NSF's National Solar Observatory

COMMUNITY EDUCATION TO FOSTER FACILITY ENGAGEMENT:

THE EXAMPLE OF THE DKIST DATA TRAINING WORKSHOPS

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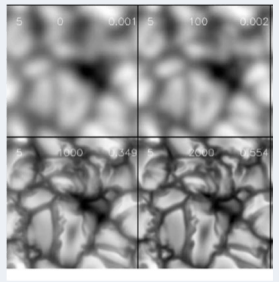
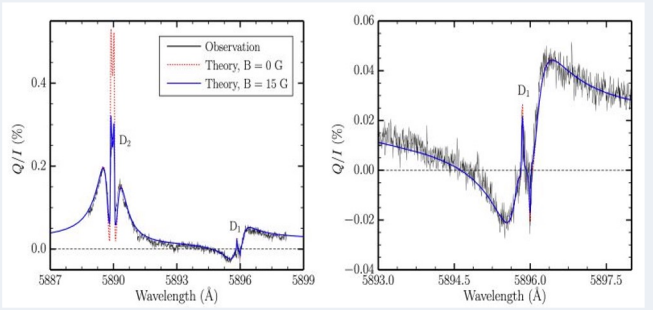
DKIST: a “novel” facility for the US community

- **A ground-based facility (GBO):** many atmospheric effects to consider
- **Works in Visible & IR:** (mostly) optically thick diagnostics
- **Emphasis on polarimetry:** mechanisms of creation of polarized light and its diagnostics power; complex calibrations; instrumental cross-talk
- **Inversion techniques:** needed to retrieve physical parameters of the emitting solar atmosphere
- **Observing time awarded on the basis of proposals:** competition among PIs
- **Very flexible instrumental configurations:** proposals need to clearly state the connection between the proposed observations and the scientific investigation



Rimmele & Marino 2012



Alsina Ballester et al., 2021

DKIST Data Training Workshops

~40 participants

Preparing for DKIST: an introduction to ground-based data

A first introduction to DKIST, and to ground-based data types, issues, and common reduction and analysis techniques.

Workshop dates:
4 – 7 June 2019
(Boulder, CO)

Read More

Preparing for DKIST: Image processing and Time Series

A primer on the effects of atmospheric seeing and their correction; time series and multi-instruments analysis.

Workshop dates:
13 – 15 January 2020
(Northridge, CA)

Read More

Preparing for DKIST: Milne-Eddington Inversions of Spectro-polarimetric data

A first guide to inversion techniques for spectro-polarimetric data

Workshop dates:
July 20-24, 2020
**** ONLINE ****

Read more

Preparing for DKIST: An Introduction to Chromospheric Diagnostics

A first guide to chromospheric diagnostics and simplified methods of analysis

Workshop dates:
July 19-23, 2021
**** VIRTUAL ****

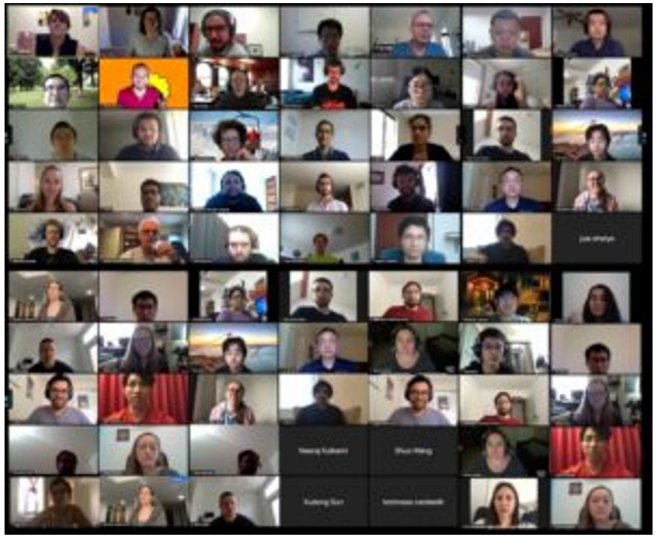
Read more

Preparing for DKIST: He I Diagnostics in the Solar Atmosphere

An introduction to the formation of optical / near-IR He I lines and their diagnostic capabilities

Workshop dates:
Jan 31 – Feb 4, 2022
***** VIRTUAL *****

Read more



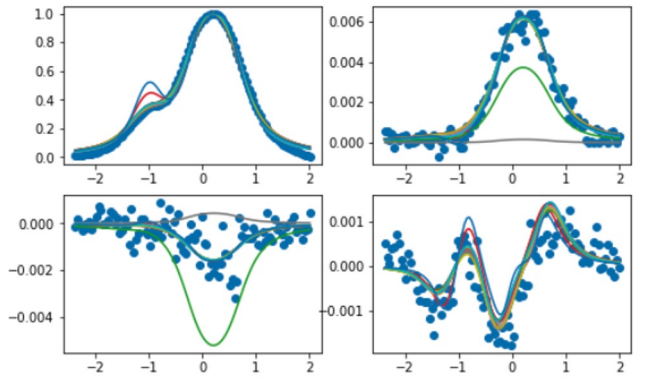
https://nso.edu/ncsp/ncsp-workshops/

> 80 participants

DKIST Data Training Workshops

		Monday, Jan 31	Tuesday, Feb 1	Wednesday, Feb 2
Start time (MST)				
10:30		WELCOME; Intro to meeting and participants; scope and instructions	General discussion on previous day & exercises; common doubts & issues.	General discussion on previous day & exercises; common doubts & issues.
11:00		Introduction to radiative transfer in chromosphere. Formation of He I 1083.0 and 587.6 nm multiplets *(H. Uitenbroek)*	Beyond Zeeman: the Paschen-Back regime *(H. Uitenbroek)*	Spectro-polarimetric Inversions *(A. Asensio Ramos)*
11:30			Scattering polarization & Hanle effect *(I. Milic)*	
12:00				
12:30		The slab model *(I. Milic)*	Scattering polarization & Hanle effect (cont.)	HAZEL2: "inversion" mode *(S. Wang)*
13:00		*Spectral synthesis guided exercise: write your own slab model*		*Exercise: inversion of single synthetic profiles. The Zeeman case*
13:30			HAZEL2: "synthesis" mode *(S. Wang)*	
14:00				
14:30		Discuss the different components of the model (velocity, optical depth..) , and their meaning	*Forward synthesis in different features & magnetic regimes*	*Exercise: inversion of single synthetic profiles. The Hanle case. Errors and ambiguities*
15:00		*Forward synthesis in different conditions, using slab model.*		
15:30				
16:00		ADJOURN		
NOTES				

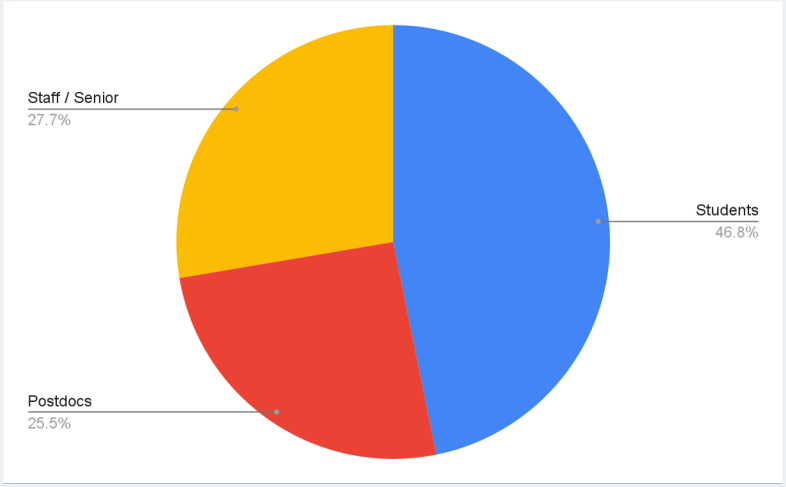
```
In [37]: plt.figure(figsize=[8,5])
         r = 0
         plt.subplot(221)
         plt.plot(ll-10830,stokes_to_fit[0,:],'o')
         for r in range(0,20):
             plt.plot(ll-10830,fit[r,0,:])
         plt.subplot(222)
         plt.plot(ll-10830,stokes_to_fit[1,:],'o')
         for r in range(0,20):
             plt.plot(ll-10830,fit[r,1,:])
         plt.subplot(223)
         plt.plot(ll-10830,stokes_to_fit[2,:],'o')
         for r in range(0,20):
             plt.plot(ll-10830,fit[r,2,:])
         plt.subplot(224)
         plt.plot(ll-10830,stokes_to_fit[3,:],'o')
         for r in range(0,20):
             plt.plot(ll-10830,fit[r,3,:])
```

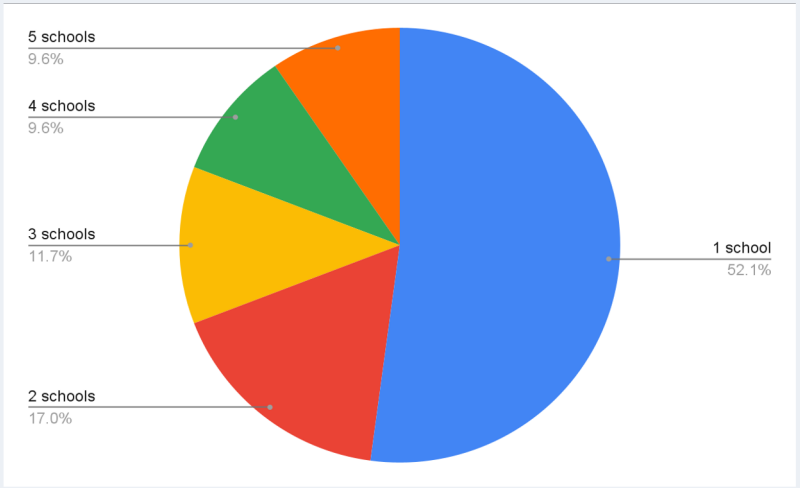


All lectures / exercises are recorded and made available in real time

Participants (US only)

Over 90 unique US participants (from most of US solar institutions)

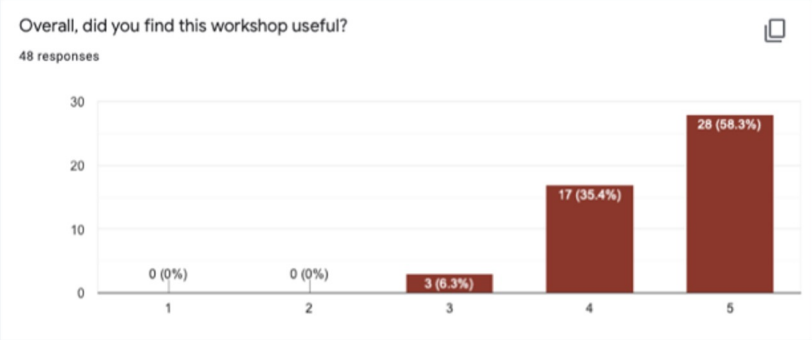


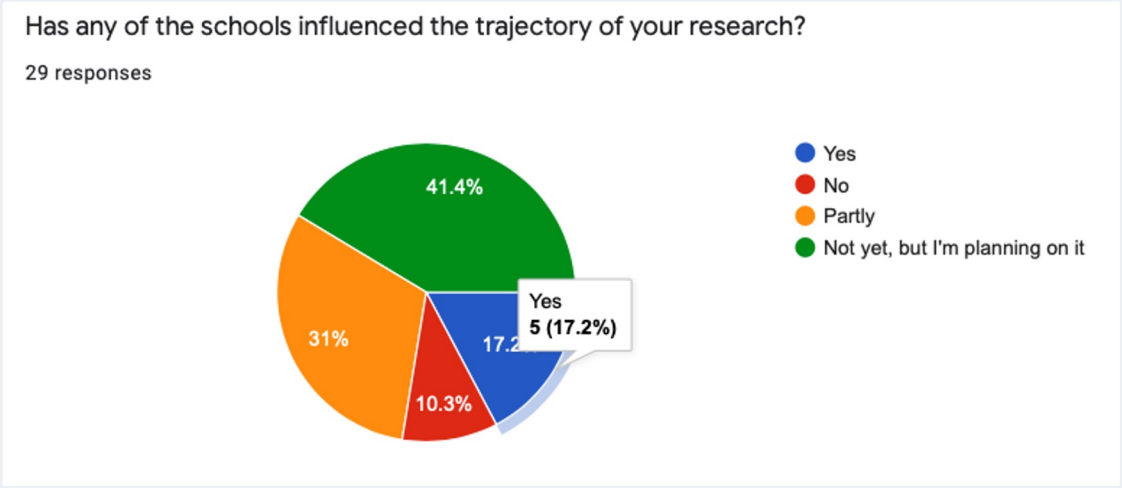


Many participated in multiple workshops

Results; feedback

Workshops consistently deemed very useful; Recordings are used often





For about 50% or respondents, schools' contents have influenced their research; another 40% is planning on that (survey still ongoing)

Summary

- DKIST Data Training Workshops have successfully engaged with, and trained future/diverse researchers. Participation is predicted to increase once actual DKIST data is available
- DKIST Workshops could serve as a "template" for the future; we should push our funding agencies to properly support this kind of activities
- Consistent with Astro Decadal 2020 recommendations: *"...A significant investment is needed in the people who will ….. train the community on the new products and tools …."* (Section H; Pathways to Discovery in Astronomy and Astrophysics for the 2020s.)
- *(Virtual experience & lectures' recording has proved very efficient, and should be kept in mind as a way to involve under-represented groups)*

Why is it important for the Helio2024 Decadal

- How the WP links to the statement of task:
  - *Identifying the workforce expertise and capabilities needed to implement the scientific and technical priorities identified by the survey, including the identification of paths for entry into the community, needs for professional development, and challenges to workforce retention.*
  - *Identifying challenges to the community responding to new and emerging scientific fields;*

Category: Workforce
Primary topic: State of the Profession including workforce capabilities and current status, future needs to improve health and vitality of the community, diversity, equity, accessibility, and inclusion

Going forward

- More workshops in the pipeline (coronal physics; proposal submission; updates on instrumentation and observing)
- Focus / emphasis will move to use of DKIST and actual data analysis