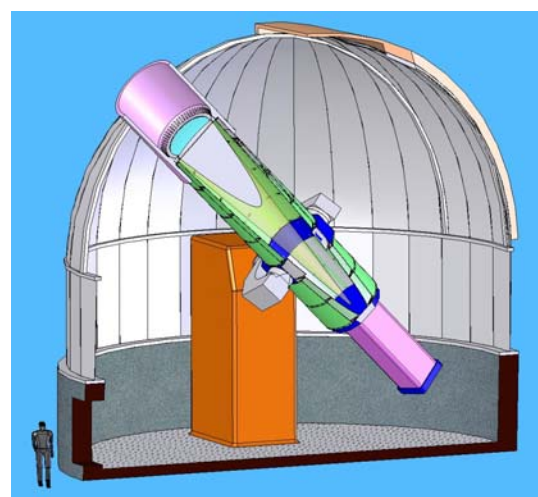
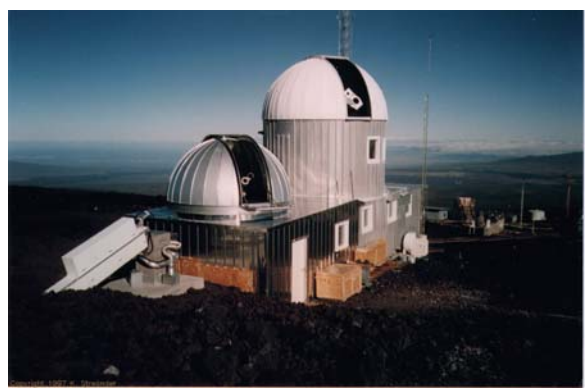
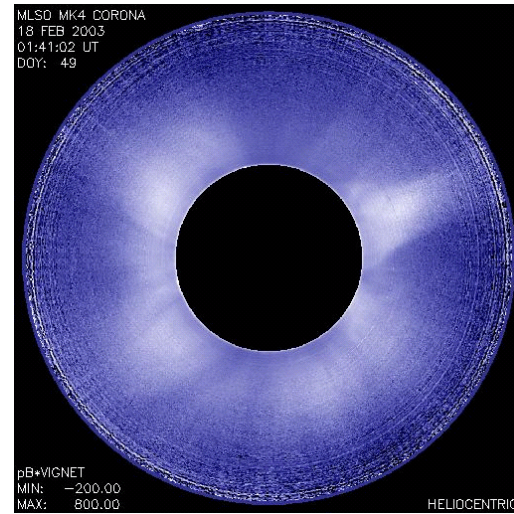


# Mauna Loa Solar Observatory (MLSO) Coronal Solar Magnetism Observatory (COSMO)

Steven Tomczyk



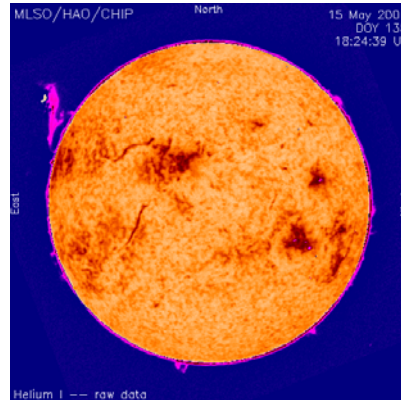
# Mauna Loa Solar Observatory (MLSO)



MK4 White Light Corona (1965-present)



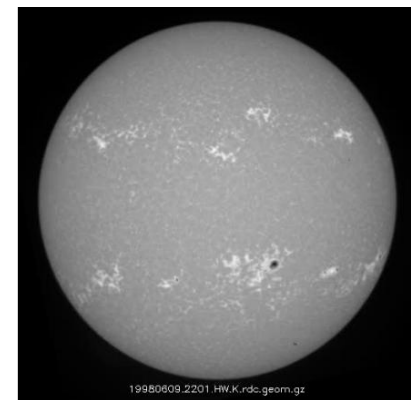
PICS H $\alpha$  Limb



CHIP He-I Chromosphere



PICS H $\alpha$  Chromosphere



PSPT CaII Chromosphere

# MLSO User Community

## MLSO Data Users

295 registered users from 29 countries

Registered users at 28 US universities, 29 foreign universities

>557 publications using MLSO data (>200 in last eight years)

Mauna Loa Solar Observatory  
Welcome to the website of MLSO, which operates instruments designed to provide observations needed to understand the Sun's continuous release of plasma and energy into interplanetary space

Home Data & Movies Activity & Logs Publications Eclipses Webcams Related Sites About Us

News: Please see the [News Page](#).

### Latest MLSO Images

ACOS Mk4	ACOS PICS Limb	ACOS PICS Disc	ACOS CHIP
<b>K-Corona</b> 700-950 nm 29-Jul-2008 UT <a href="#">Watch Movie</a>	<b>H-Alpha Limb</b> 656.3 nm 29-Jul-2008 UT <a href="#">Low-res Movie</a> <a href="#">Full-res Movie</a>	<b>H-Alpha Disk</b> 656.3 nm 29-Jul-2008 UT <a href="#">Low-res Movie</a> <a href="#">Full-res Movie</a>	<b>Helium-I</b> 1083 nm 29-Jul-2008 UT <a href="#">Low-res Movie</a> <a href="#">Full-res Movie</a>
<b>Featured Event</b>	<b>PSPT Calik</b>	<b>PSPT Blue</b>	<b>PSPT Red</b>
<b>More Information</b> <a href="#">Watch Movie</a> 25-Mar-2008 <small>Funding Courtesy NASA</small>	<b>Calik</b> 393 nm 29-Jul-2008 UT	<b>Blue</b> 408-412 nm 29-Jul-2008 UT	<b>Red</b> 605-610 nm 29-Jul-2008 UT

## MLSO Web Site

~6200 Hits/day (2.26 million in the past year)

Serves 125 GB/year out of a total archive of 2.5 TB (~2X CEDAR data traffic)

<http://mlso.hao.ucar.edu/>

# Future of MLSO

Aging Instruments and Infrastructure Need Upgrading

Need Additional Capabilities to Address Current Scientific Problems

Coronal Solar Magnetism Observatory

# COSMO Motivation

*Coronal Magnetism is Responsible for the Sources of Space Weather:*

- Solar Flares
- Coronal Mass Ejections
- Energetic Particle Acceleration
- Coronal Heating
- Solar Wind Acceleration

Routine Measurements of Coronal  
Magnetic Fields are Not Available

# Community Involvement

COSMO Science Advisory Committee

Thomas Zurbuchen, U Michigan (Chair)

David Alexander, RICE

Spiro Antiochos, NRL

Jean Arnaud, France

Phil Judge, HAO

Matt Penn, NOAA

John Raymond, CFA

Aad VanBallegooijen, CFA

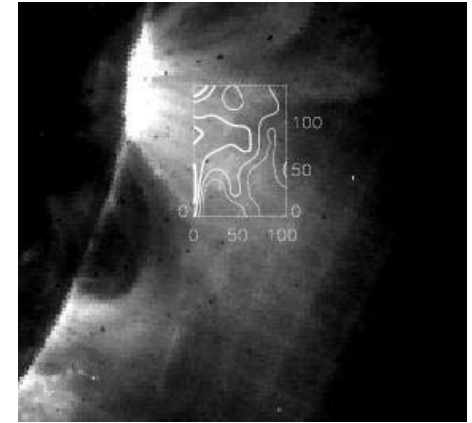
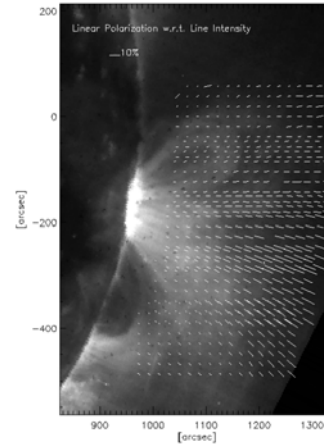
# COSMO Science Priorities

The Community through the COSMO SAC  
Recommends that COSMO Measure:

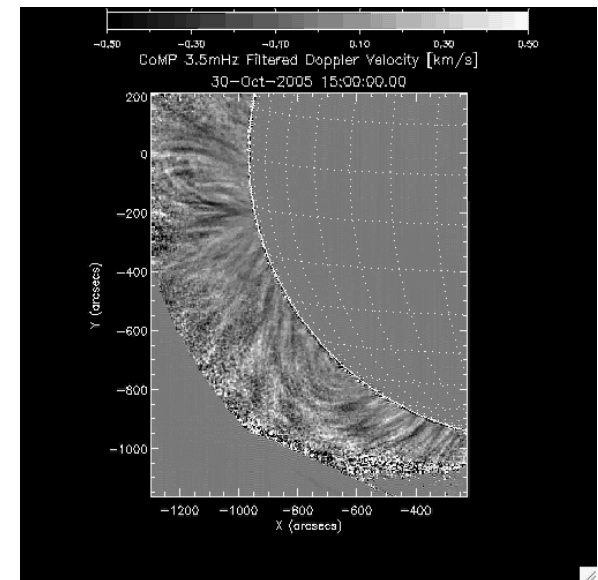
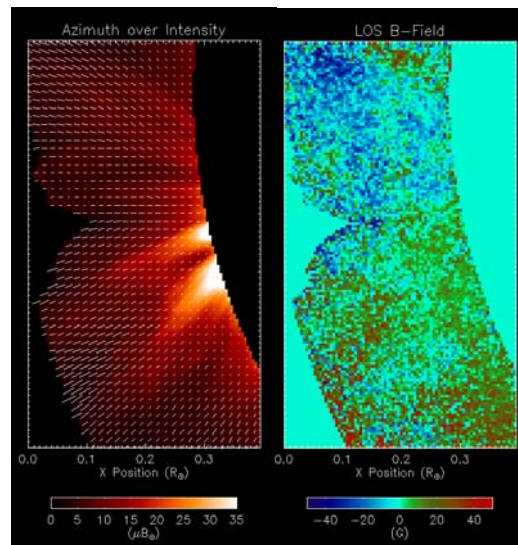
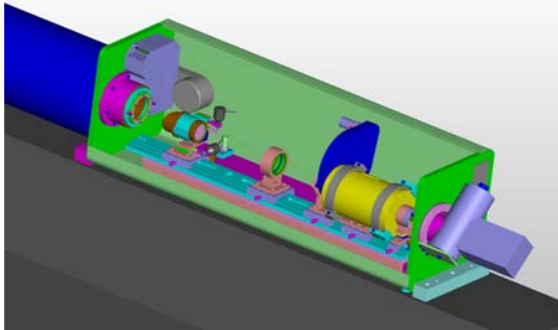
- Coronal Magnetic Fields
- Chromospheric Magnetic Fields
- White Light Corona

# Coronal Magnetic Field Prototype Instruments

SOLAR-C/OFIS (U of Hawaii)



CoMP Instrument (NCAR)

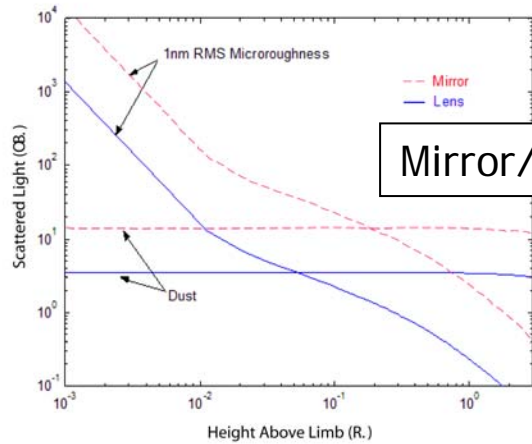




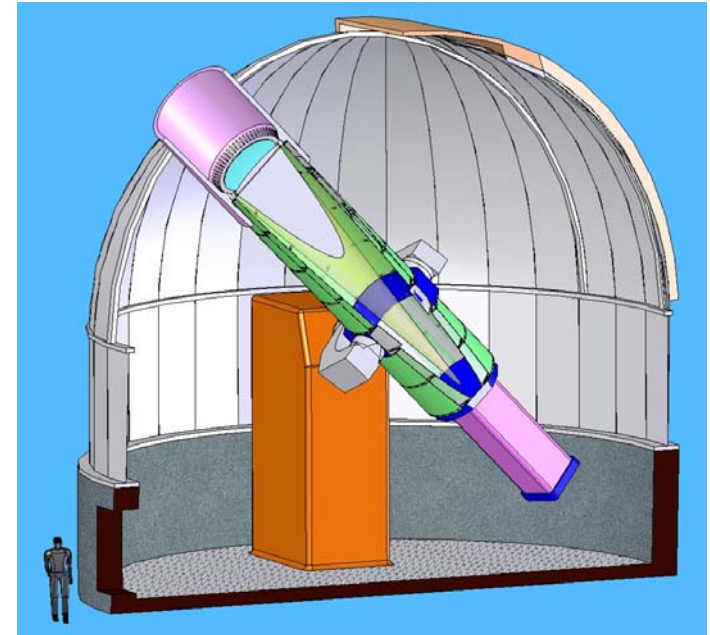
# COSMO Requirements

- Prototype Instruments Verify Use of Zeeman Effect in Coronal Emission Lines to Measure Coronal Magnetic Fields
- Need Better Spatial and Temporal Resolution to Meet Science Goals
- More Photons Requires Large Aperture (1.5 m) Coronagraph

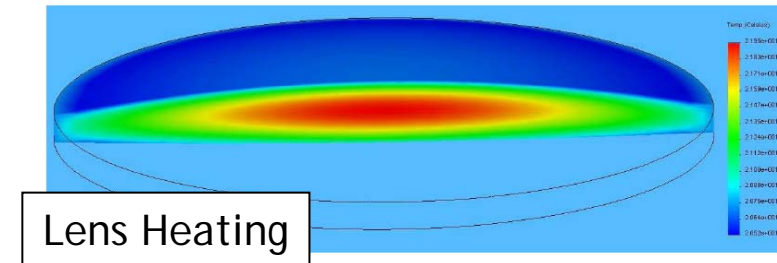
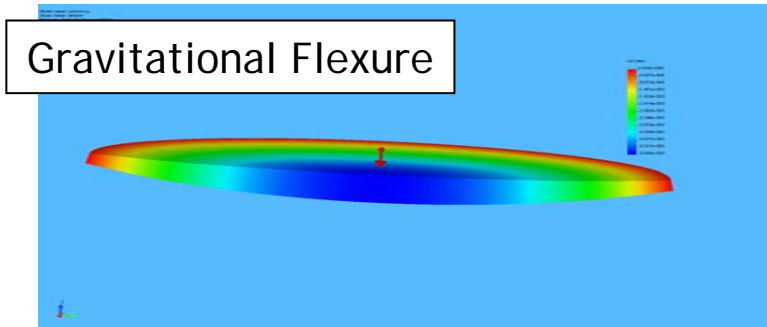
# COSMO Engineering



Mirror/Lens Scattering



1.5 m Refractive Coronagraph is Feasible with Current Technology: Nelson et al., SPIE, 2008.



Lens Heating

# COSMO Engineering

## Technical Notes:

- 1) Measurement Errors in Coronal Magnetic Field Parameters
- 2) A FEA of Meter-Class Refracting Objectives for Coronal Polarimetry
- 3) Polarization in Reflecting and Refracting Coronagraphs
- 4) An Analysis of Scattered Light in Reflecting and Refracting Coronagraphs
- 5) Trade Study Summary for Reflecting vs. Refracting Primary Objectives
- 6) Some Considerations for a High Etendue Birefringent Filter
- 7) Scattered Light from Internal Reflection in a Coronagraph Objective Lens
- 8) Baseline Design of a Coronagraph to Measure K-corona Polarization Brightness
- 9) SBM Sky Brightness at Mauna Loa
- 10) Mk IV Scattered Light Analysis
- 11) Baseline Design for a Prominence Magnetometer Proposal
- 12) Prominence and Filament Magnetometry Simulations
- 13) Thermal Analysis of a 1.5 meter f/5 Fused Silica Primary Lens

<http://cosmo.ucar.edu/>

# COSMO Plans

A Facility Dedicated to Routine Measurement of Coronal Magnetic Fields is Required to Advance Understanding of the Causes of Space Weather

A Large Aperture Coronagraph and Associated Instruments are Feasible and Can Meet Science Requirements

Need Money to Build New Facility

Will Close MLSO and Apply Current Operations Resources to COSMO