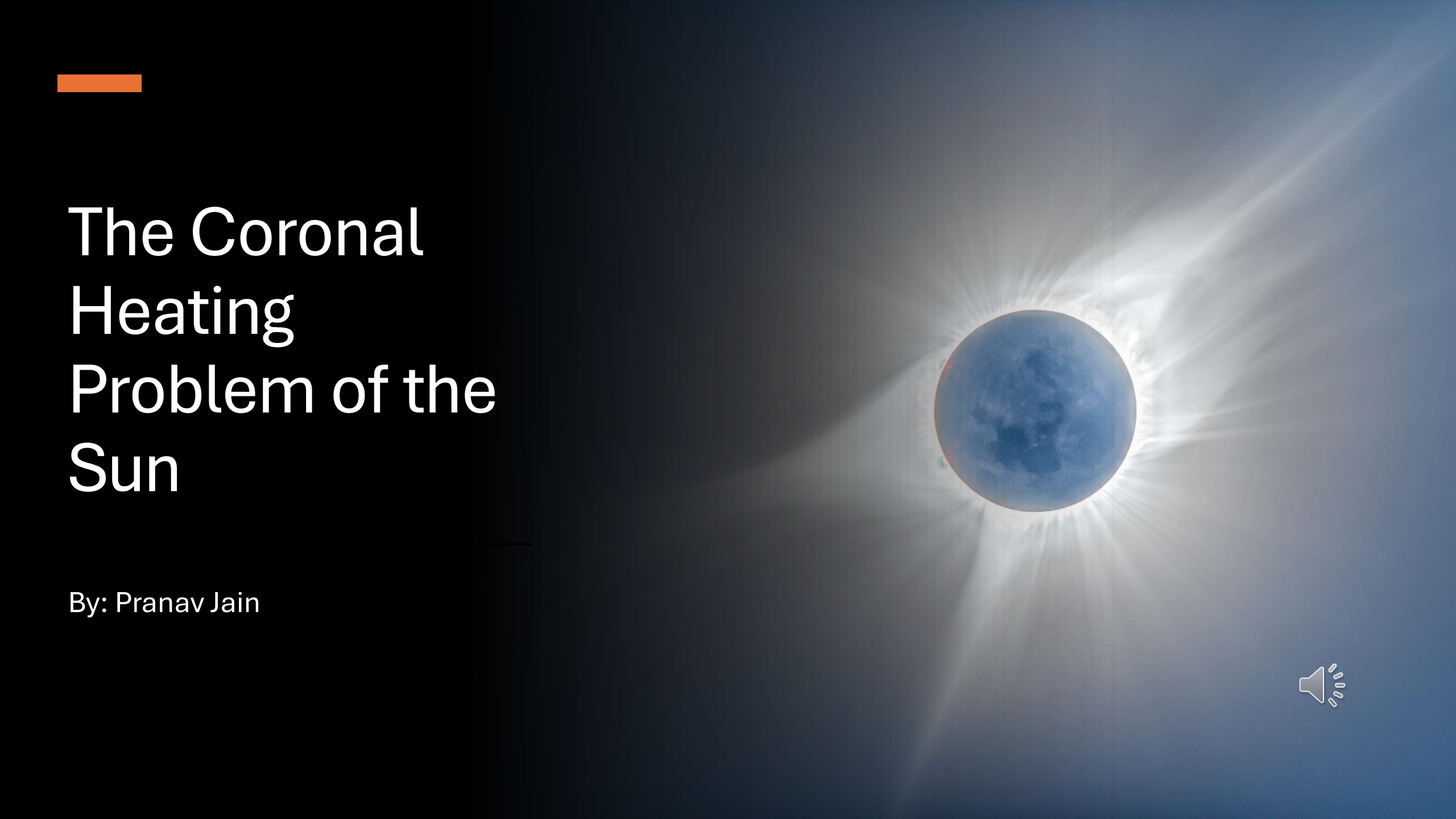
The Coronal Heating Problem of the Sun

By: Pranav Jain



Outline

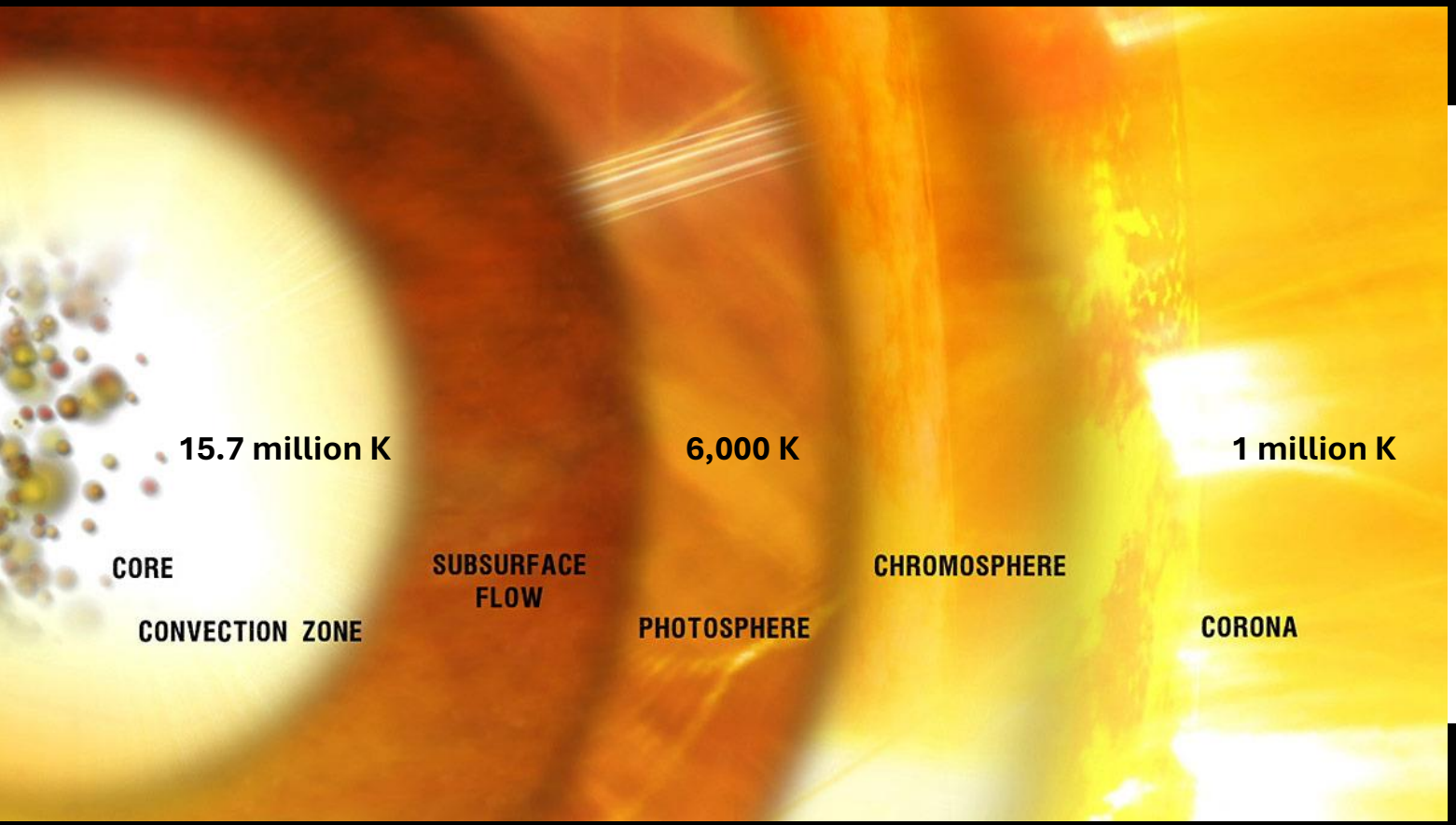
CORONAL HEATING PROBLEM

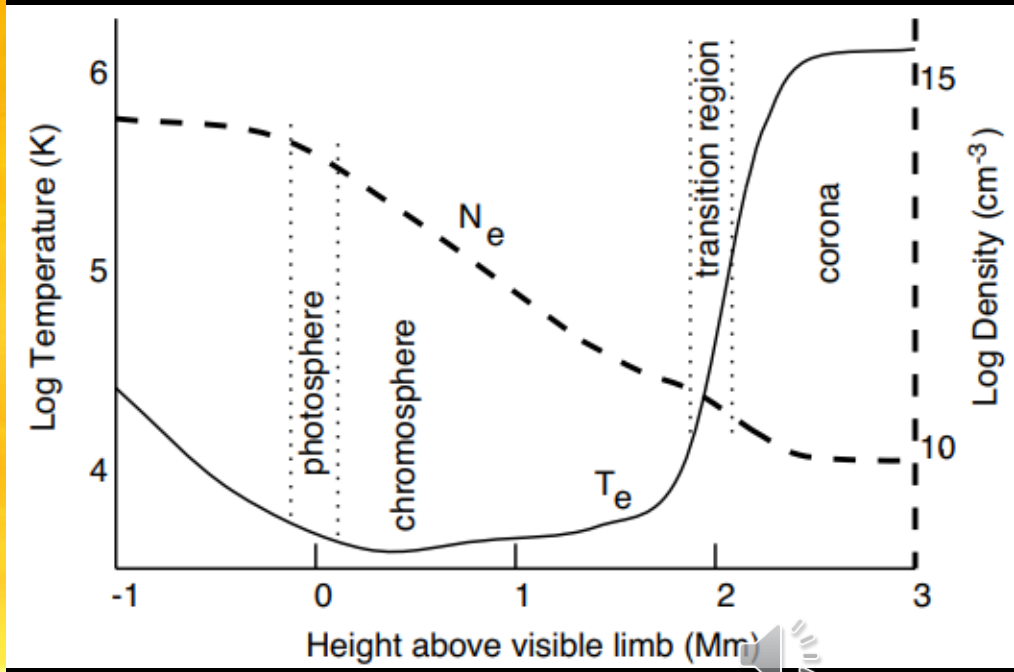
PROPOSED THEORIES

OBSERVATIONS

CONCLUSION

Coronal Heating Problem

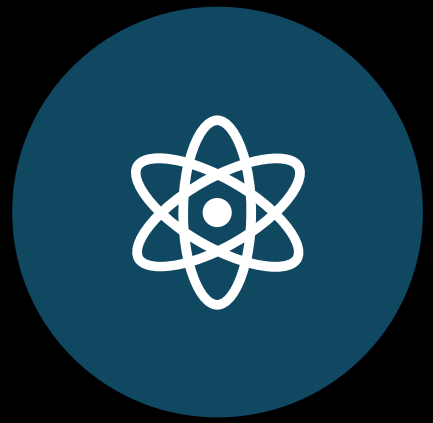




Proposed theories

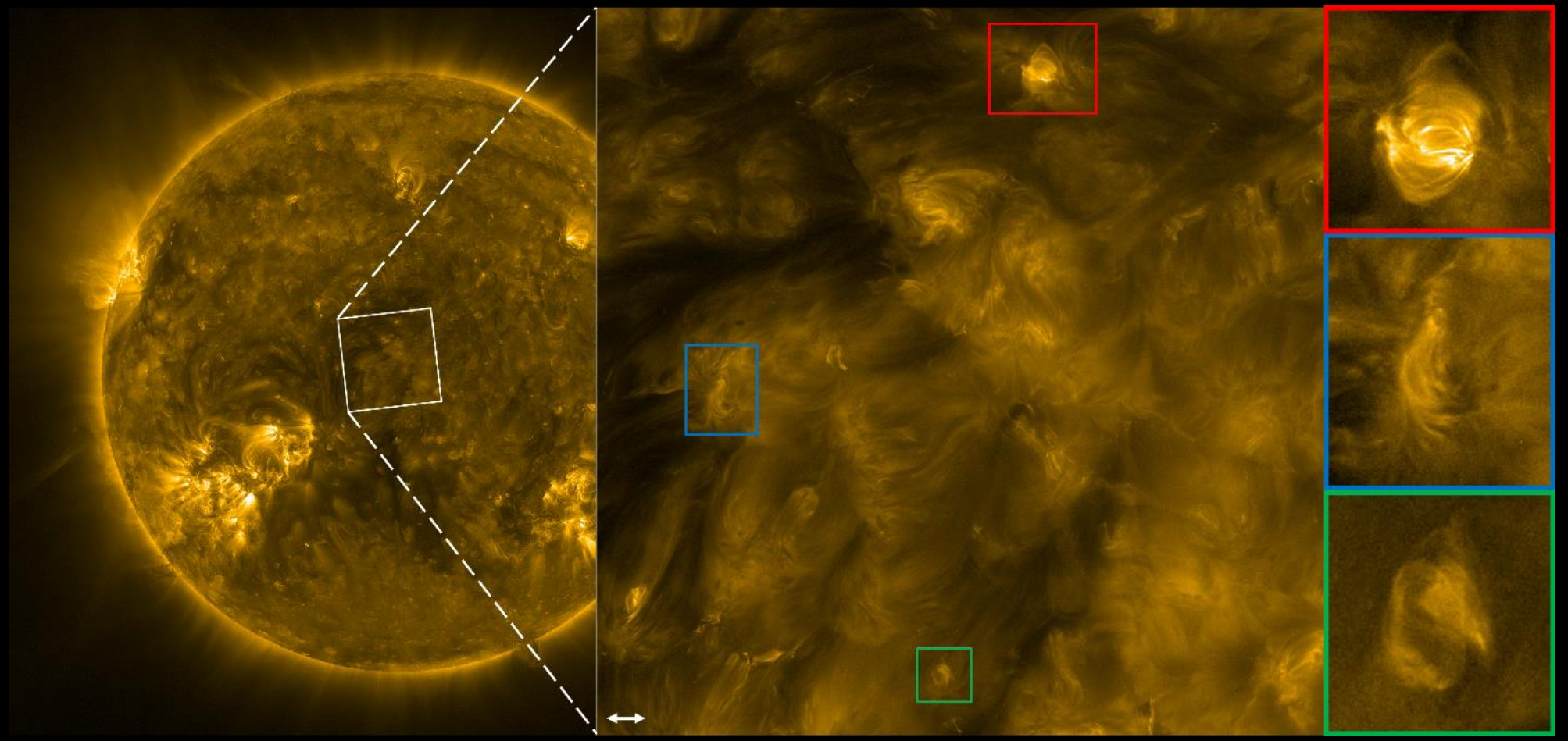
WAVE HEATING

MAGNETIC RECONNECTION



NANOFLARES

Wave Heating



Alfvén waves travel along magnetic field lines using the magnetic tension as their restoring force

Dissipation:

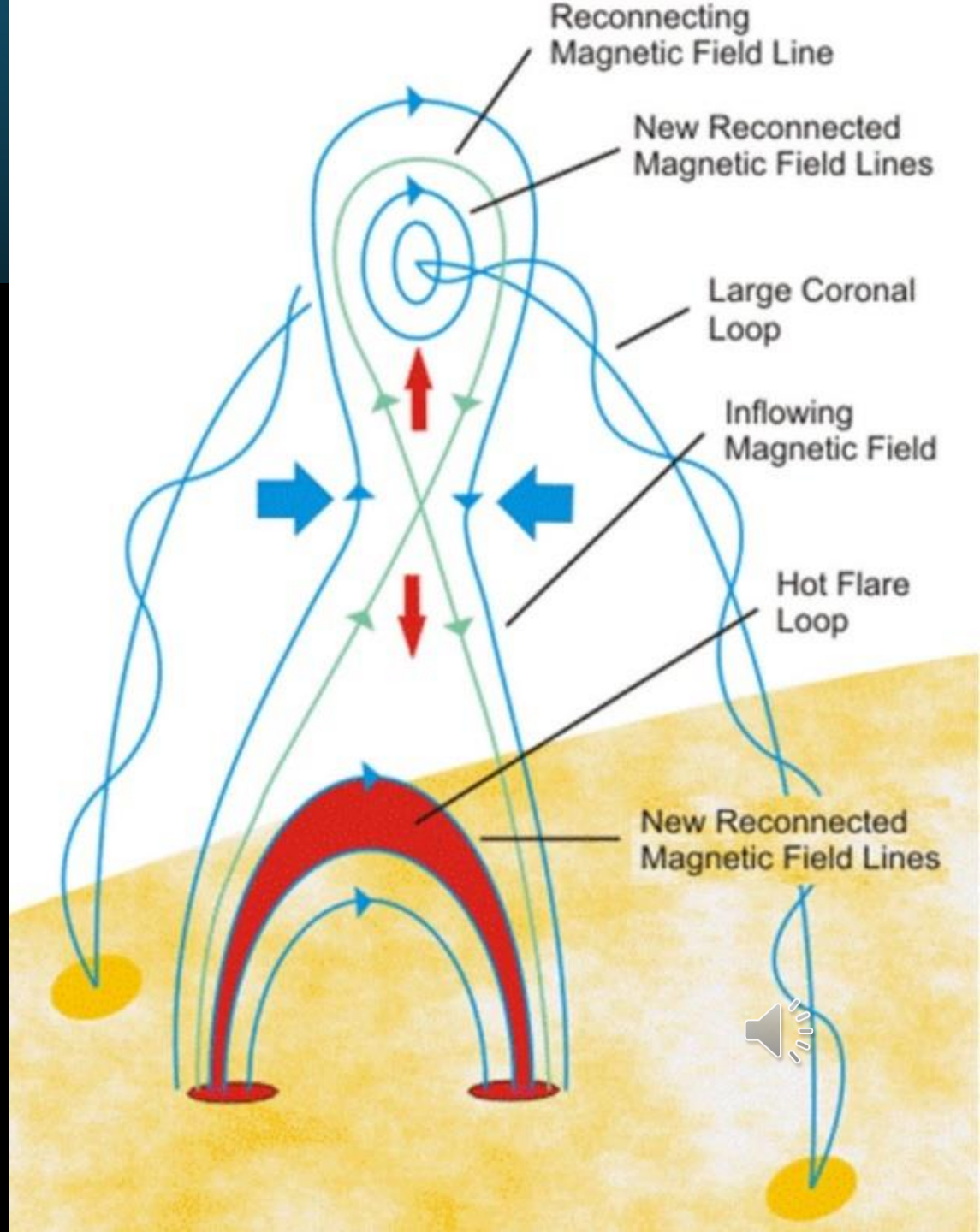
- Resonant Absorption
- Phase Mixing

Magnetic Reconnection

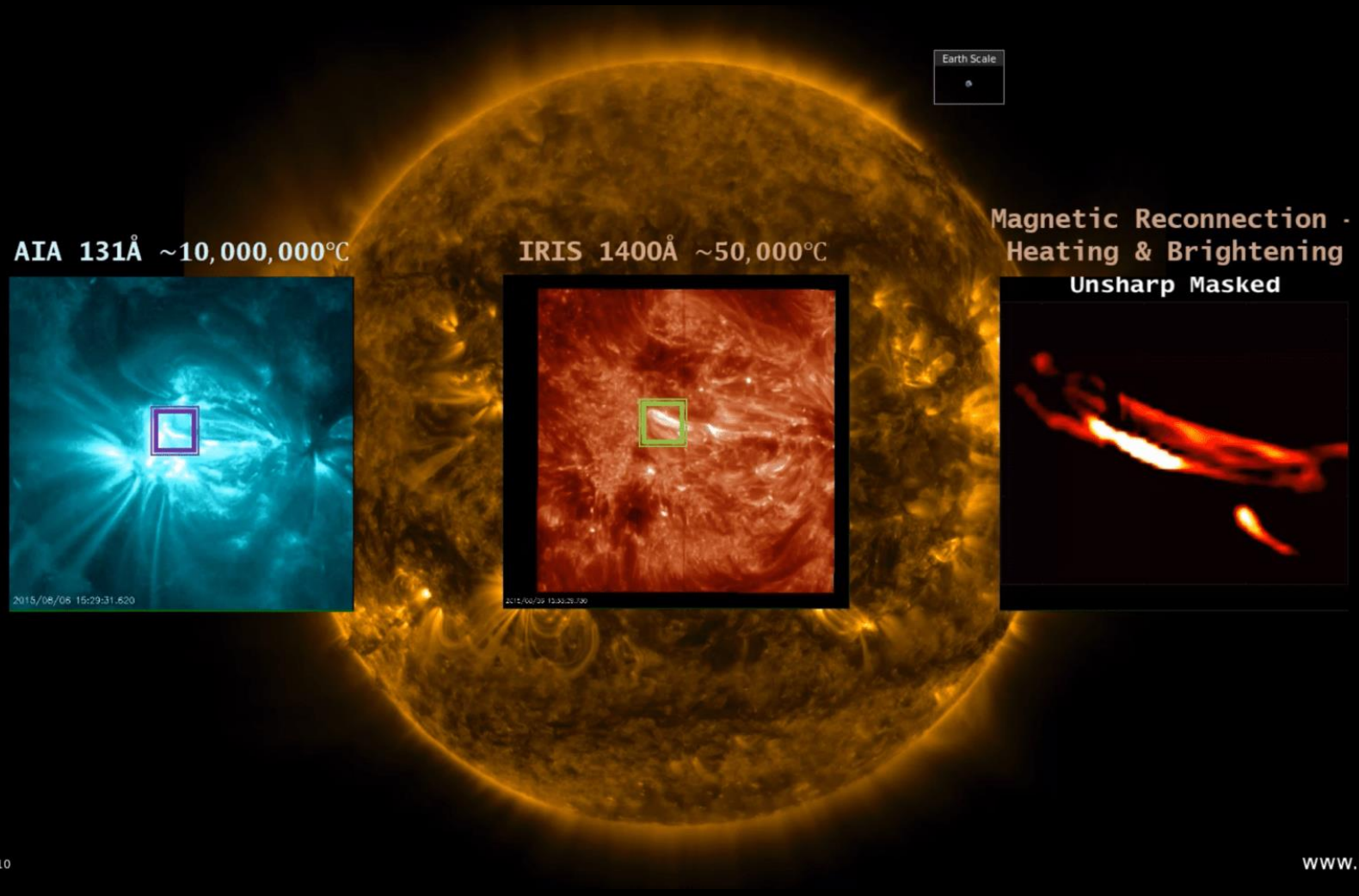
It involves oppositely directed magnetic field lines breaking and reconnecting, releasing stored magnetic energy as heat and kinetic energy.

Dissipation:

- Ohmic Heating



Nanoflares



Tiny, frequent bursts of energy that are caused by small-scale magnetic reconnection events throughout the corona

Dissipation:

- Ohmic Heating

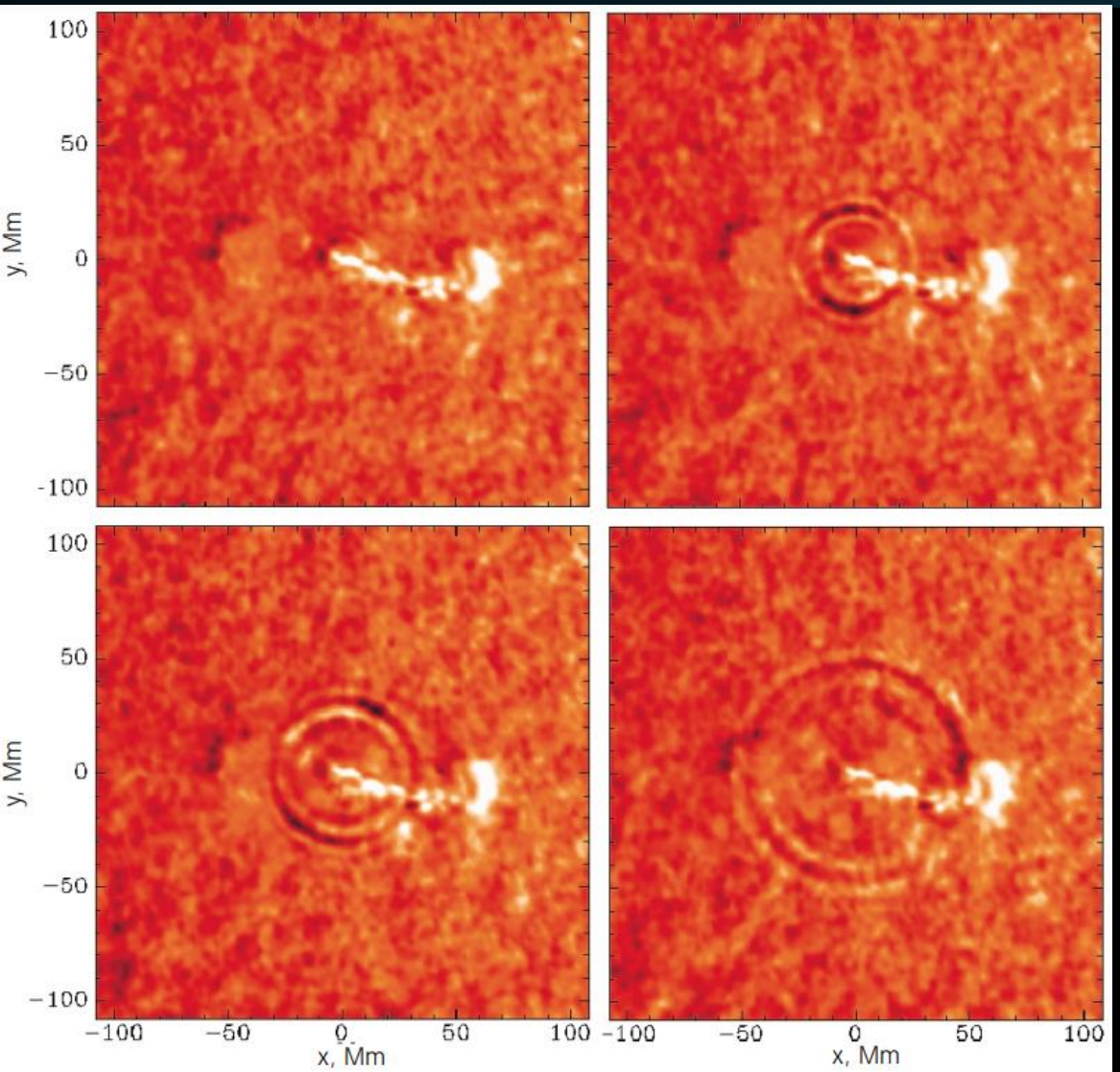
Observations

SOHO

TRACE

PARKER SOLAR PROBE

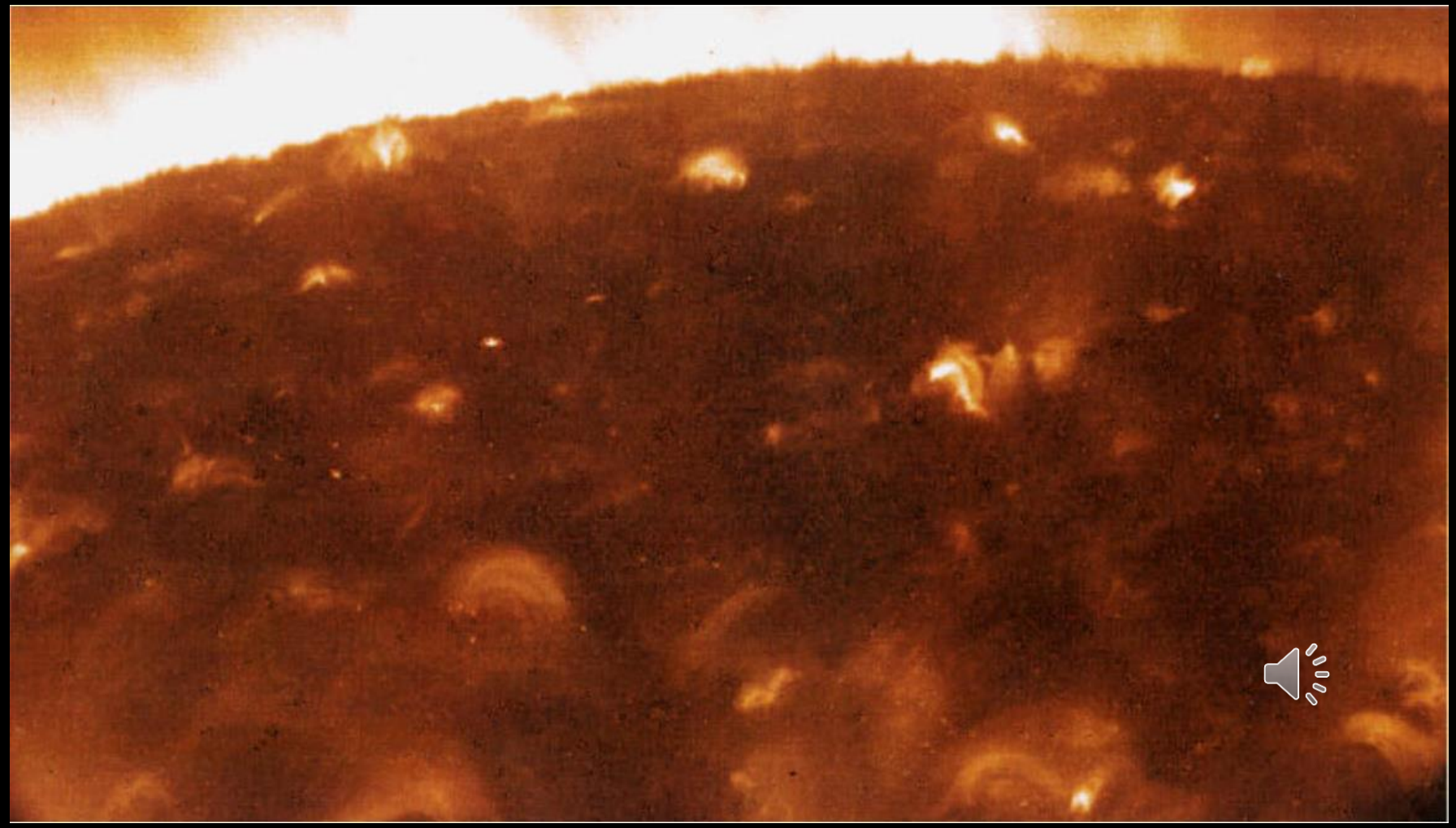
SOHO



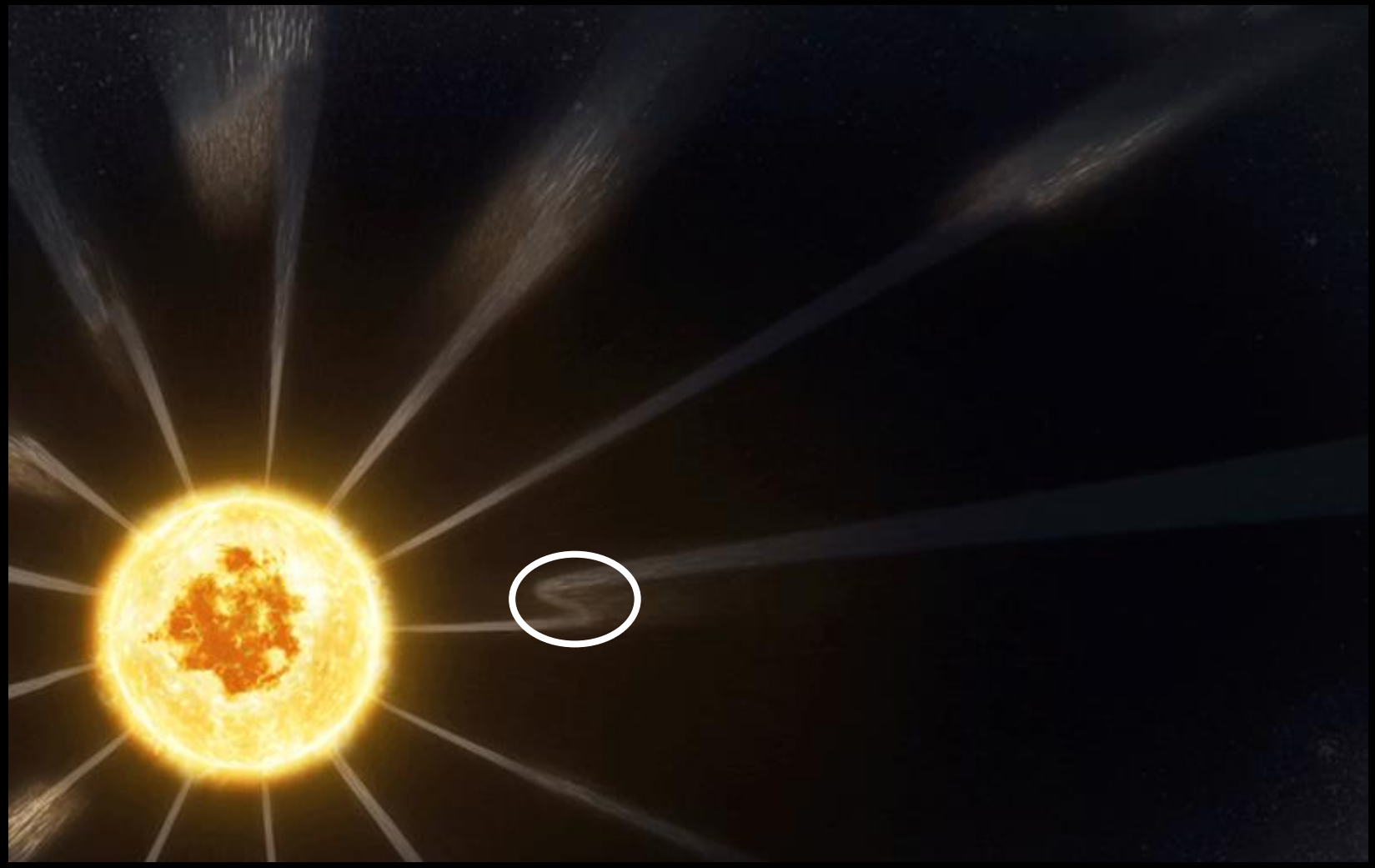
- **Launched:** December 2, 1995
- Found isothermal loops and Alfvén waves
- Observed magnetic reconnection and nanoflares

TRACE

- **Launched:** April 2, 1998
- Detected nanoflares and coronal oscillations
- Observed magnetic reconnection events

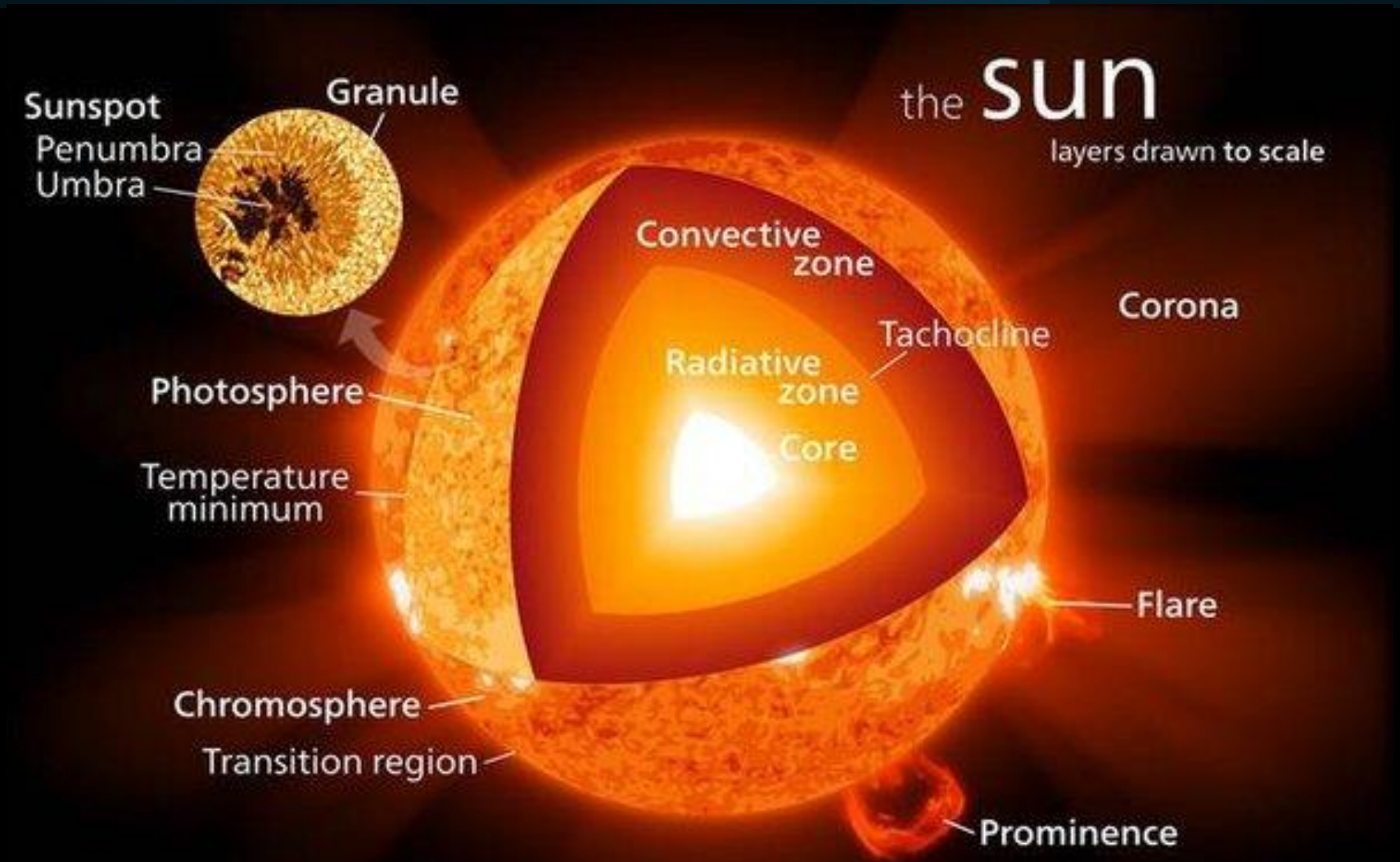


Parker Solar Probe



- **Launched:** August 12, 2018
- Observed magnetic switchbacks
- Found evidence of nanoflares and plasma waves

Conclusion


the sun
layers drawn to scale
Sunspot
Penumbra
Umbra
Granule
Photosphere
Temperature minimum
Chromosphere
Transition region
Convective zone
Tachocline
Radiative zone
Core
Corona
Flare
Prominence

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