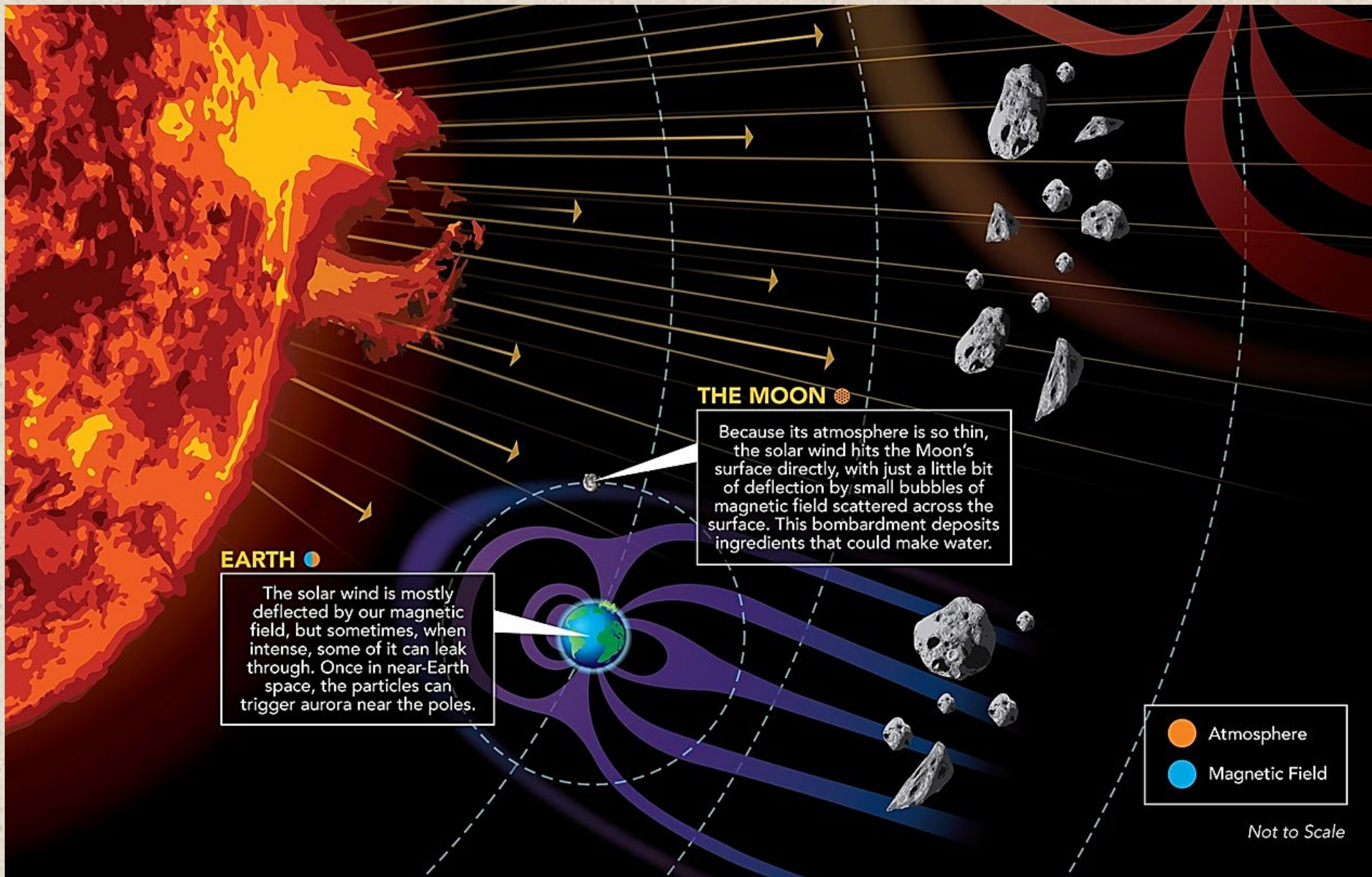
- Sun's outer atmosphere
- Very HOT, low-density gas
- Forms the solar wind – high velocity gas of protons and electrons

Solar wind

The Sun releases a constant stream of particles and magnetic fields called the solar wind. This solar wind slams worlds across the solar system with particles and radiation – which can stream all the way to planetary surfaces unless thwarted by an atmosphere, magnetic field, or both. Here's how these solar particles interact with a few select planets and other celestial bodies.



Solar wind





Resources

NASA Marshall Space Flight Center Solar Physics <https://solarscience.msfc.nasa.gov/>

NASA Solar and Heliospheric Observatory (SOHO) <https://soho.nascom.nasa.gov/home.html>

National Solar Observatory: <https://nso.edu/>

NOAA Space Weather Prediction Center: <https://www.swpc.noaa.gov/>

Australian Space Weather Forecasting Center <https://www.sws.bom.gov.au/Educational/2/1>

Current views of space weather:

<https://spaceweather.com/>

<https://swe.ssa.esa.int/current-space-weather>

<https://www.swpc.noaa.gov/>