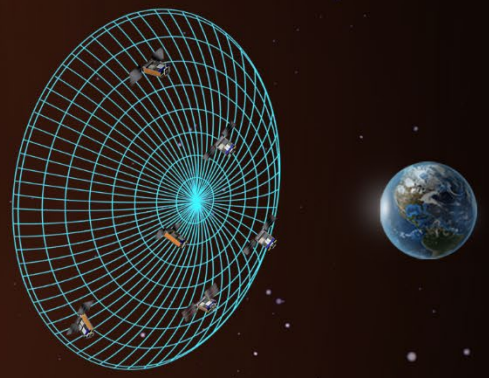
The Sun Radio Interferometer Space Experiment (SunRISE)



Justin C. Kasper, University of Michigan

NESS Steering Committee Meeting
Boulder CO September 24 2019

UNIVERSITY OF MICHIGAN

JPL
Jet Propulsion Laboratory
California Institute of Technology

Space Dynamics LABORATORY
Utah State University Research Foundation

SunRISE
Sun Radio Interferometer Space Experiment

PRINCIPAL INVESTIGATOR: Justin C. Kasper (University of Michigan)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Mission concept and status

SunRISE
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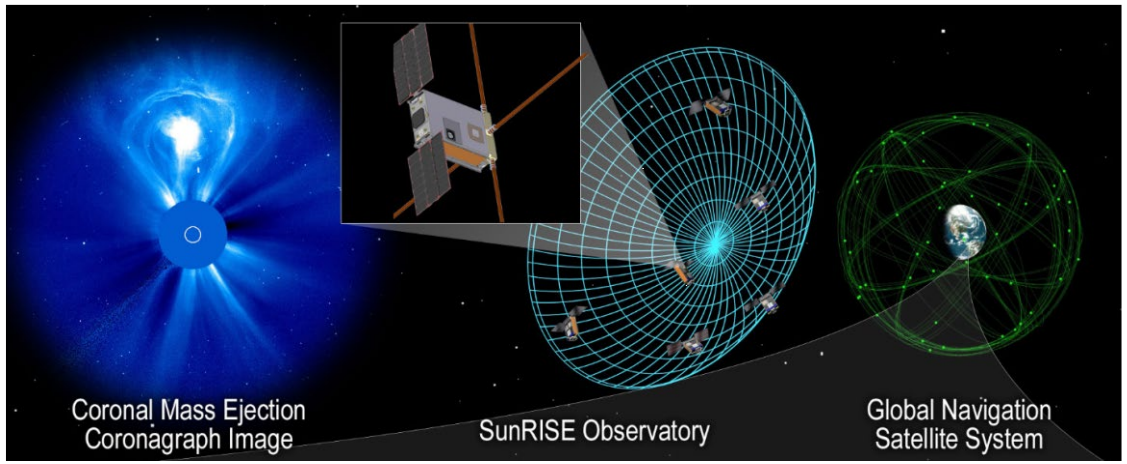
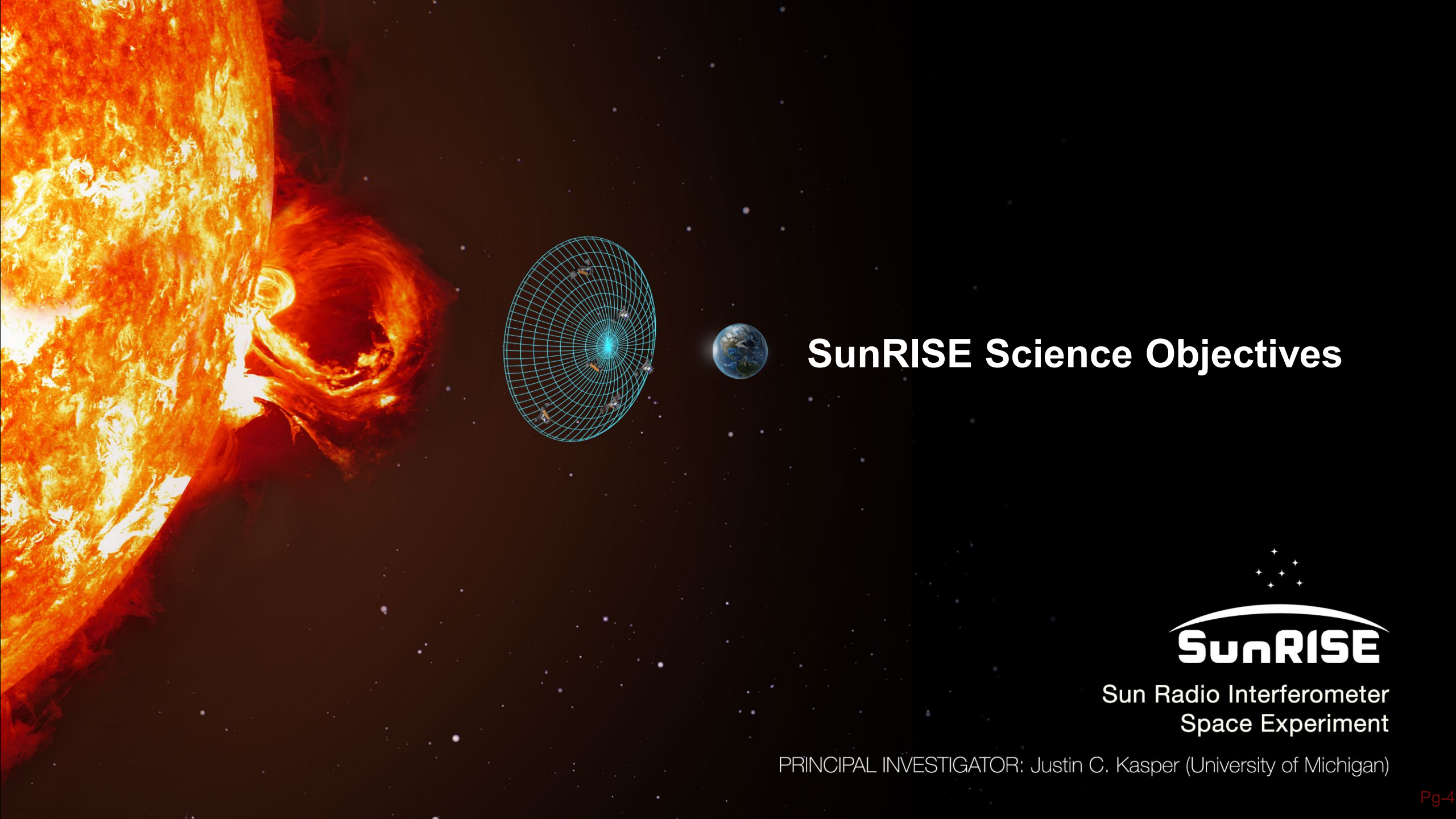


- Selected in 2016 NASA Heliophysics Explorer Mission of Opportunity ($55M standalone mission) for Phase A concept study
  - Phase A Concept Study Report delivered in summer 2018
  - February 25, 2019 – Selected into an Extended Phase A to address value of launching a year later, validate cost and benefit of extending Phase E from 6 months to one year
  - Launch no earlier than March 2023, one year prime mission
- Six small spacecraft fly in loose formation, 10 km diameter, above geosynchronous orbit 25 hour period orbit
- Each spacecraft has 4m crossed dipole antennas and a 0.1-20 MHz dual polarization receiver
- Deployed from back of a communications satellite
- Simultaneous recording of 0.1-20 MHz radio emission from sky and Global Navigation Satellite System recorded for navigation and timing



SunRISE Science Objectives

SunRISE

Sun Radio Interferometer
Space Experiment

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Coronal Mass Ejections and Solar Energetic Particles

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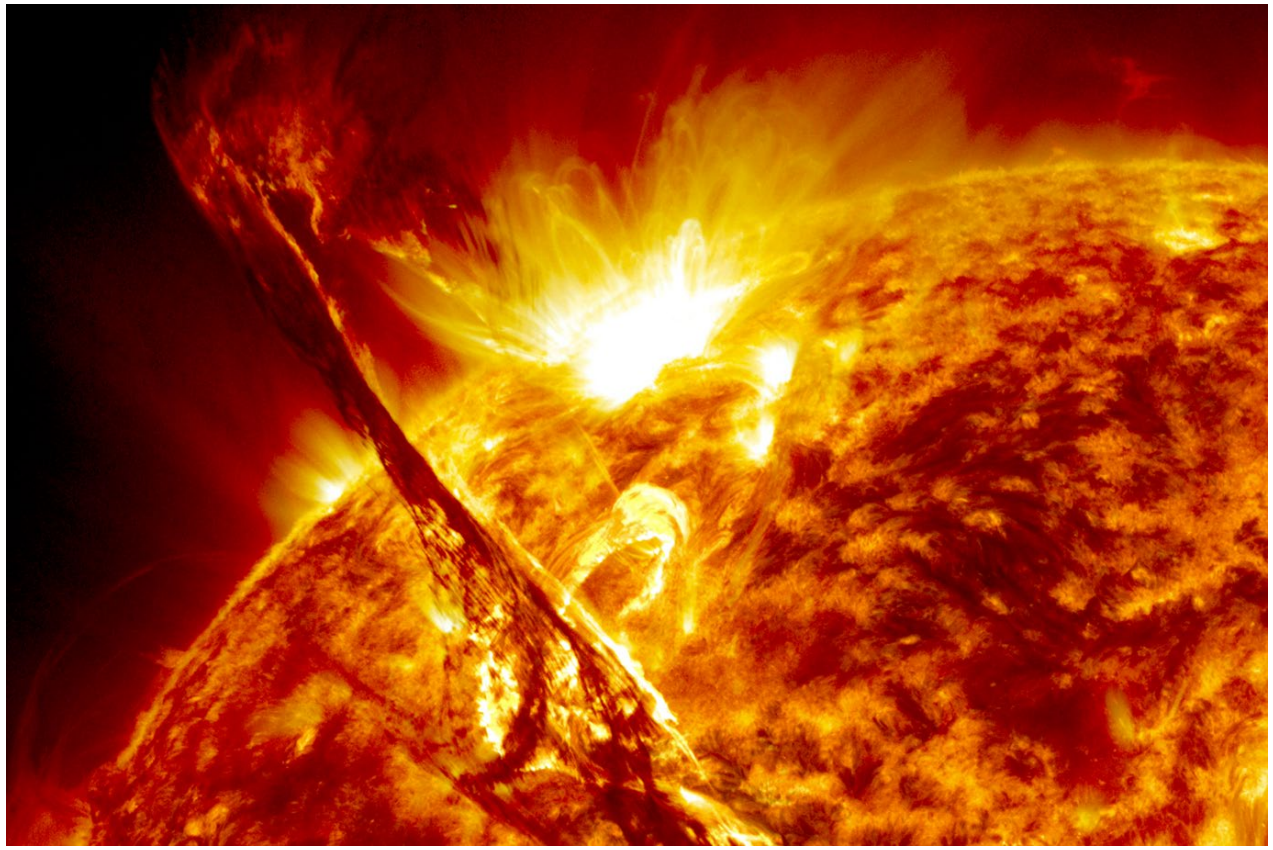

SHP-3. Determine how magnetic energy is stored and explosively released and how the resultant disturbances propagate through the heliosphere.

Coherent solar radio bursts

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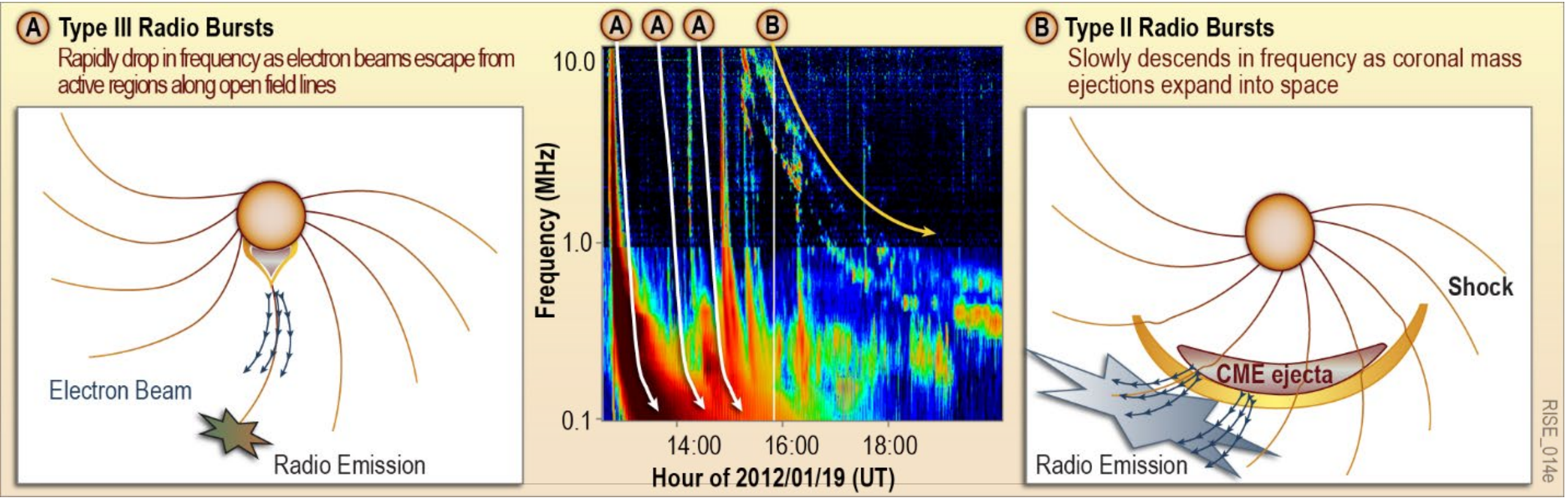
$$f_p = 8.98\ kHz\sqrt{n_e/(1\ cm^{-3})}\,, f_{obs} = (f_p, 2f_p)$$



Measure the location and distribution of Type II radio emission relative to expanding CMEs 2–20 Rs from the Sun, where the most intense acceleration occurs.

SunRISE Objective 1

The SEP – DH Type II Burst Connection

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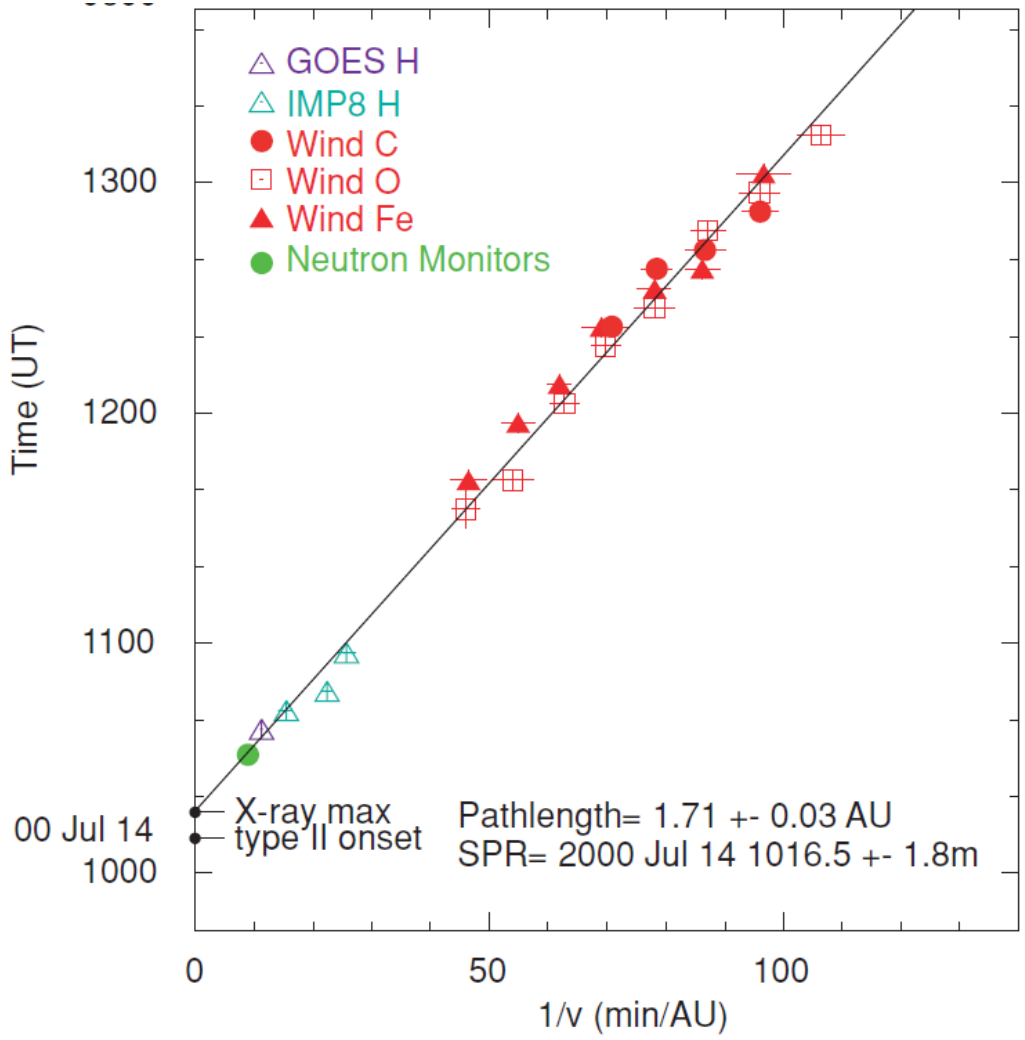
- All major solar energetic particle ion events (NOAA classification based on proton > 10 Mev flux) are proceeded by a decametric-hectametric (DH, < 10 MHz) Type II burst
- When timing is possible arrival time of SEPs at Earth vs speed can be solved for SEP release time and height above Sun
- Generally SEP release occurs 10-20 minutes after DH Type II burst starts



Emission is from a small region of the CME

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