

with Science at Eclipses and

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Scientific efforts enhance public's eclipse appreciation

The New York Times.

MONDAY, NOVEMBER 10, 1919.

LIGHTS ALL ASKEW IN THE HEAVENS

Men of Science More or Less
Agog Over Results of Eclipse
Observations.

EINSTEIN THEORY TRIUMPHS

Stars Not Where They Seemed
or Were Calculated to be,
but Nobody Need Worry.

VIDEO: NASA scientists travel to Exmouth for total eclipse

Posted Mon 17 Apr 2023 at 11:18pm



STUDYING THE SUN

NEWS



What scientists hope to learn from the eclipse

By Ashley Strickland, CNN
Updated 9:52 PM EDT, Sun August 20, 2017





(Modern) Unique Opportunities for Science

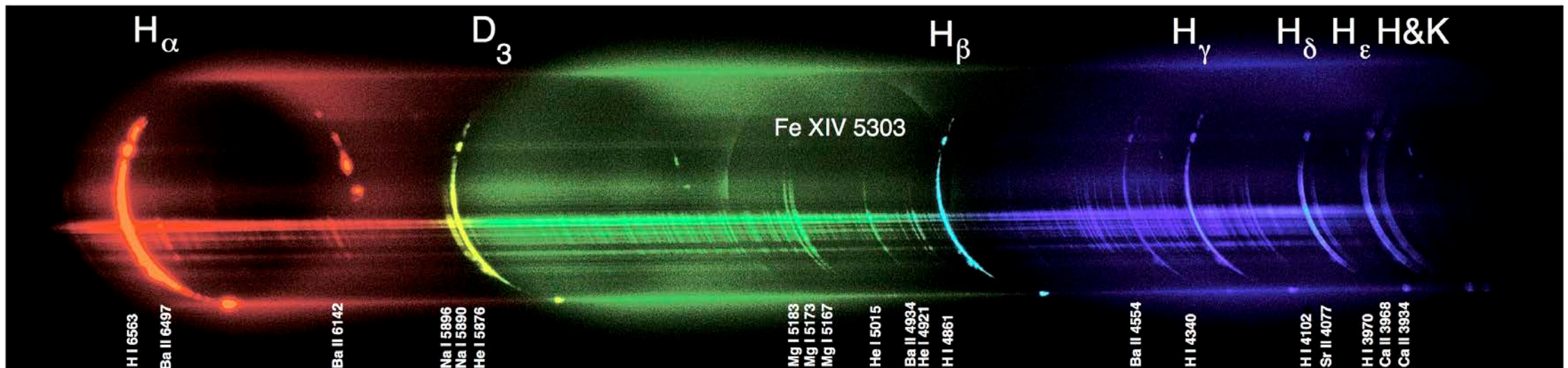
Observing Advantages

- Low scattered light
- View of inner corona
- High time cadence
- Extended duration (e.g. CATE2024)

What Can We Measure

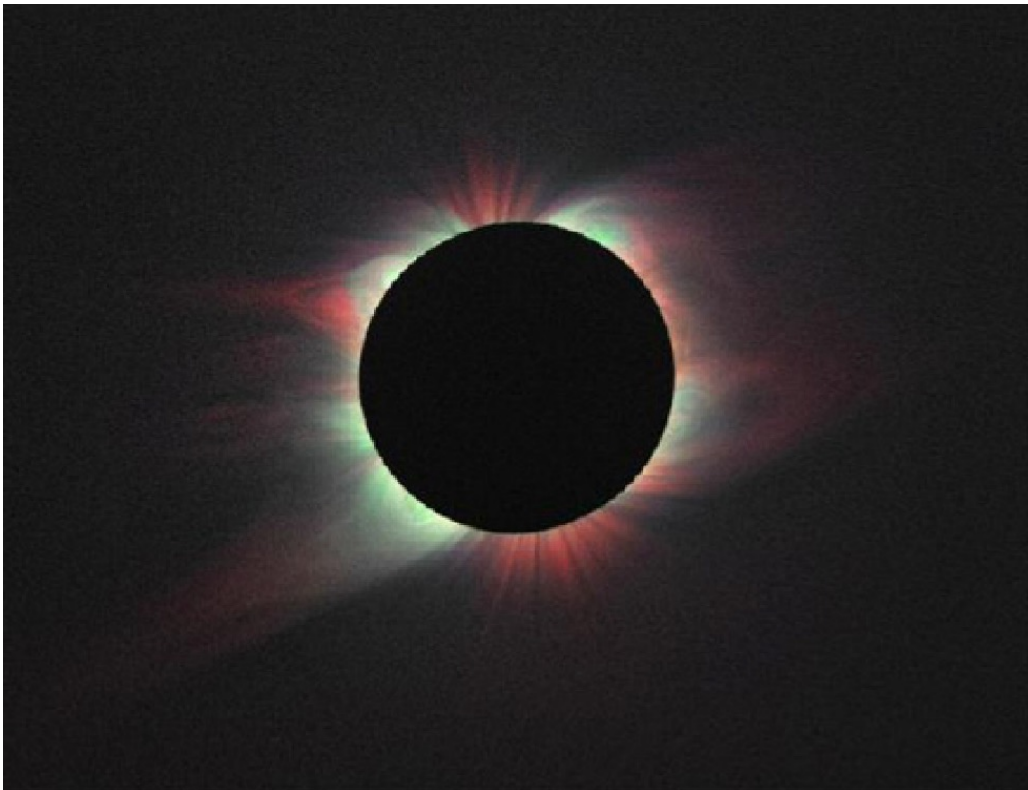
- Temperatures
- Densities
- Magnetic Structures
- Waves or Changes

Most Powerful Tool - Spectroscopy!



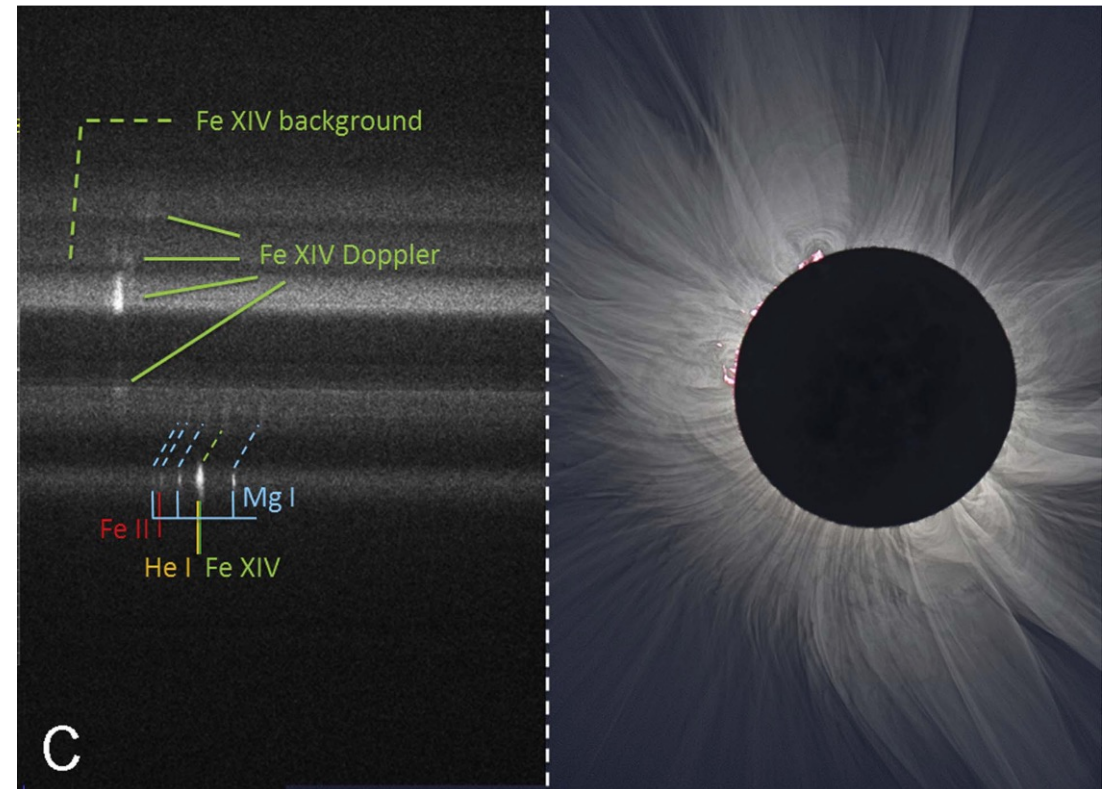
Different Types of Spectroscopy

Filter Spectroscopy



Habbal et al., 2010, ApJ, **708**

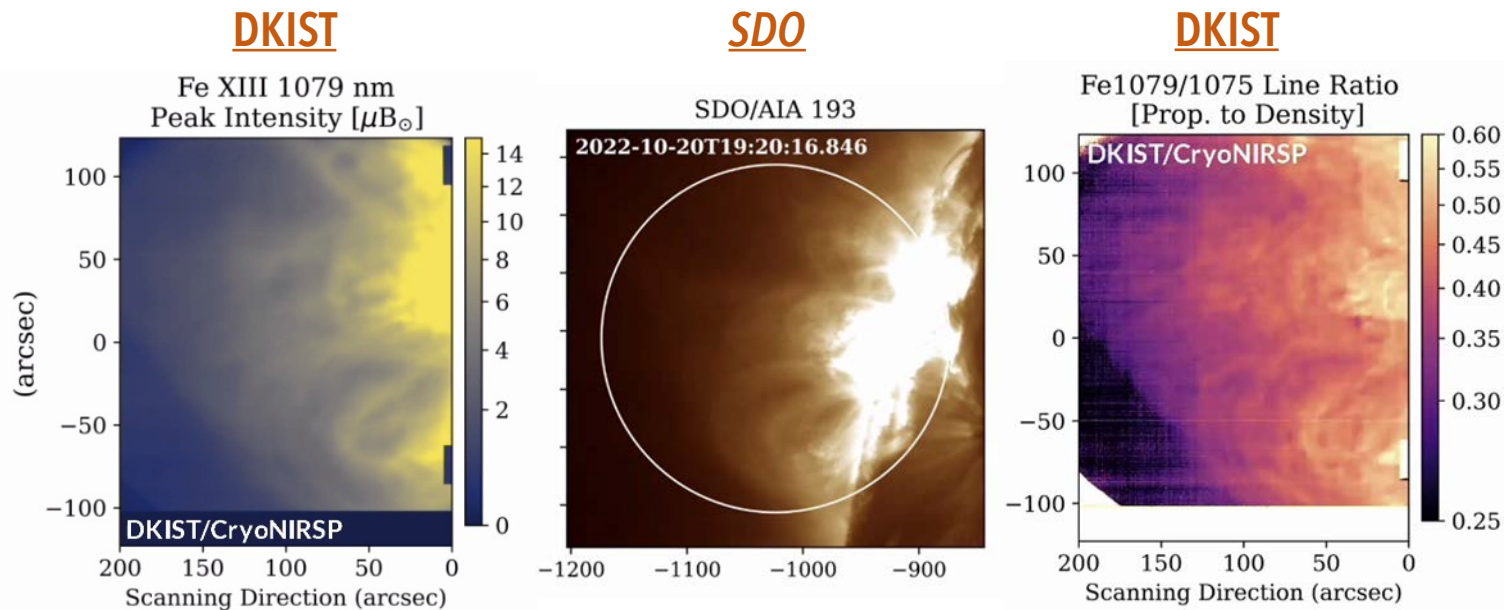
Grating Spectroscopy



Ding and Habbal, 2017, ApJL, **842**

Spectroscopy outside of Eclipses – DKIST Science with eclipse

- DKIST is a four-meter, off-axis, solar telescope on Haleakāla, Hawai'i
- Can function as a coronagraph – observes the corona outside of eclipses
- Maps densities & temperatures of ions → comparisons with eclipse electron corona
- DKIST can also measure coronal magnetic fields



Daniel K Inouye Solar Telescope



Non-Eclipsed Observations

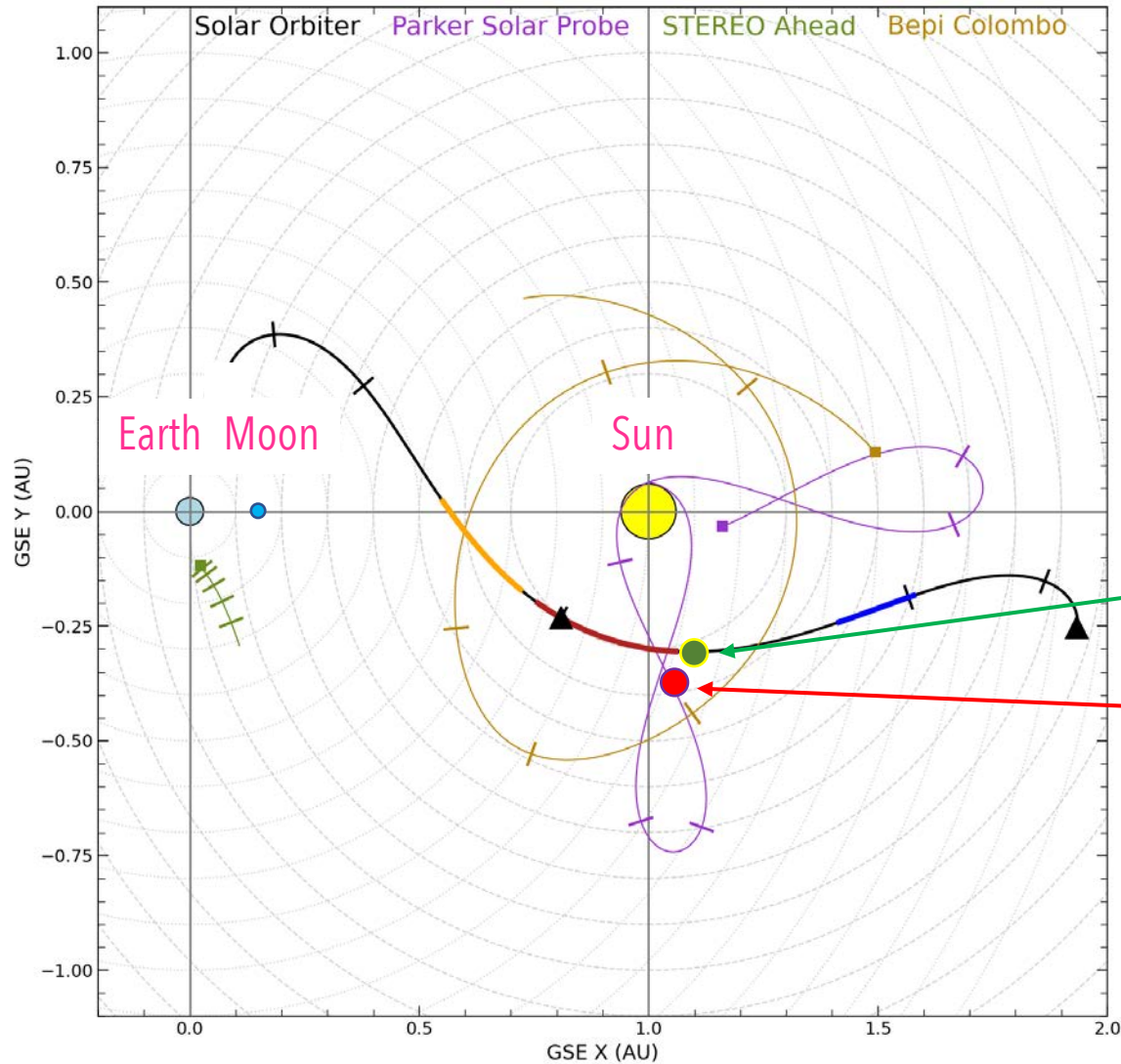
Observatories outside of the path of totality can observe the Sun at the same time and derive important, complementary information

For 2023 and 2024 eclipses:

- Solar Dynamics Observatory
- IRIS
- Very Large Array
- Extended Owens Valley SolarArray
- Big Bear Solar Observatory
- Dunn Solar Telescope (NMSU)
- COMP

- Solar Orbiter
- Parker Solar Probe **in quadrature!**

Spacecraft quadrature



Scientific driver:

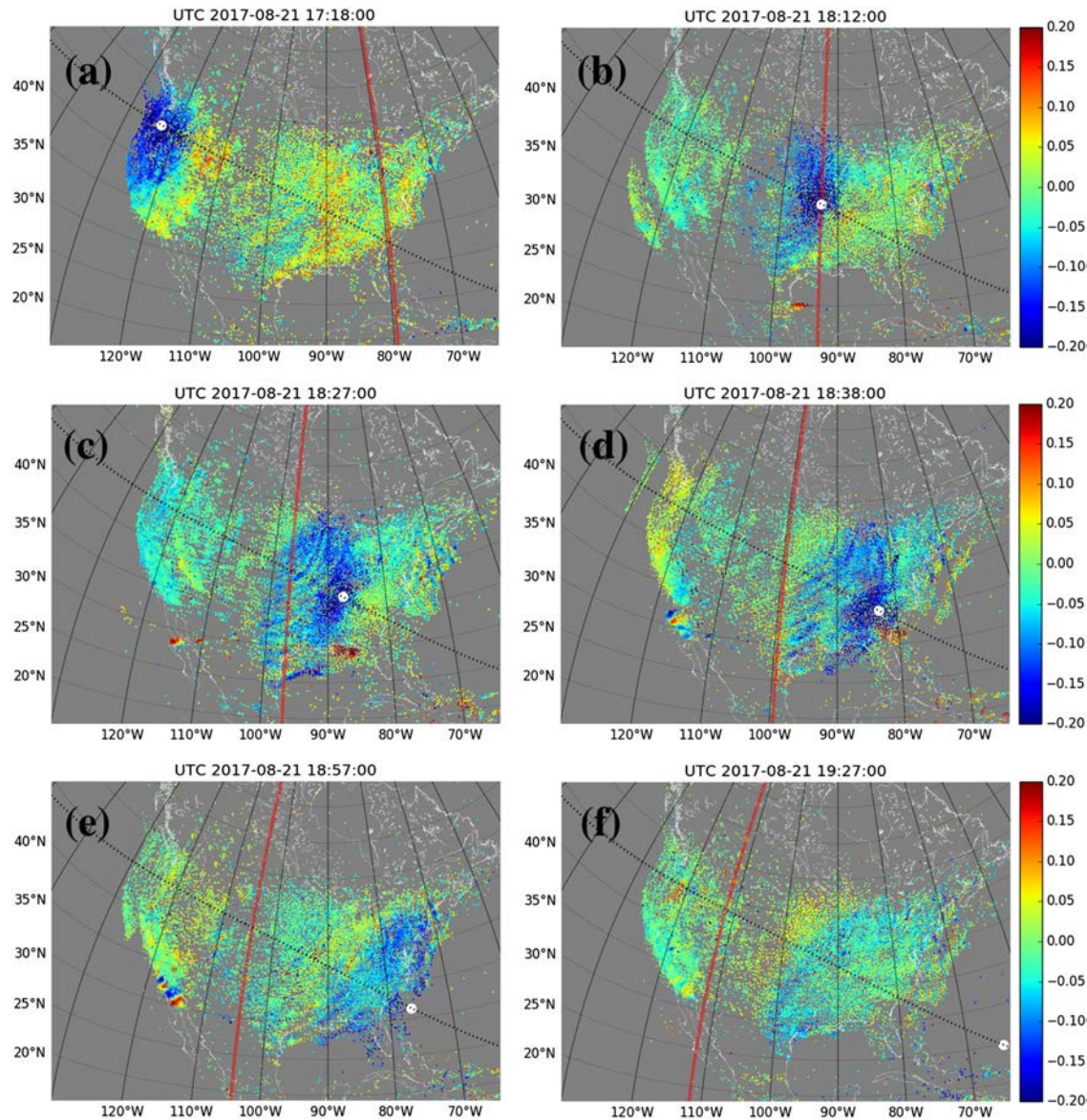
Can measurements in the totality path & DKIST help understand the near-Sun in-situ measurements by PSP and Solar Orbiter?



spacecraft positions on 08 April 2024

Effects on Earth's Atmosphere

Supersonic passage of shadow (a temperature perturbation) can create ***ionospheric Disturbances***, akin to a bow wave



Zhang et al., 2017