

National Aeronautics and
Space Administration



Sounding out the unknown Sun

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Astronomy on Tap
Huntsville, AL
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MARSHALL
SPACE FLIGHT CENTER

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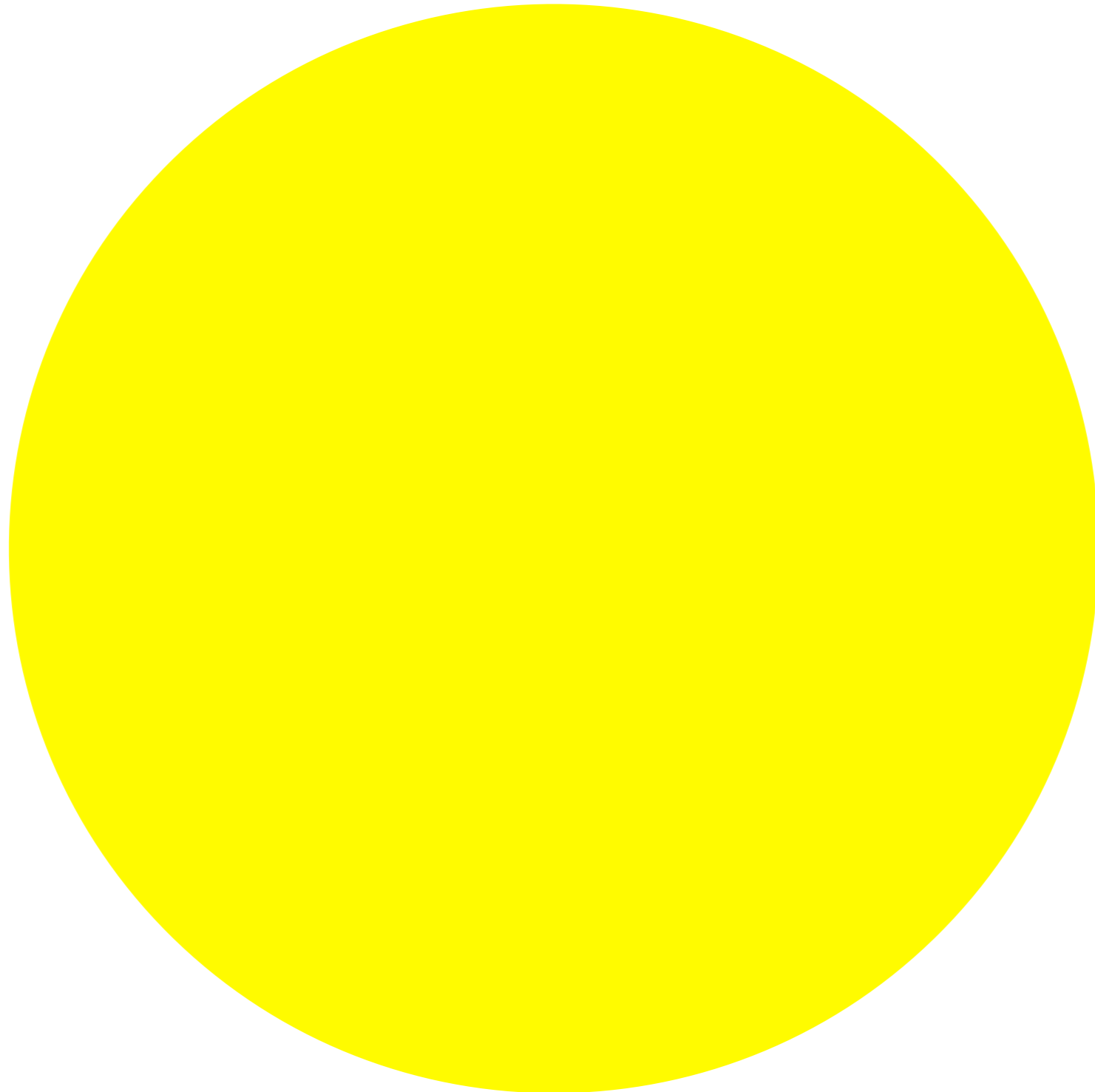
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Part I: Solar Dynamics

Our Dynamic Sun

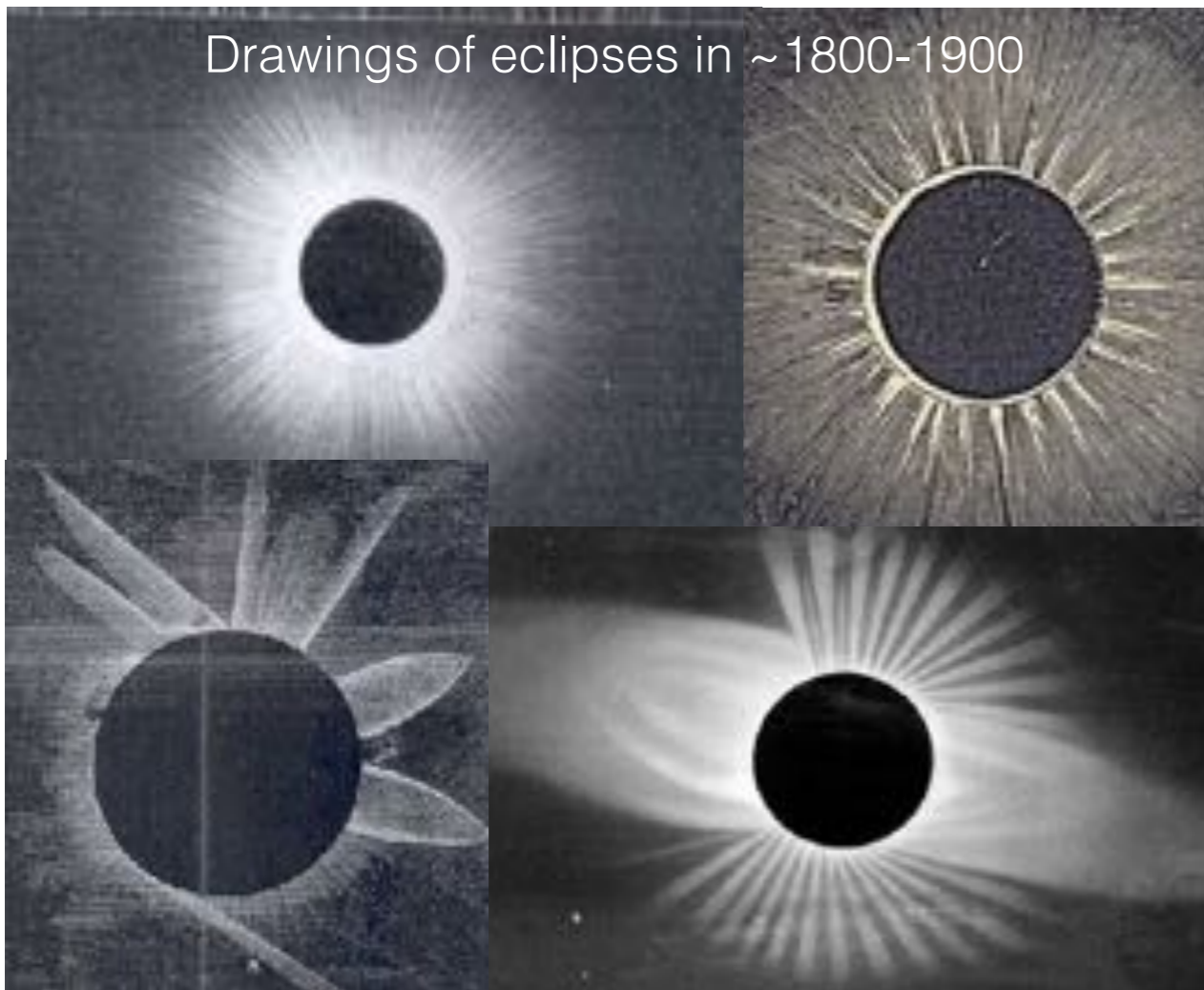


Petroglyph in Colorado



~1000 AD, De temporibus anni, Aelfric

Drawings of eclipses in ~1800-1900



2008 eclipse, ApJ, 10.1088/0004-637X/719/2/1362

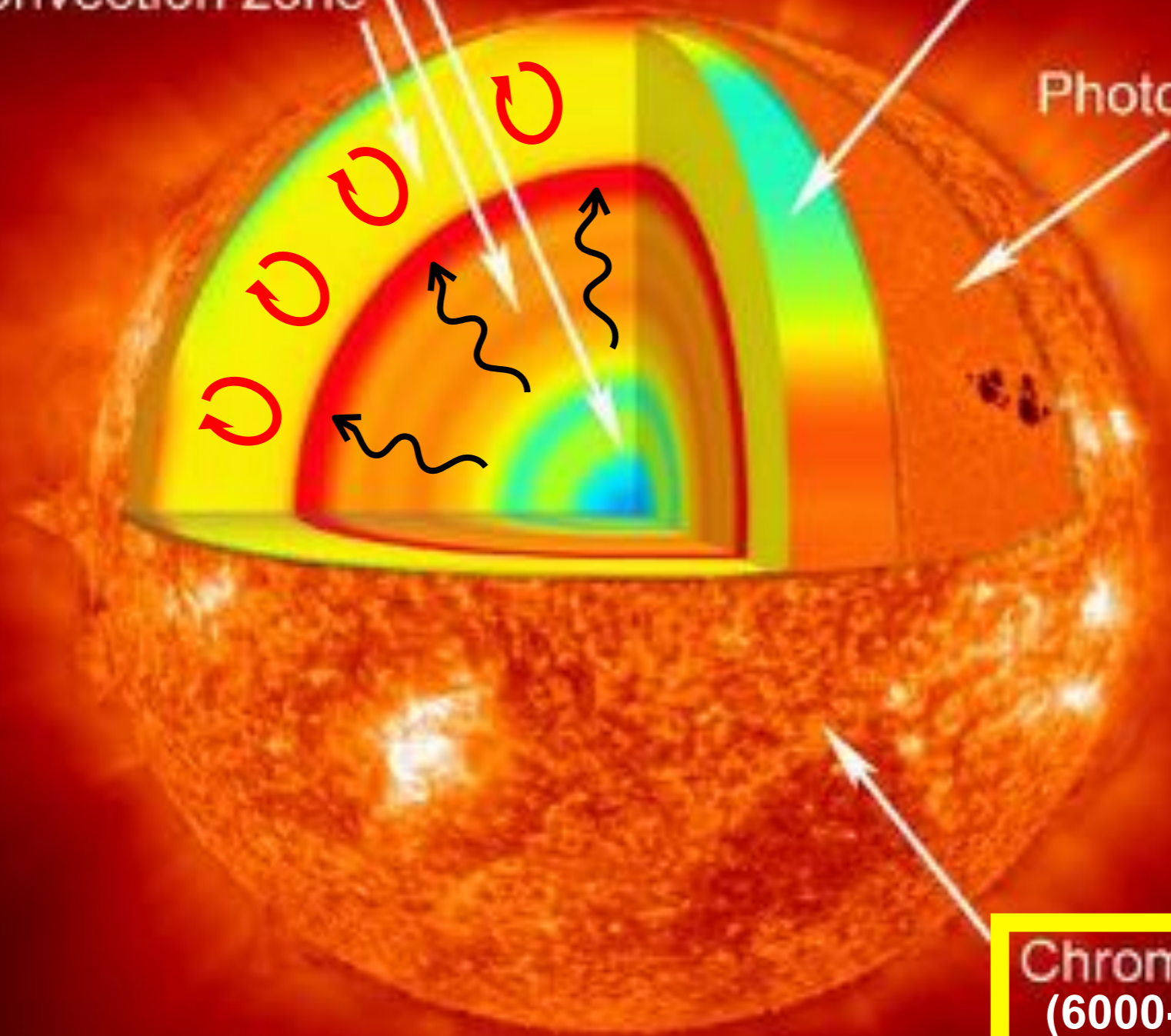


Internal structure:

inner core (15 million K)
radiative zone
convection zone

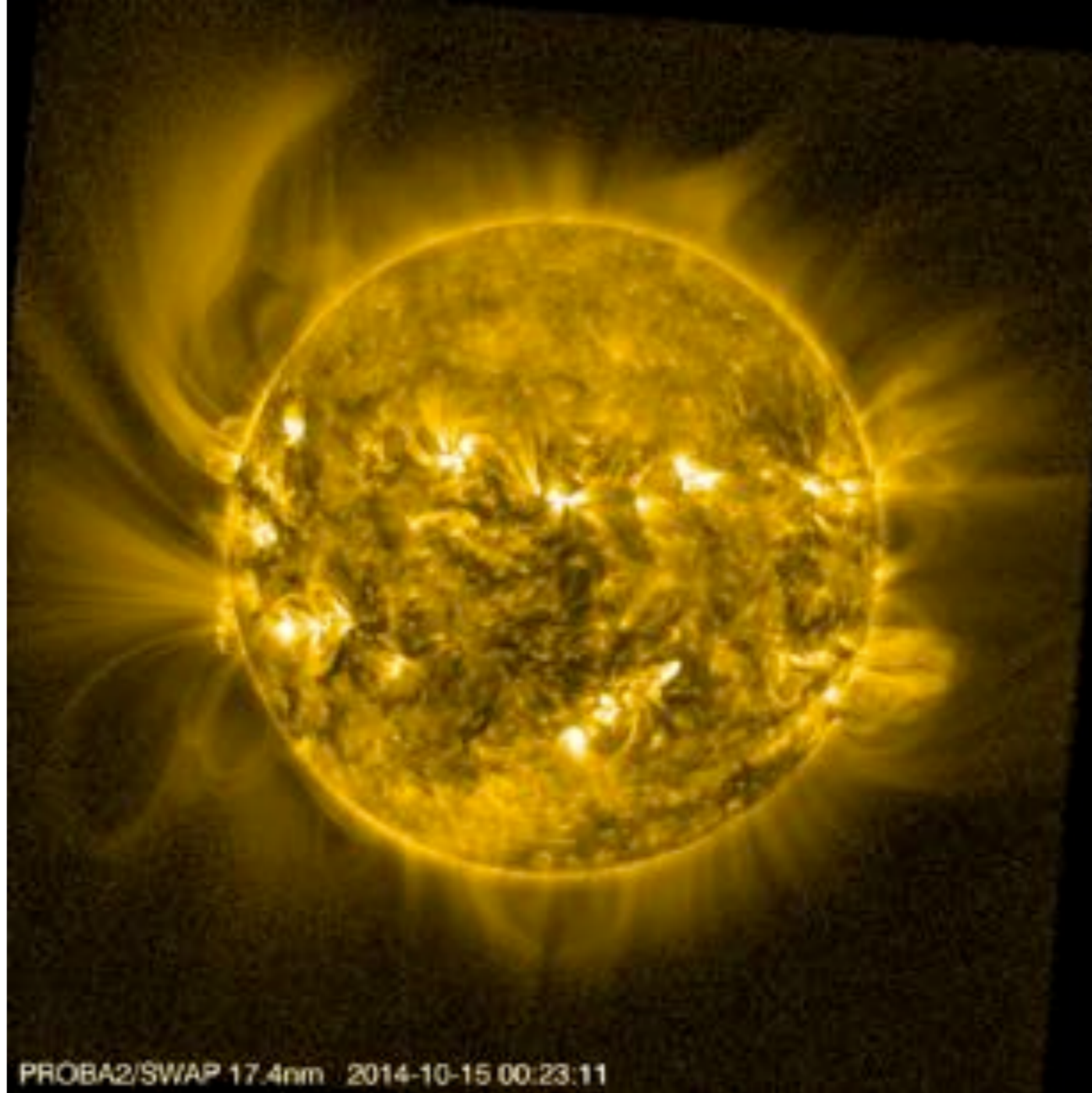
Subsurface flows

Photosphere (5800 K)



Chromosphere (6000-20,000 K)

Corona (several million K)



The dynamic corona

PROBA2/SWAP movie of 3 solar rotations

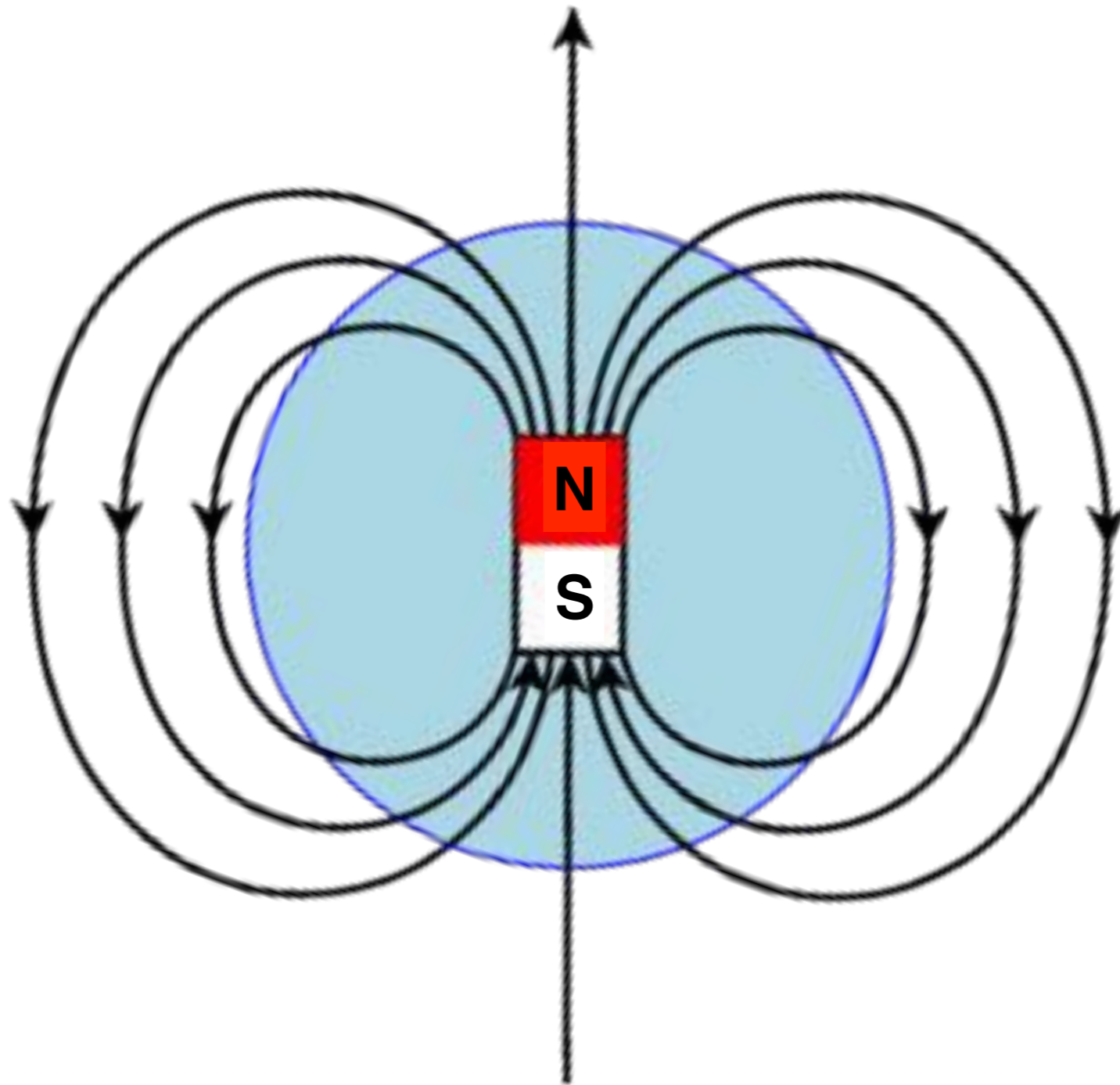
Coronal Mass Ejections

- How massive?
- How fast?
- How much energy?

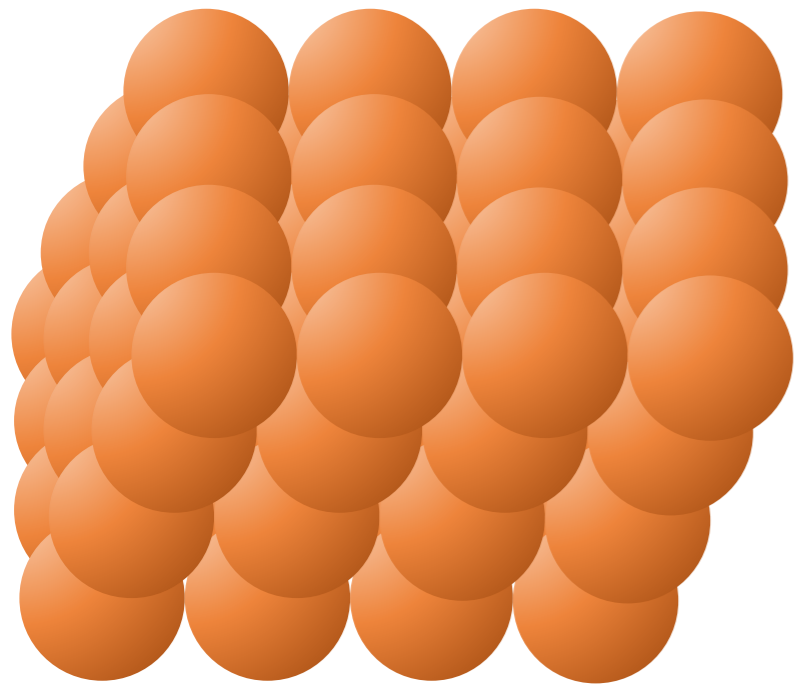
But where does this energy come from??

Magnetic field

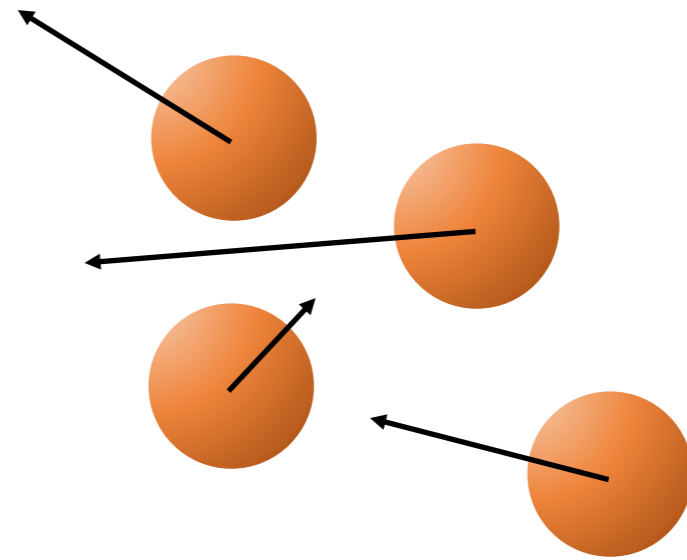
The Sun, like the Earth, has a global magnetic field.



Phases of Matter

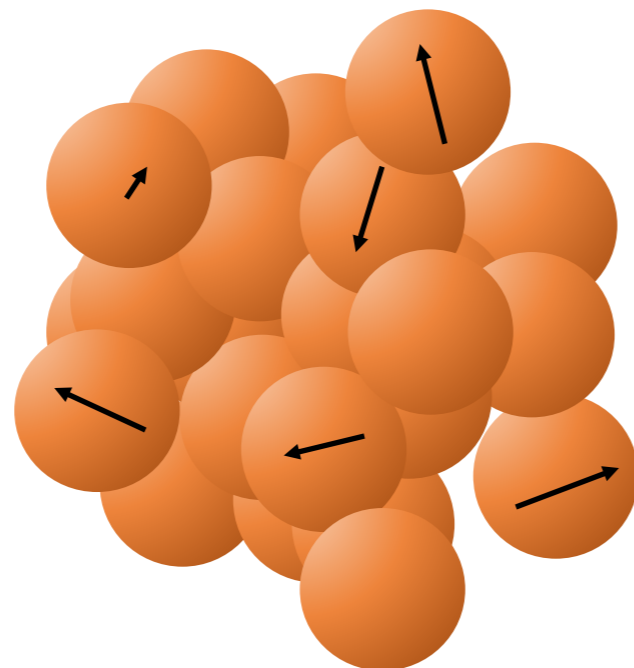


solid

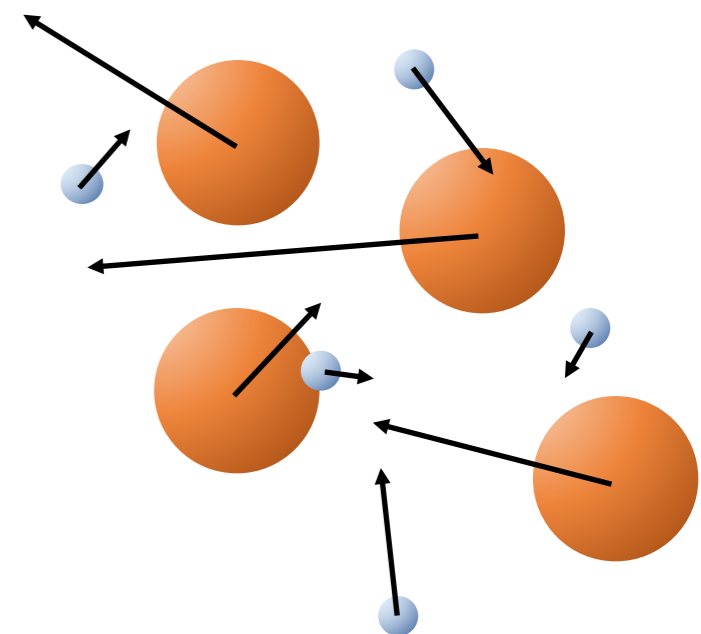


gas

liquid



plasma

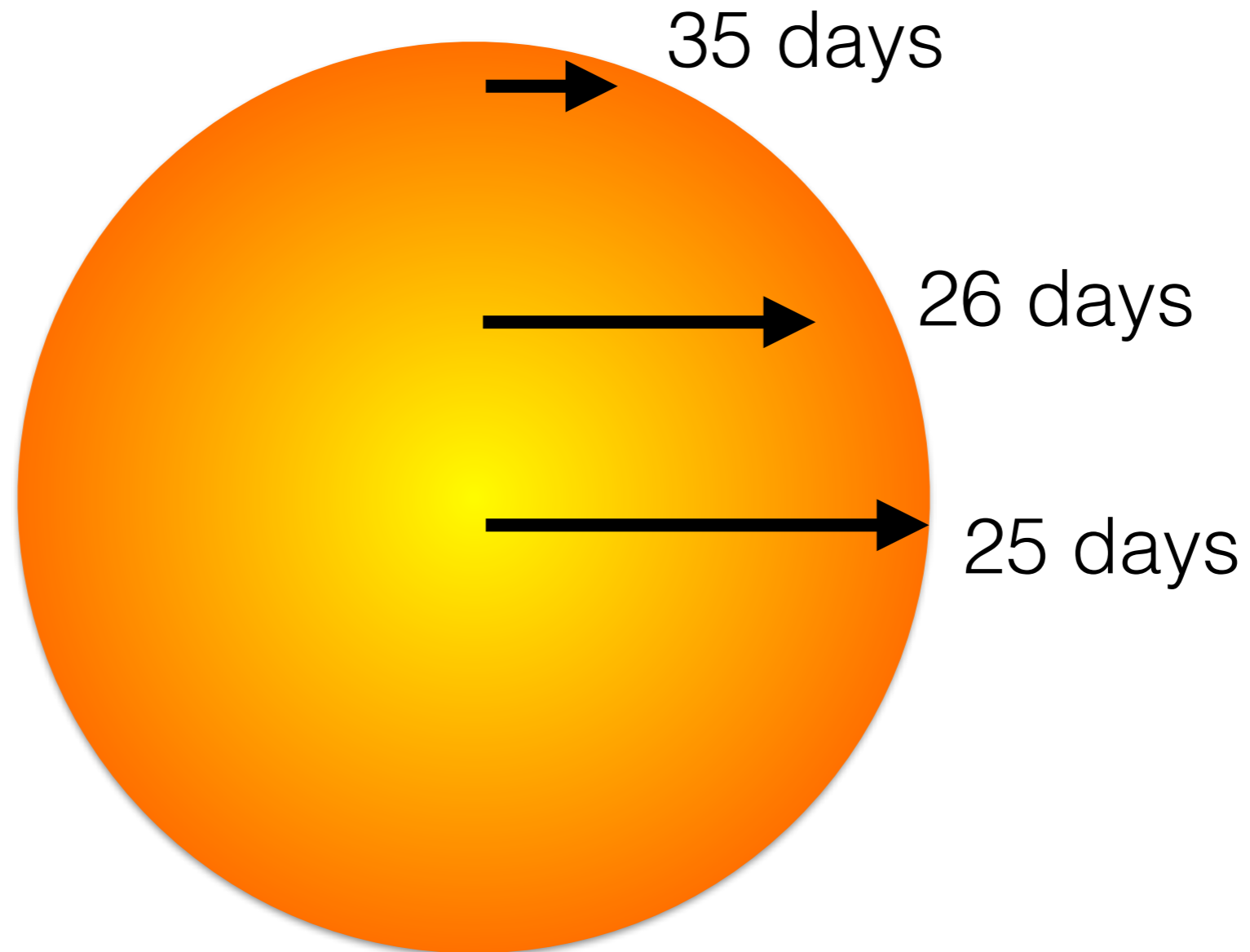


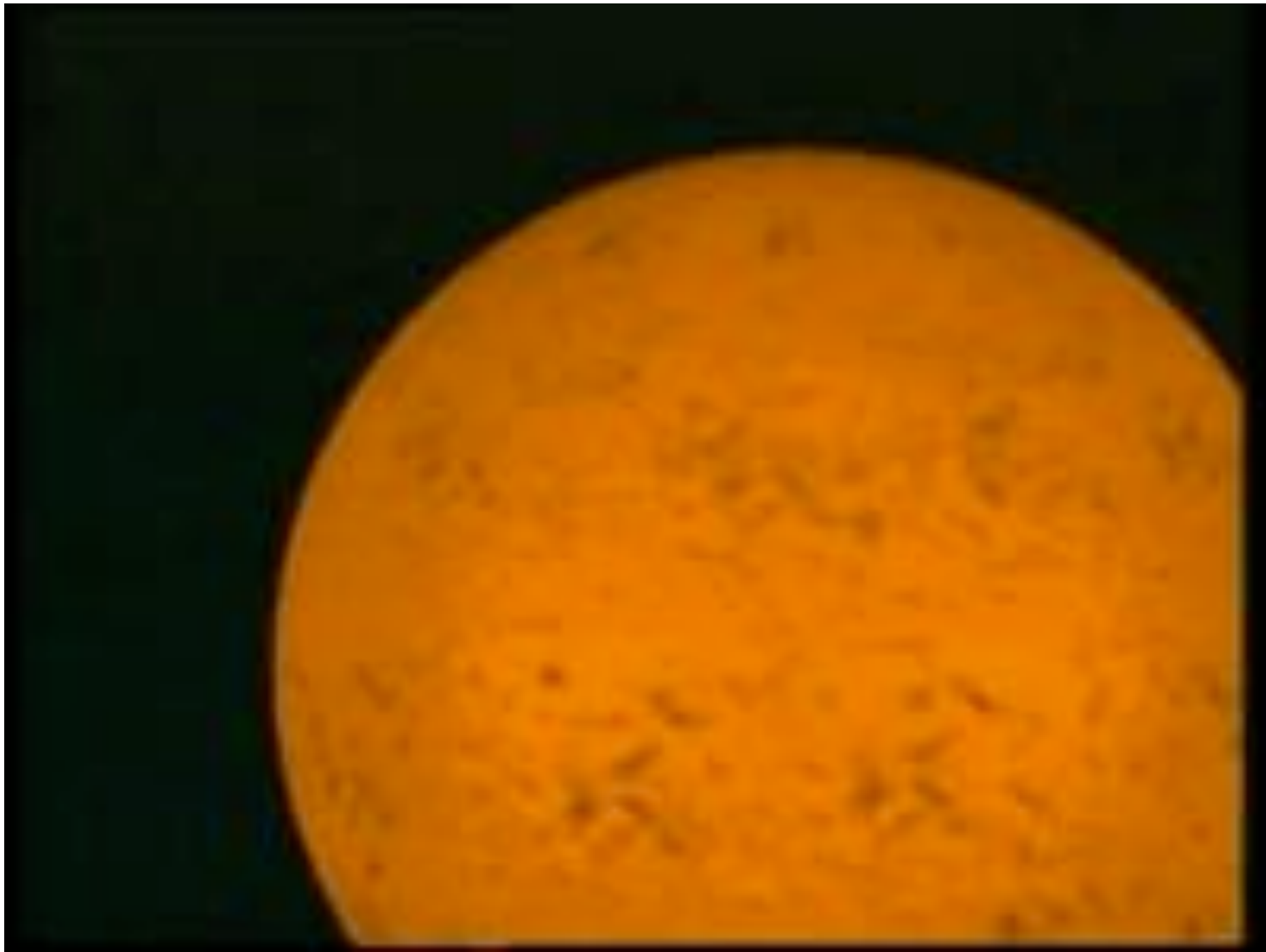
temperature



Solar Rotation

The equator spins faster than the poles: ***differential rotation***.



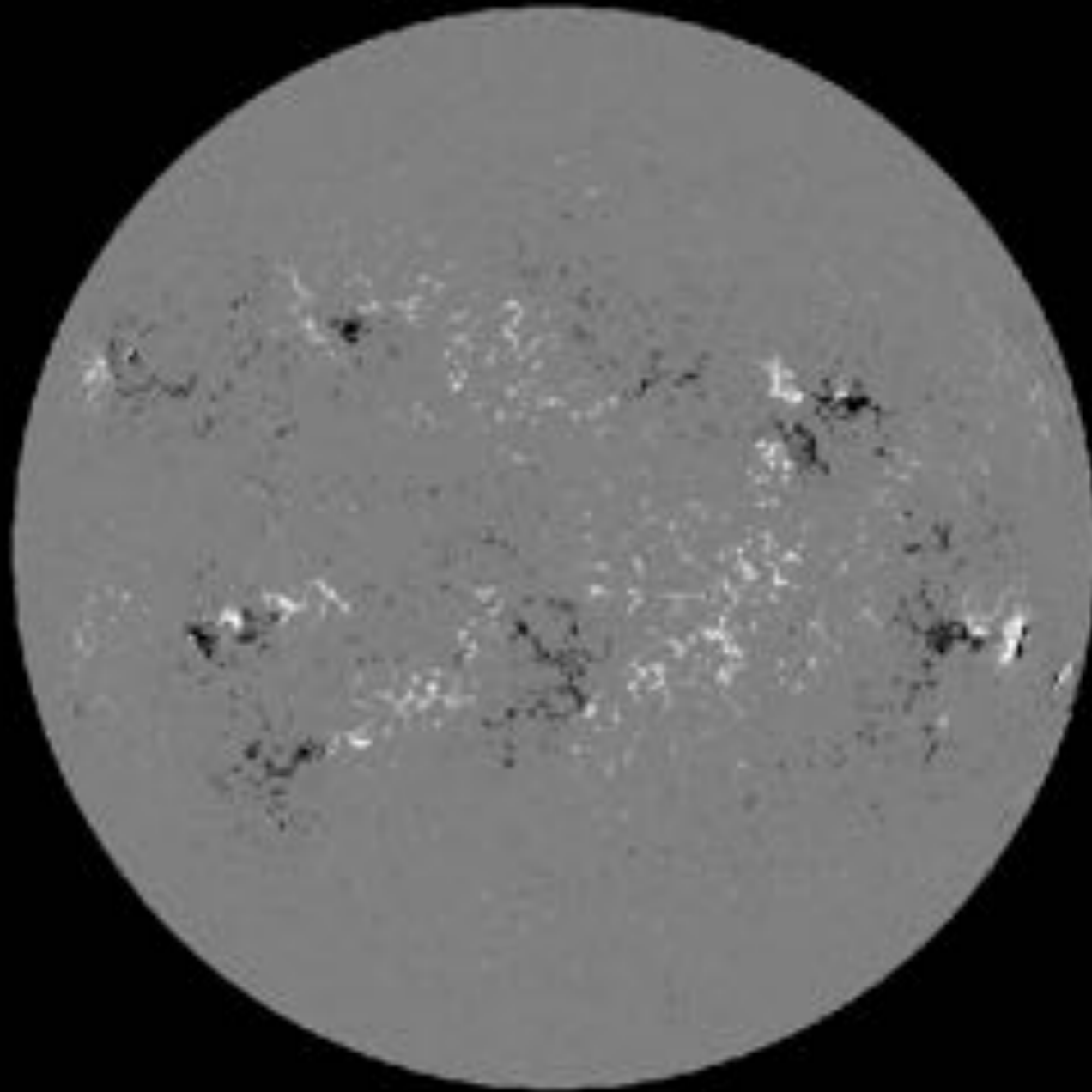


Solar Dynamo

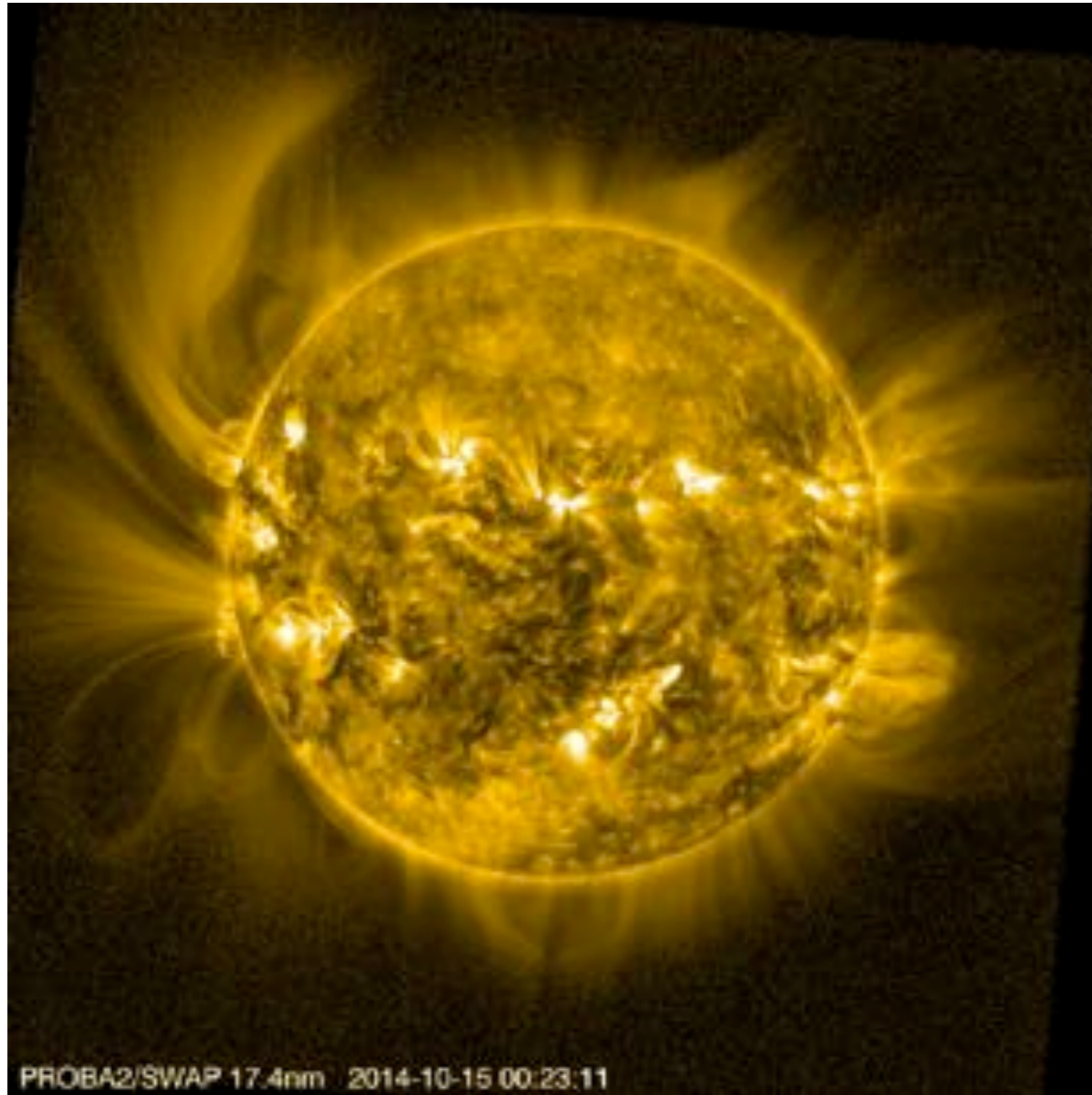
Spinning plasma drags the magnetic field.

Part 2:
Magnetic Field
Measurements

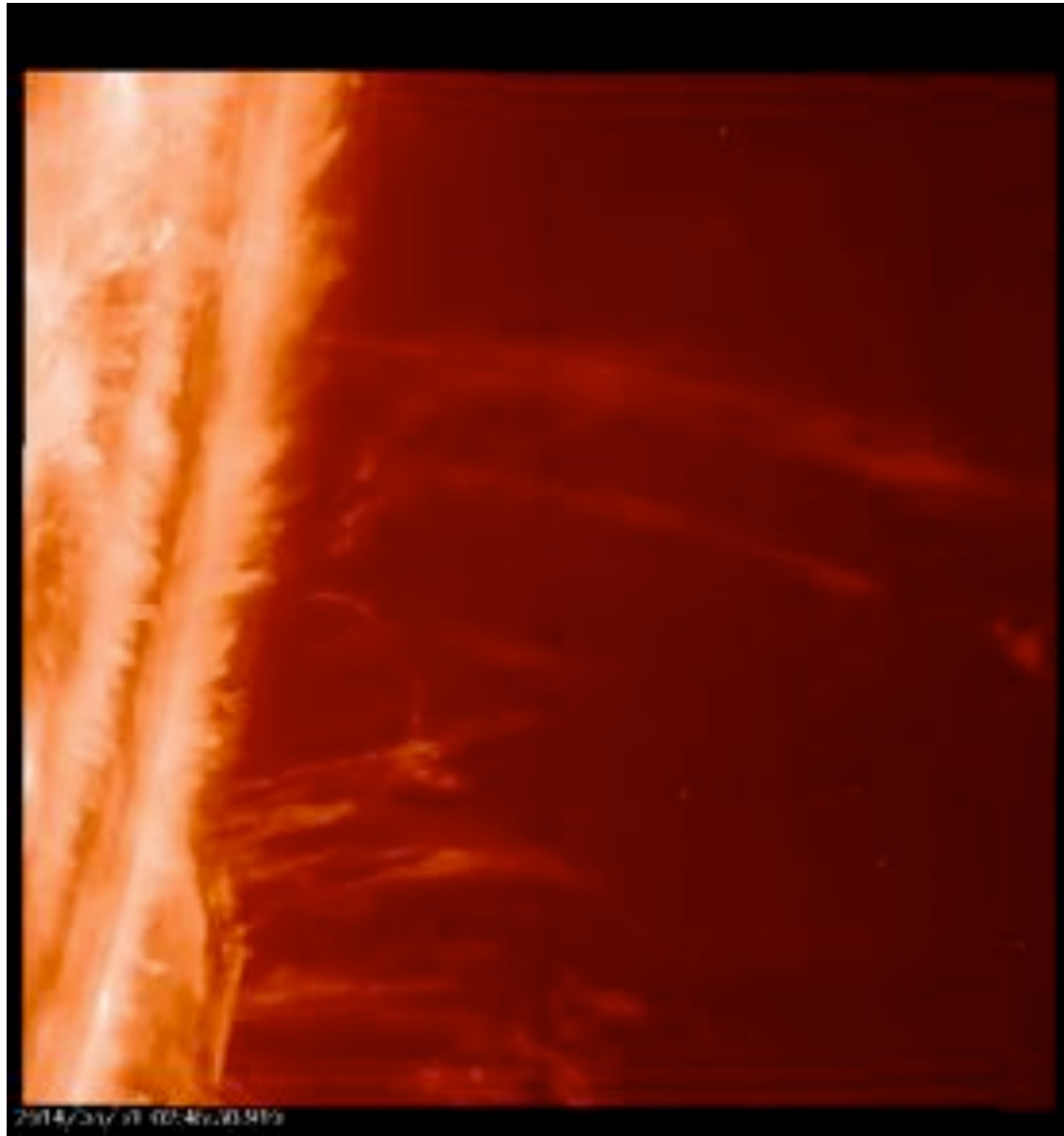
Magnetic field in the photosphere - magnetogram



Corona: tracing the field



Magnetic field in the Chromosphere



NASA/
IRIS

Chromospheric Magnetic Field Measurement

Observations

Theory and models



Sounding Rockets!



CLASP 2

- Chromospheric LAYER Spectro Polarimeter 2
- Launched April 11, 2019
- First measurements of polarization in the ultraviolet Mg II h&h lines emitted from the chromosphere
- International team dedicated to probing the magnetic field in the chromosphere.



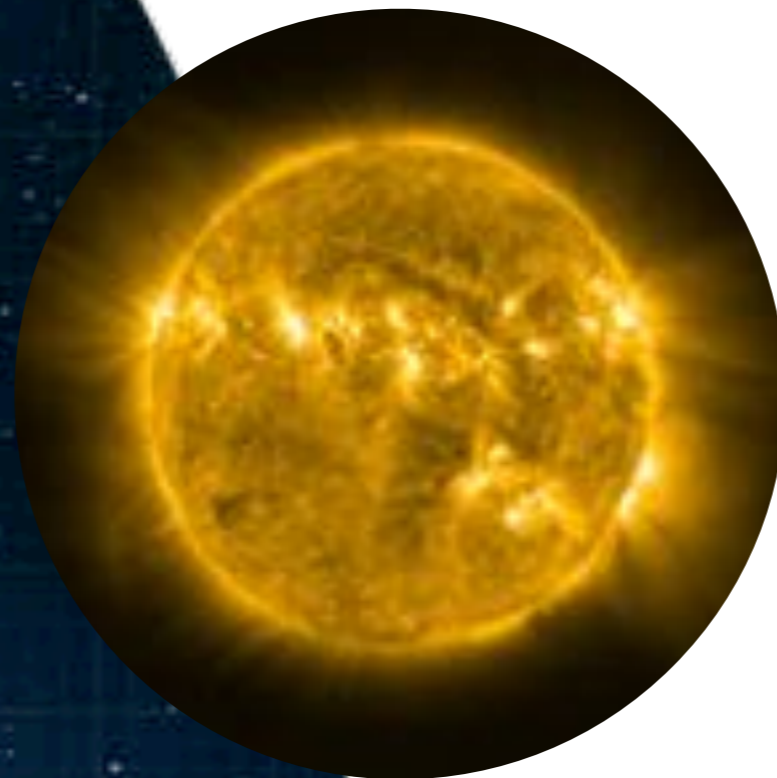
**Next up: Experience
Sounding Rockets with
Dr. Gen Vigil!**

National Aeronautics and
Space Administration



Thank you!

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