

# Parker Solar Probe: The Coolest, Hottest Mission under the Sun!!

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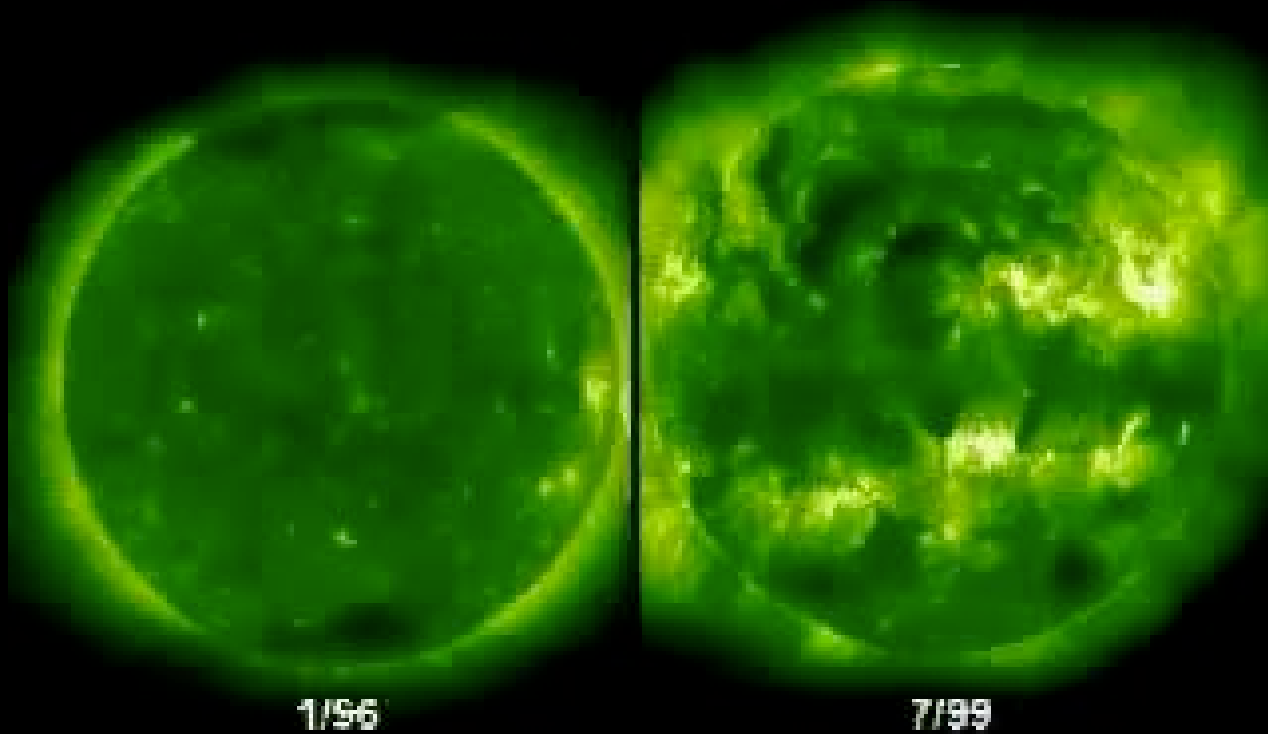
**Parker Solar Probe**

*A NASA Mission to Touch the Sun*



# Sun Earth Connections

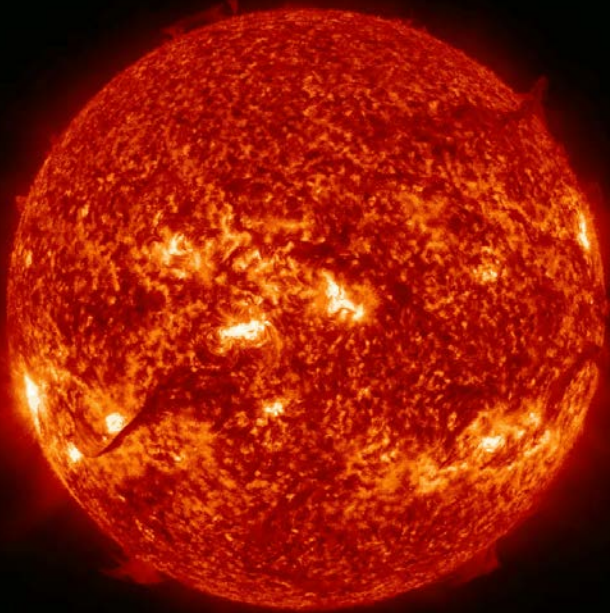
The Sun is a dynamic star



We live in the atmosphere of the Sun

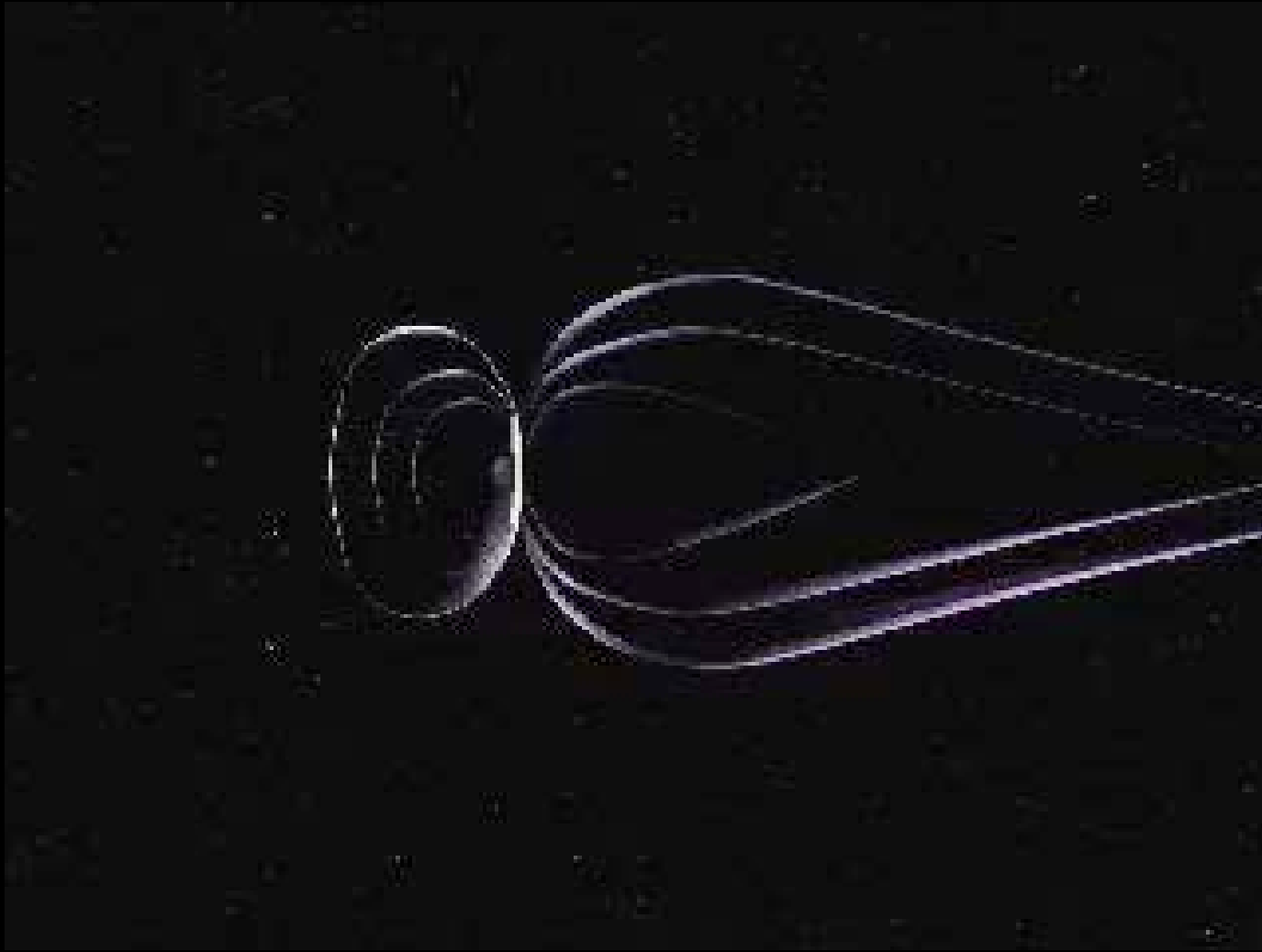
# Sun Earth Connections - from there to here

Billions of tons of solar material are hurled from the Sun at millions of miles an hour



When the material reaches the Earth it interacts with our protective magnetic field

# The Earth's Magnetosphere

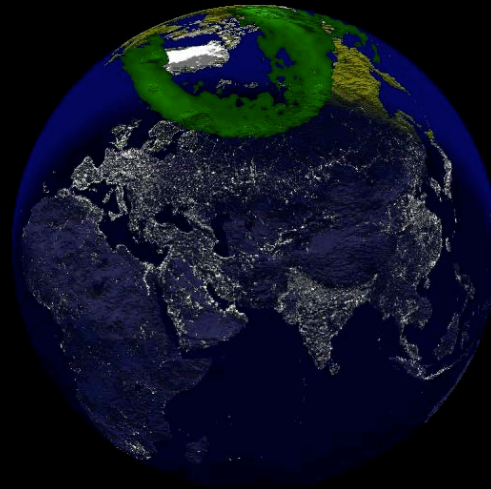


Dangerous electron and protons are not able to penetrate down to Earth's surface but are forced to move around it by the magnetic field.

# Sun Earth Connections

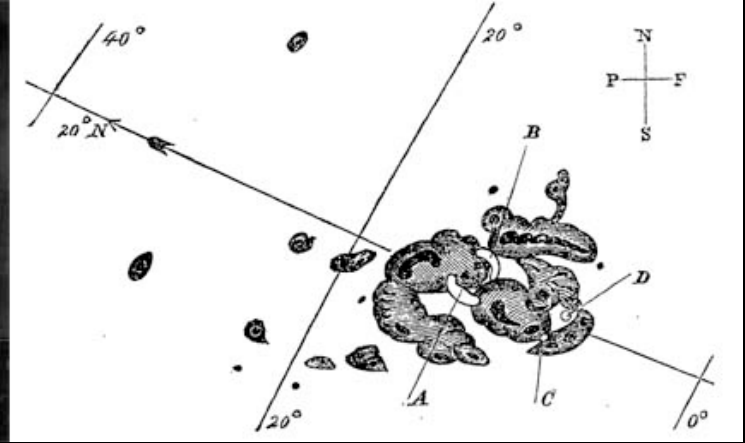
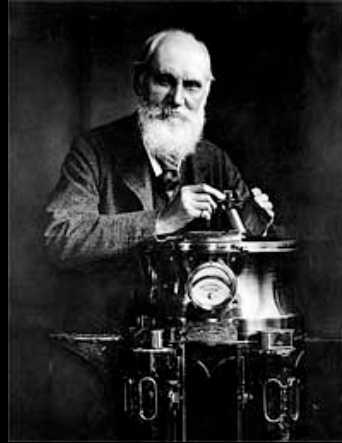
Earth responds to the changing Sun

- this response is known as Space Weather



The Aurora is a physical sign of this Space Weather

# Our Violent Sun



EUVI A: 2011-06-07 05:30:30 UT



# The mysterious corona



Picture of Sun's corona taken from the ground at the same instant.

The corona extends far from the Sun and deep into space, rising from the Sun in streams.

# The Mysterious Corona

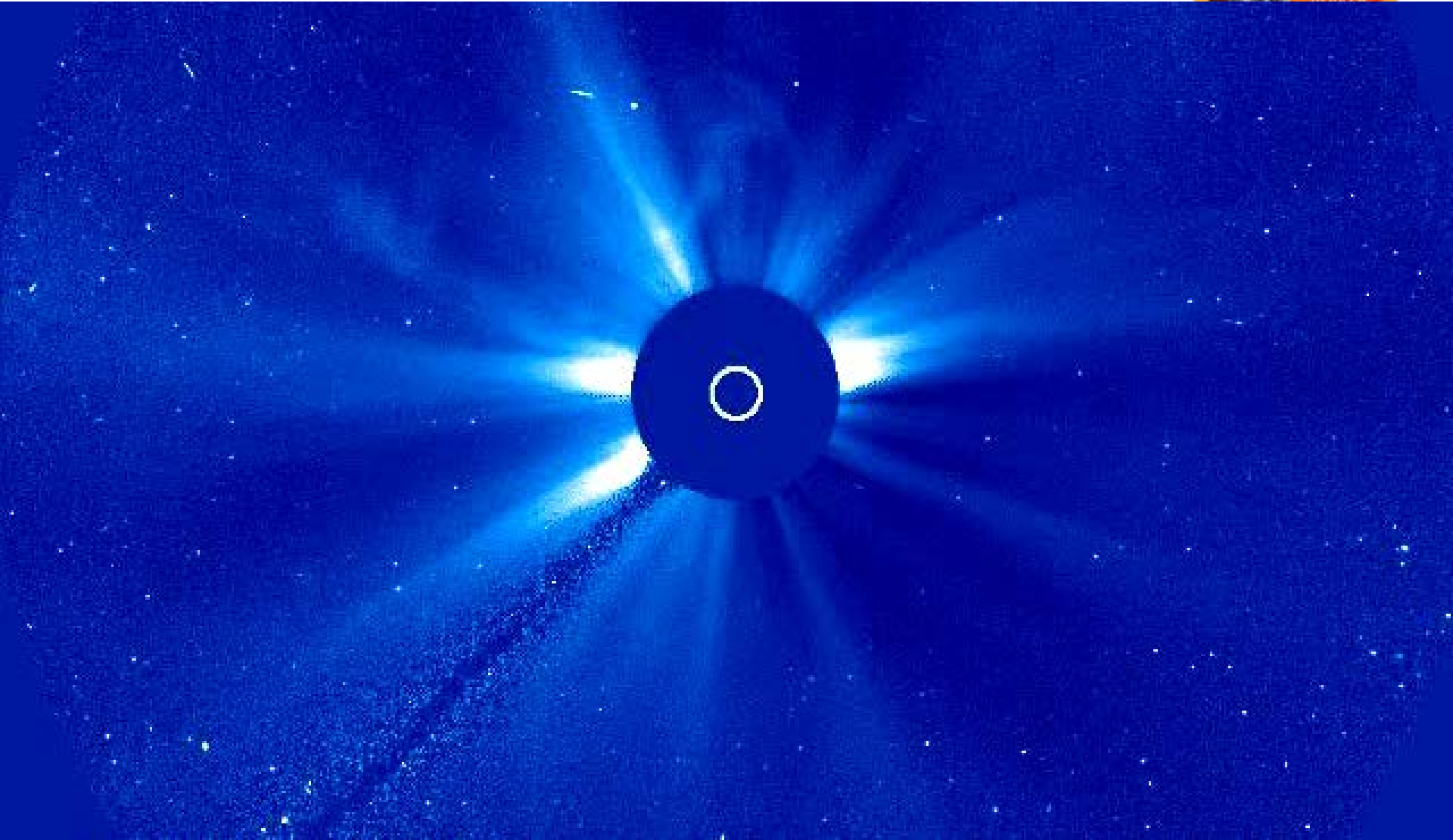


**The Mystery number 1  
The temperature rises as you  
move away from the surface!**

6,000 degrees K



# What does the escaping atmosphere “look like”?



# What does the escaping atmosphere “look like”?

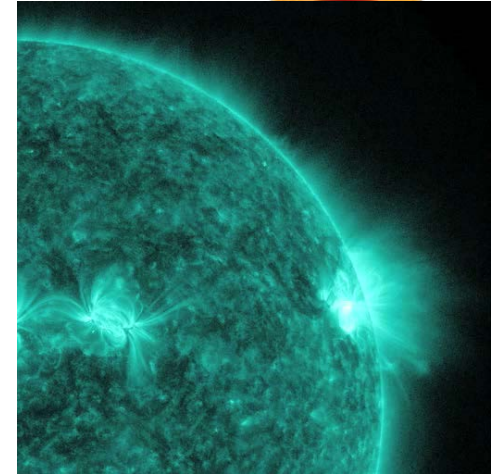


**Mystery number 2**  
**How does this “solar wind” get**  
**continually accelerated?**

# Physics of the Corona: The Missing Link



- Key, lacking measurements are local and in-situ
- Current remote and global observations reveal phenomenology
  - Images reveal global structure – but we have to look through the atmosphere rather than taking pictures in the region of interest
  - Other measurements can estimate average speeds but do not include the necessary details
- No consistent, physics-based, theories can explain the mysteries of the corona and solar wind



The energy rate from a flare is the equivalent of millions of 100-megaton hydrogen bombs exploding at the same time

# Almost 60 years into the space age and we still don't understand the corona and solar wind



- Calls for a “solar probe” actually predate NASA, but only recently has our technology caught up with our desire.
- Mission concept decades old – since Simpson Committee in 1958
- Some older concepts had:
  - Perihelia as close as 4Rs
  - Jupiter gravity assists
  - 1-2 Perihelia
  - RTG-powered spacecraft



# But why haven't we done this yet???



- Only recently has our technology caught up with our needs.

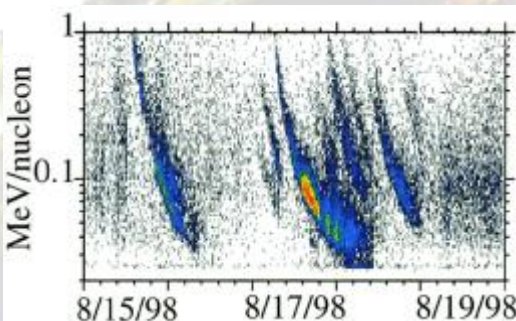
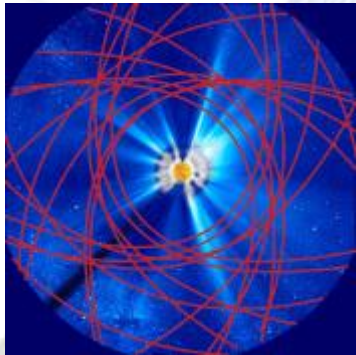
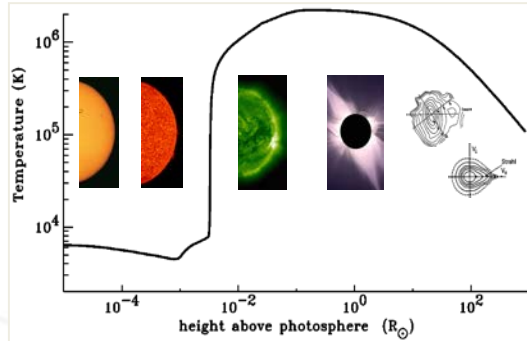


1962 GPO 706L  
in glossy black  
Diakon



iPhone 7

# Parker Solar Probe Science



- **Parker Solar Probe will study how energy flows out of the Sun, why the solar corona is so hot and to what makes the solar wind go so fast.**
  - Trace the flow of energy that heats and accelerates the solar corona and solar wind.
  - Determine the structure and dynamics of the plasma and magnetic fields at the sources of the solar wind.
  - Explore mechanisms that accelerate and transport energetic particles.

Get to within 4% (below 10 Rs) Sun-Earth distance

10 SOLAR RADII

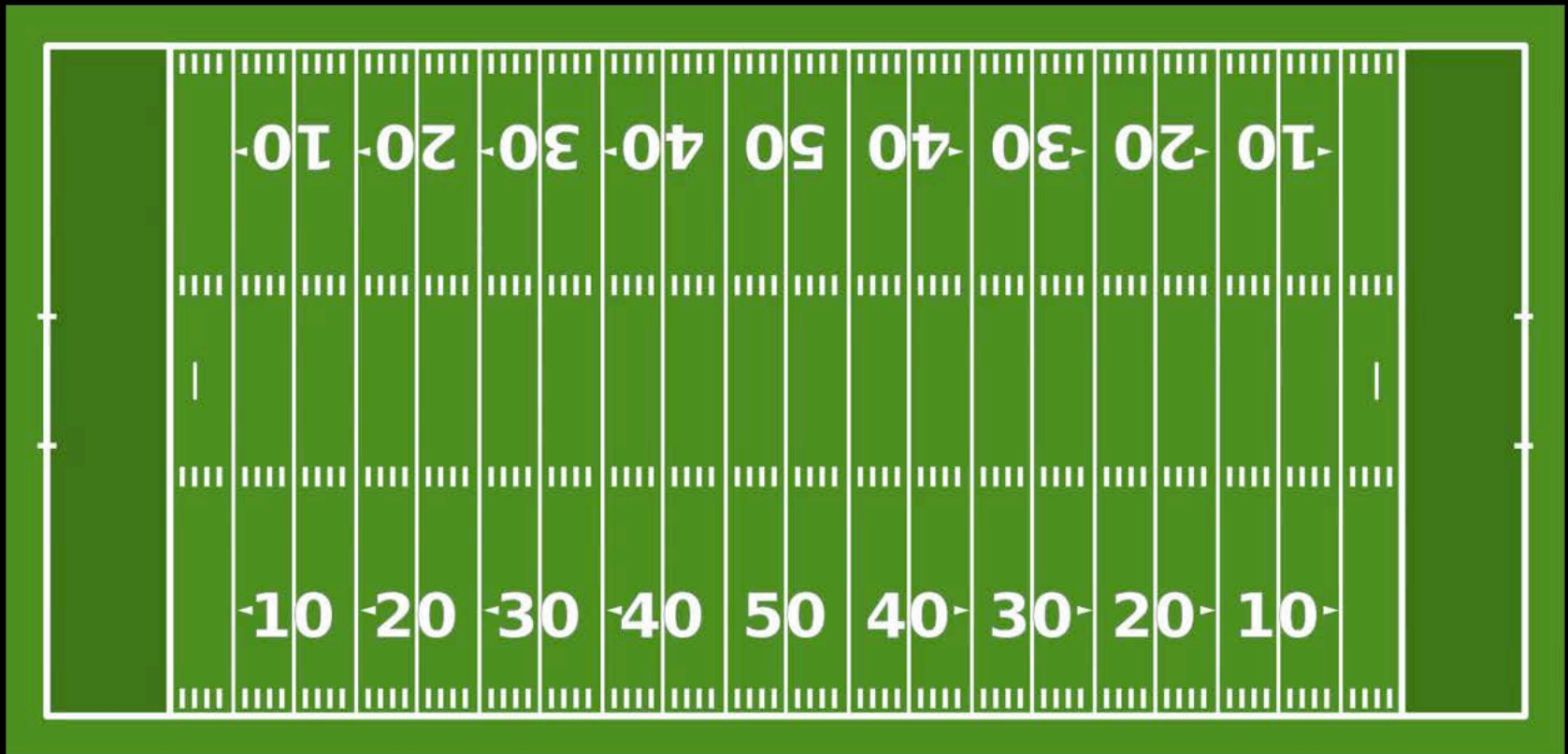


# The Mission of the Parker Solar Probe





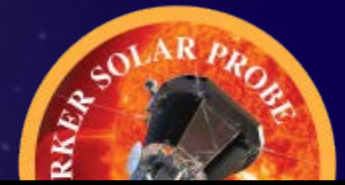
If the distance from the Earth to the Sun was one football field...



Object sizes not to scale.

# Parker Solar Probe

## A NASA Mission to Touch the Sun



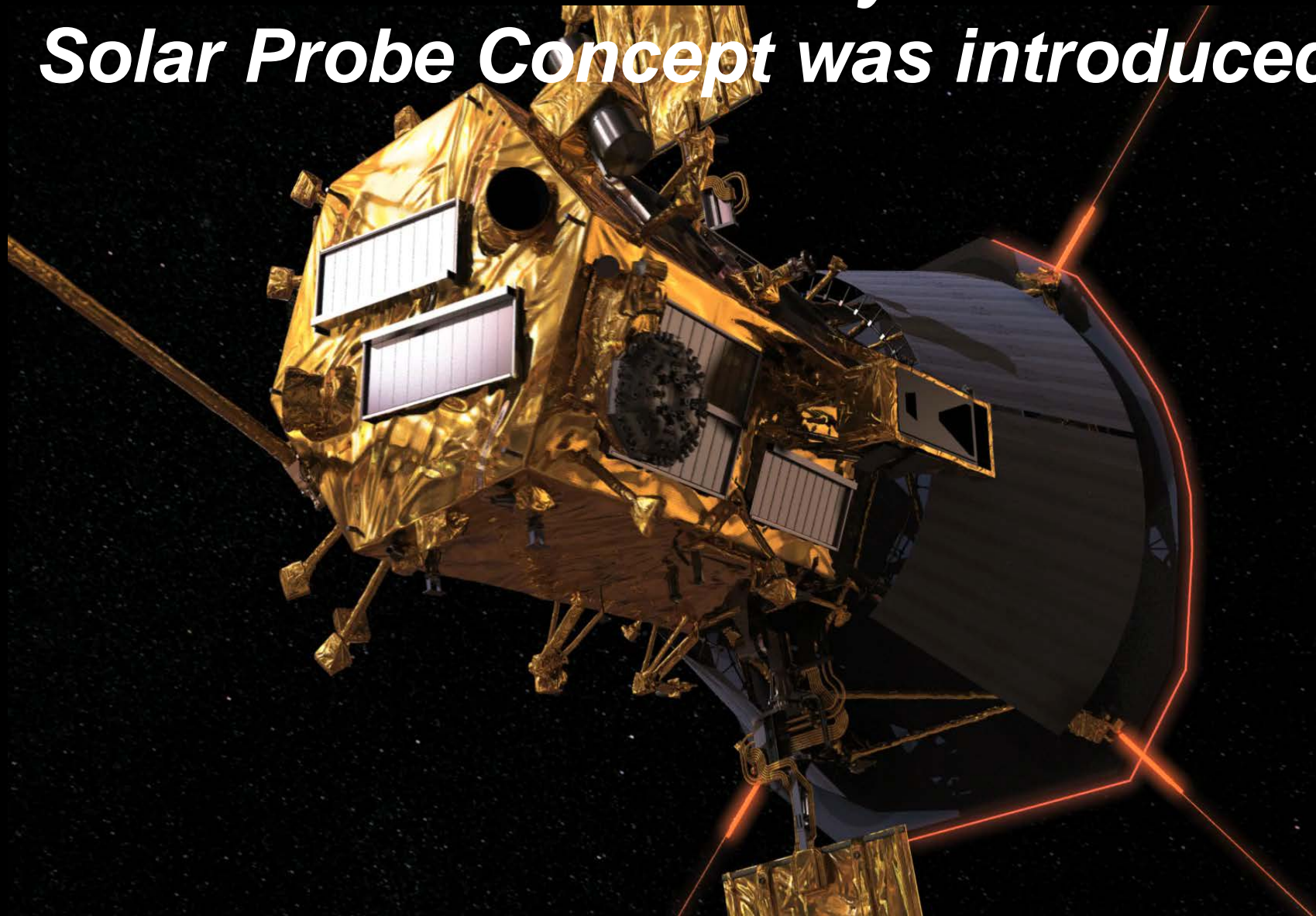
Extraordinary and historic mission exploring arguably the last (and most important) region of the solar system to be visited by a spacecraft to finally answer top-priority science goals for over five decades

But we don't do this just for the basic science.

One recent study by the National Academy of Sciences estimated that without advance warning a huge solar event could cause two trillion dollars in damage in the US alone, and the eastern seaboard of the US could be without power for a year.

In order to unlock the mysteries of the corona, but also to protect a society that is increasingly dependent on technology from the threats of space weather, we will send Parker Solar Probe to touch the Sun.

***It has been almost 60 years since the Solar Probe Concept was introduced. . .***



***We are on our way!***