Coupling Models and Observations to Probe Fundamental Physical Processes

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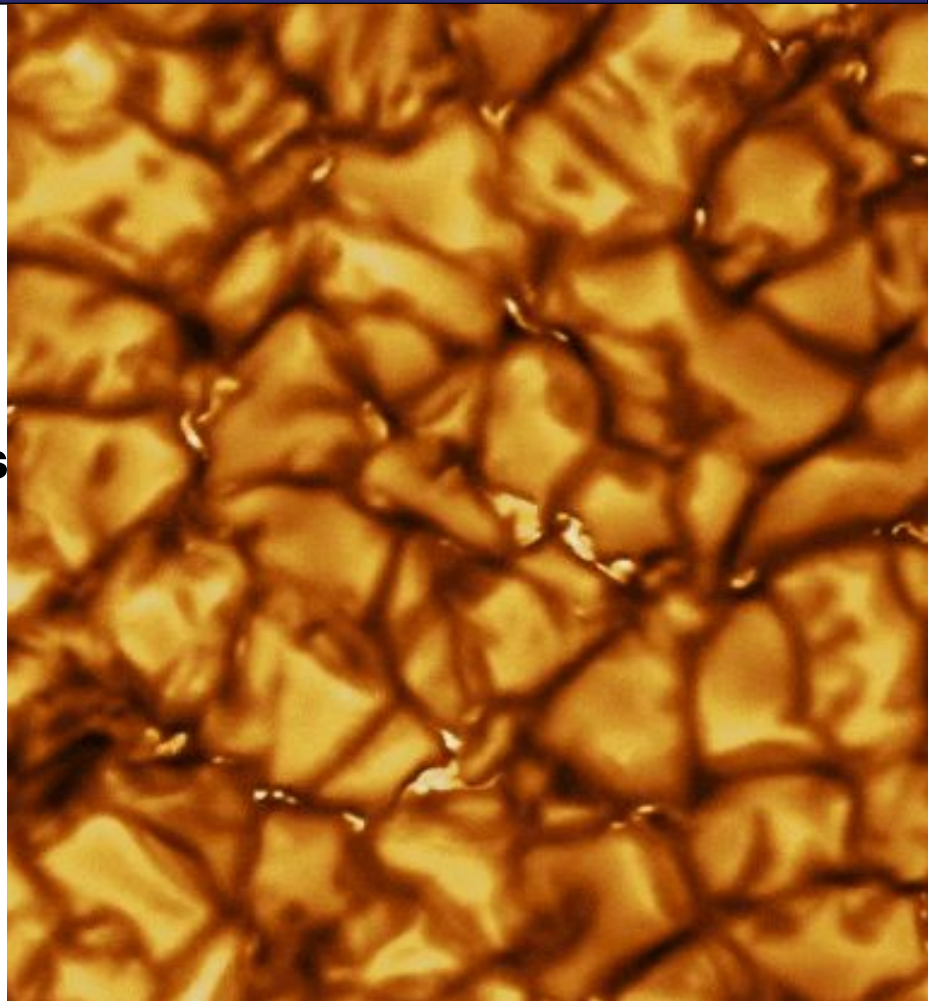
LASP / CU BOULDER / NSO



Working together to study the Sun

SOLAR ORBITER

Space-based: Remote sensing of photons and in-situ particles and fields
Orbit: Will fly within 0.28 AU of the Sun. Out of the ecliptic orbits inclined by 30 degrees

The ESA/NASA Solar Orbiter will examine how the Sun creates the vast bubble of charged particles blown by the solar wind into the interstellar medium, known as the heliosphere.

PARKER SOLAR PROBE

Space-based: In-situ particles and fields
Orbit: Will fly within .04 AU of the Sun

NASA's Parker Solar Probe will provide a statistical survey of the Sun's outer corona, tracing the flow of energy and exploring what accelerates and heats the solar wind.

DKI SOLAR TELESCOPE

Earth-based: Remote sensing of photons
Orbit: 1 AU

The NSF's Daniel K. Inouye Solar Telescope, the world's largest solar telescope, indirectly measures the magnetic fields to create maps of the corona and better understand how and why the corona heats up so dramatically.

FUTURE FACILITIES

ngGONG
FASR
COSMO

MODELS

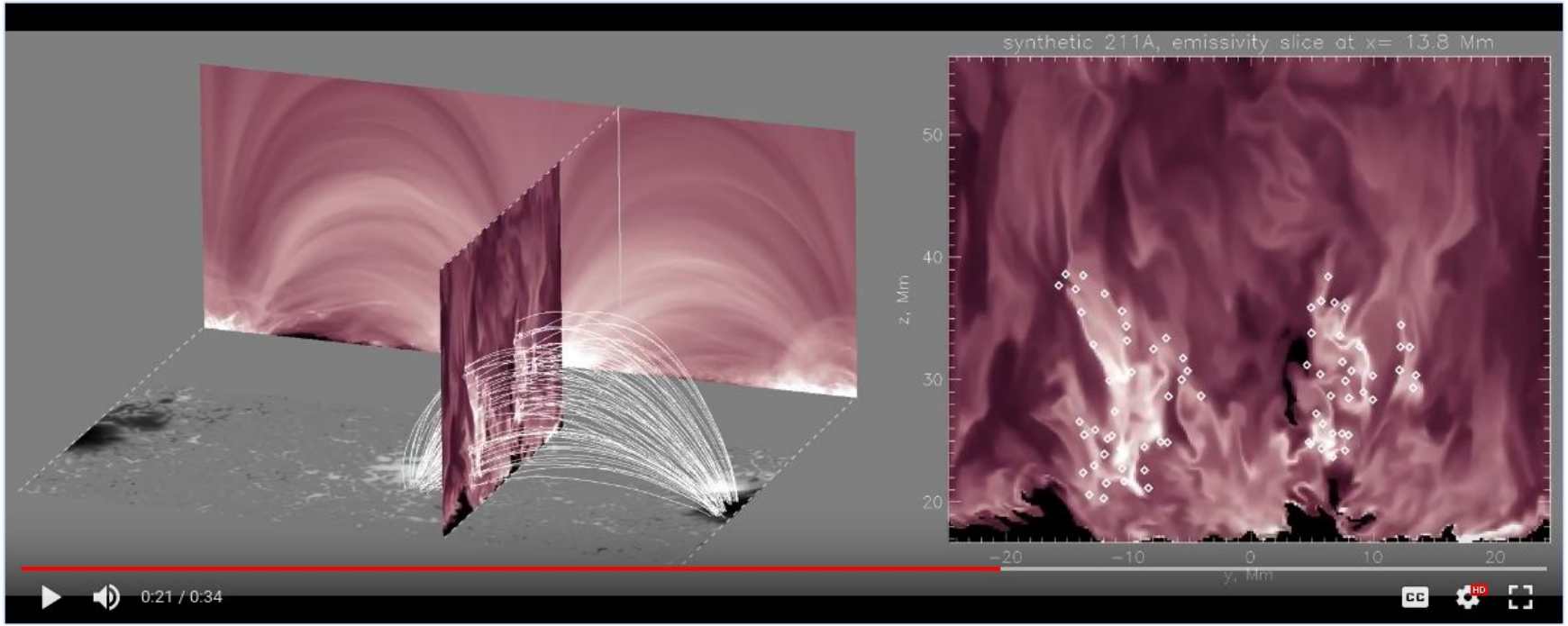
Inversions
Forward modelling
Data-driven simulations
Data assimilation

WE NEED MODELS TO INTERPRET HIGHLY COMPLEX OBSERVATIONS

NSO AURA NSF

Example: Interpretation of coronal loops

- **Models:** Strands or veils? Statistical analysis of data-driven simulations may help answer.



(Credit: A. Malanushenko *et al.*)

MIMOSAS

Mission to Interpret Models and Observations of the Surface and Atmosphere of the Sun

Goal: Support in a coordinated manner projects that cut across multiple missions and facilities (current and future).

MIMOSAS: A ten-year plan

The next 10 years…

Collection of data
(e.g., DKIST, ngGONG, FASR, COSMO).

Spectral inversions:
See talk by Ivan Milic.

Forward modelling and data-driven simulations:
Development of new methods/algorithms. See talk by Lucas Tarr.

Data assimilation
(4D-VAR, Ensemble Kalman Filtering, hybrid methods).