

Modeling Solar Irradiance with the Daniel K. Inouye Solar Telescope (DKIST)

Serena Criscuoli
National Solar Observatory

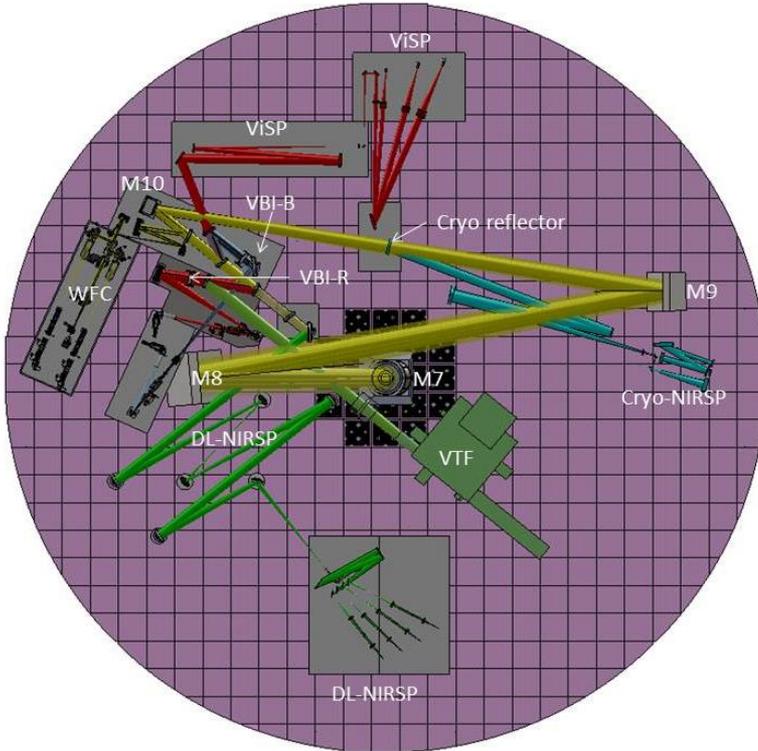


The DKIST

- New generation, 4m Aperture
- 2019: Start of operations
- NSF funded
- 22 Institutes involved, led by NSO



First Generation Instruments



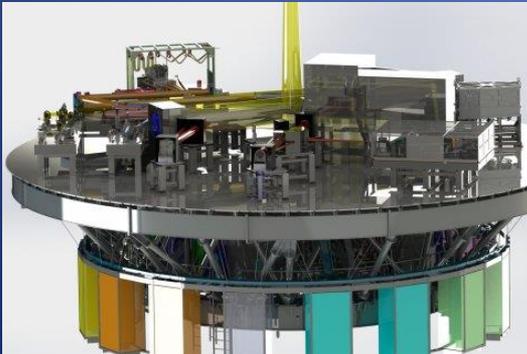
VBI –Visible Broad Band Filter
ViSP, Visible Spectropolarimeter
VTF, Visible Tunable Filter
DL-NIRSP, diffraction Limited Near Infrared Spectropolarimeter

Cryo-NIRSP, Cryogenic Near Infrared Spectropolarimeter

From 380 nm to 2500 nm

0.03 arcsec @ 500 nm

All instruments have Spectro-Polarimetric capabilities, but the VBI



The Critical Science Plan

Science to focus on the first year of operations.

This will also provide information useful for:

- Developing the data-center.
- Data handling.
- Developing operation plans.
- Define (some) instrumental capabilities.

The developing of the CSP is a community effort, with the intent of:

- Make the community familiar with the DKIST capabilities
- Make the community familiar with new modes of operations (application for time, data acquisition, reduction and distribution)
- Engage new users!!!

Critical Use Cases

- ❖ Flux emergence and active region formation
- ❖ Turbulent dynamo: Hanle effect imaging of the quiet-sun
- ❖ Small-scale photospheric magnetic fields
- ❖ Wave generation and propagation
- ❖ *Magnetoconvective modulation of solar luminosity*
- ❖ Sunspots: umbral and penumbral structure and dynamics

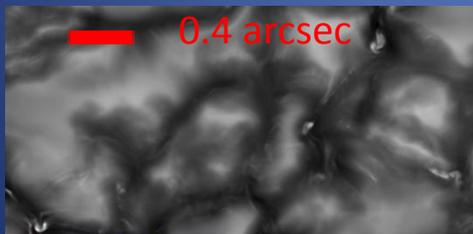
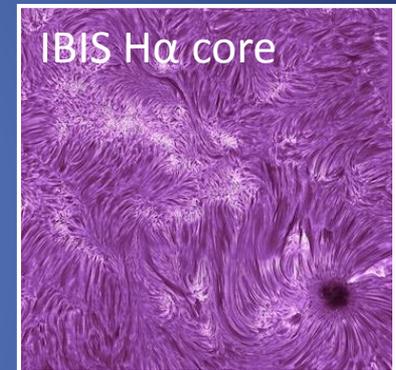
- ❖ The chromosphere/corona connection
- ❖ Spicule physics
- ❖ Formation, evolution, and eruption of non-potential configurations
- ❖ Multilayer magnetometry and atmospheric heating
- ❖ Infra-red survey of solar atmosphere

- ❖ Prominence morphology, connectivity, and life cycles
- ❖ Coronal waves and energy fluxes
- ❖ Energy and magnetic helicity in coronal structures
- ❖ Magnetic field connectivity and changes in flares
- ❖ Flare electron diagnostics in visible light
- ❖ Flare foot points at their fundamental scales

- ❖ Sun-grazing comets as solar probe

How DKIST can improve our understanding of solar irradiance?

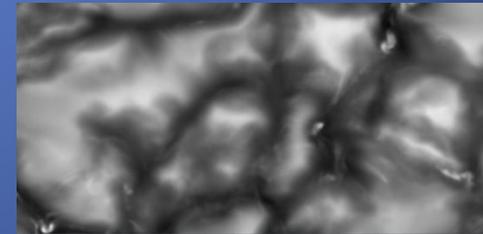
- Irradiance reconstruction techniques do not take into account the complexity of the solar atmosphere.
- Validation of models, especially of 3D-MHD simulations of solar and stellar atmospheres
- Influence of features currently not resolved on irradiance



Original



SST resolution



DKIST resolution

How to contribute?

Observing proposals can be submitted through the DKSIT web-page:

<http://dkist.nso.edu/CSP>

- Description and purpose of the CSP
- Description of the instruments and Coude' configuration
- Description of the Research Areas and contact information
- Proposal form
- A forum

Anybody can join existing proposals.

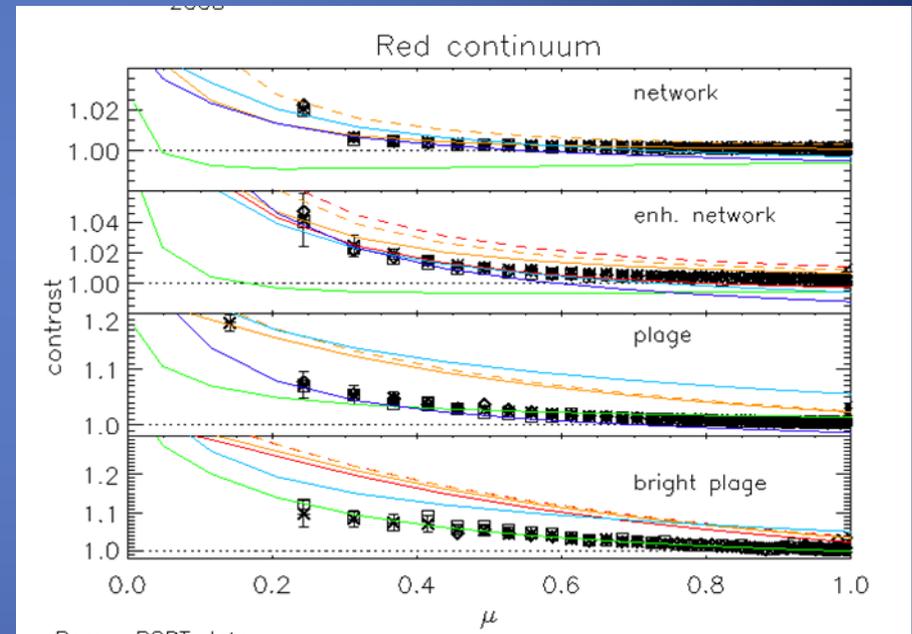
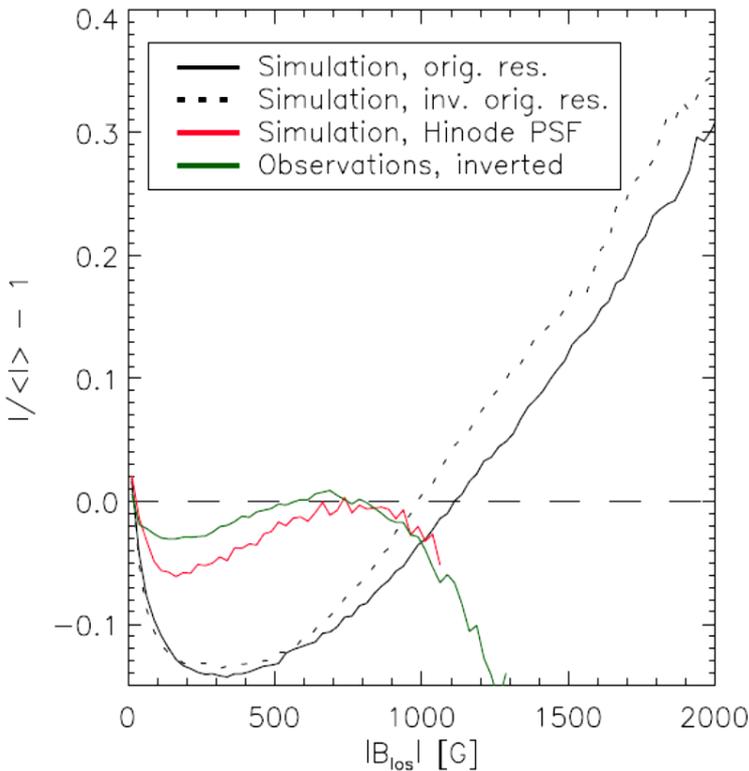
The DKIST CSP web-pages and instrument description are living documents, so do not hesitate to contact:

- Dr. Mark Rast – LASP/CU (chair of the Science Working Group)
- Use Cases Contacts
- P.I. of instruments

Suggestions for other topics are also welcome!

THANK YOU

Modeling vs Measurements



From Danilovic et al 2013