UCAR
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

Space Weather Research Roles and Responsibilities and the Need for Legislation

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Overview

University Corporation for Atmospheric Research

- *501c3*
- *109 universities*
- *Research and Development*
- *Training*
- *Atmospheric and Related Geosciences*
- *Operates NCAR (FFRDC)*

National Space Weather Strategy—2015

Structure of the Strategy

This Strategy articulates six high-level goals for Federal research, development, deployment, operations, coordination, and engagement:

1. Establish Benchmarks for Space Weather Events
2. Enhance Response and Recovery Capabilities
3. Improve Protection and Mitigation Efforts
4. Improve Assessment, Modeling, and Prediction of Impacts on Critical Infrastructure
5. **Improve Space Weather Services through Advancing Understanding and Forecasting**
6. Increase International Cooperation

National Space Weather Strategy—2015

5. Improve Space Weather Services through Advancing Understanding and Forecasting

7 Objectives

1. **Define a baseline operational space weather observation capability**

2. **Improve understanding of user needs for space weather forecasting and use these data to establish lead-time and accuracy goals**

3. **Ensure products are intelligible and actionable to inform critical decision-making:**

4. **Improve forecasting accuracy and lead-time**

5. **Enhance fundamental understanding of space weather and its drivers to develop and continually improve predictive models**

6. **Improve effectiveness and timeliness of research to operations transition process**

7. **Assess and develop observational strategies for the study and prediction of space weather events**

Current Research to Operations Priorities (UCAR) (We are here to help)

1. COSMIC 2
2. COSMO
3. WACCM-X

Who owns the research and operational requirements in these 7 objectives?

HOLD that thought!

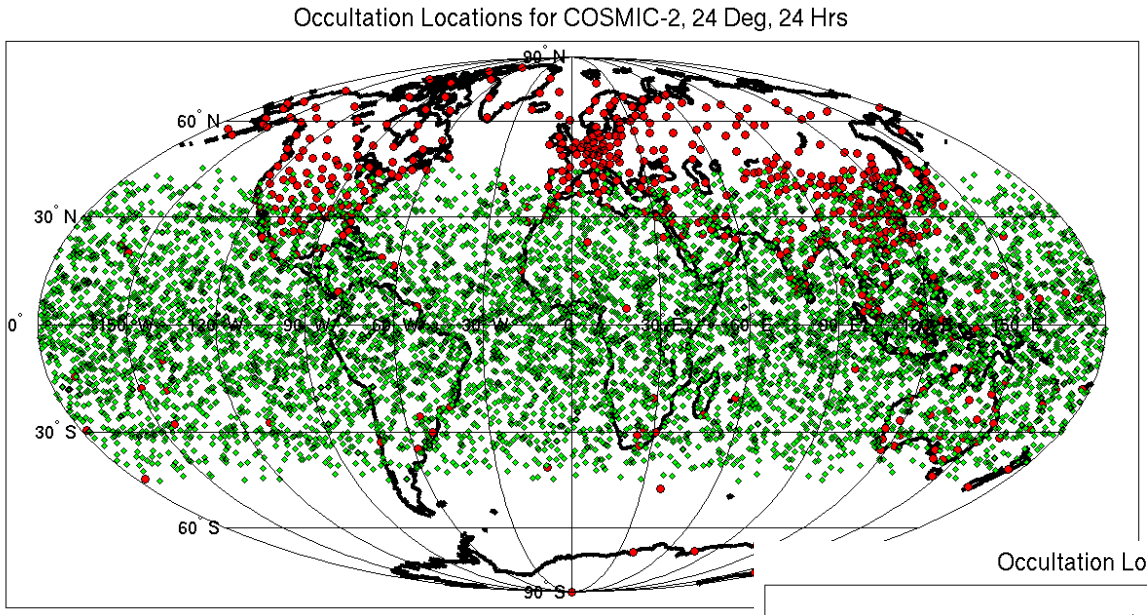
COSMIC 2
(3 Missions)

- **Weather**
  - Improve skill of global and regional weather prediction models
- **Ionosphere and Space Weather**
  - Improve the analysis and prediction of space weather
- **Climate**
  - Monitor climate change and variability with unprecedented accuracy

World's most accurate, precise,
and
stable thermometer from space!

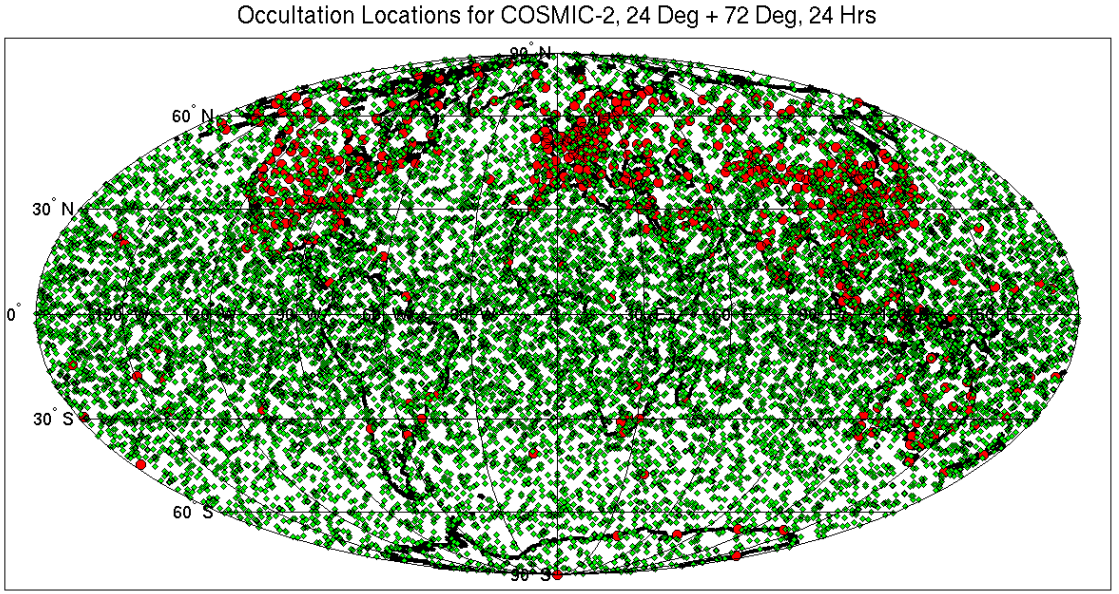

FM6
FM5
FM4
FM3
(in TV Chamber)

COSMIC 2—Importance of 2nd Launch



1st Launch 2016
(Ion Velocity Meters in Equatorial)

With 2nd launch 2019



NCAR's High Altitude Observatory (Doing Space Weather Research Before it was Cool!)

MISSION:

I: Understand the processes that drive Space Weather and how they impact our atmosphere.

II: Understand the impact of trends in solar and anthropogenic variability on the geospace environment.

COSMO

The CoSMO Suite enables exploration into the magnetic and thermal environment of the outer solar atmosphere and the processes responsible for space weather.

THE CORONAL SOLAR MAGNETISM OBSERVATORY

COSMO

What is CoSMO?

The Comprehensive Solar Magnetism Observatory

CoSMO is a collaboration between HAO, Harvard, Universities of Michigan and Hawaii. It is a three instrument suite:

The K-Coronagraph - "KCor"
Chromospheric Magnetograph - "ChroMag"
Large Coronagraph - "LC"

The $30m CoSMO facility will provide the nation with essential multidimensional boundary conditions of the inner heliosphere.

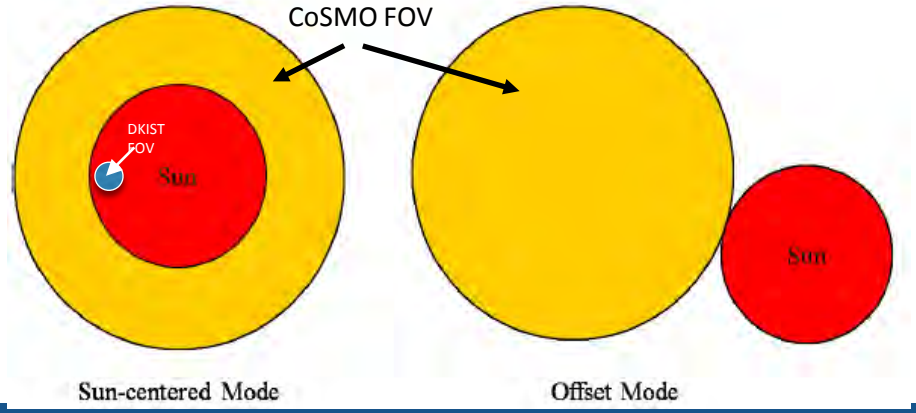
KCor is operational at Mauna Loa. ChroMag prototype nearing completion - deployed to Mauna Loa early 2016.

Develop and enhance forecast skill in Space Weather research including assimilative technology transfer.

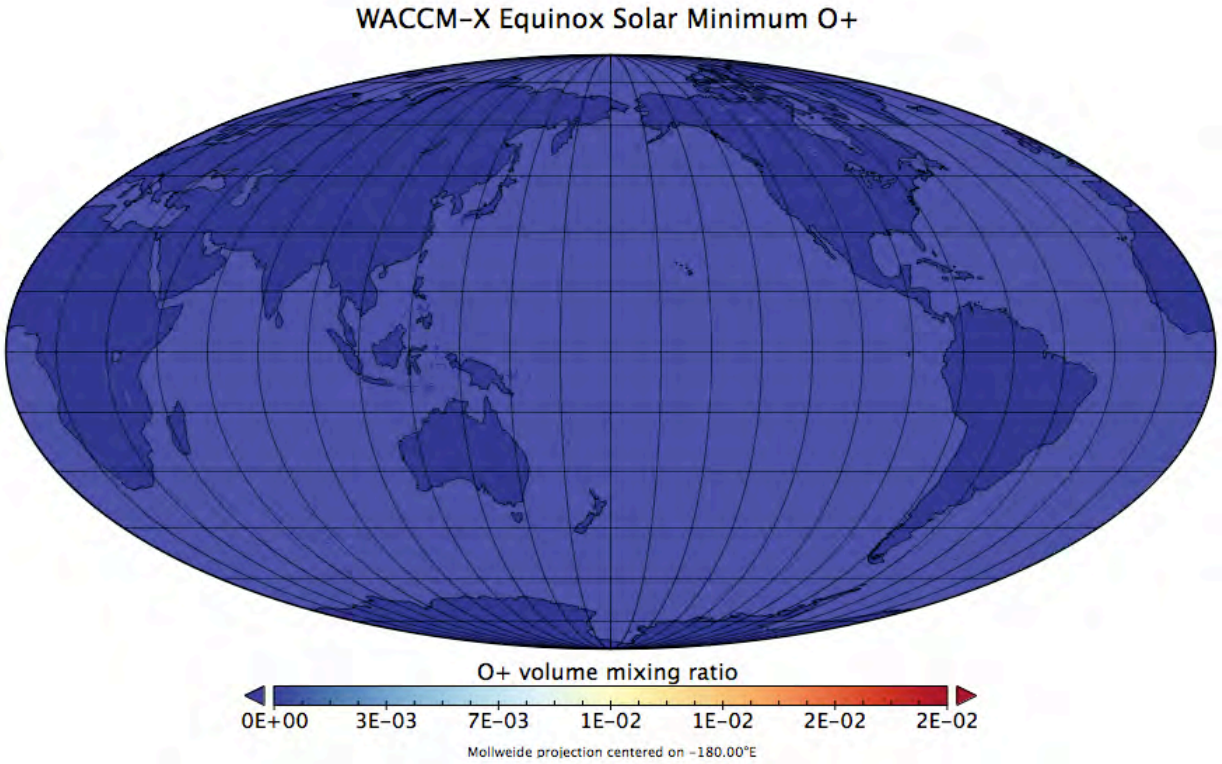
CoSMO-LC

- 1.5m refracting coronagraph for S/N.
- Builds and extends CoMP/UCoMP filter heritage.
- Large FOV and 1" spatial resolution.
- LC Design Review will take place this summer.

CoSMO will have "community spar" face to support novel coronagraphic designs and next-gen developments across community.



WACCM-X



NCAR/HAO is developing **the** next-generation "bottom-up/top-down" model of ionospheric conditions – WACCMx - based on decades of success in the modeling of Earth's upper atmosphere, geospace, and coupled global climate modeling.

WACCM-X: Enabling Exploration of the Near-Space Environment

What?

WACCM-X is currently the thermospheric extension of NCAR's WACCM model. We are extending the "lid" on WACCM-X further, towards 500km, to explore ionospheric effects and forecast the region better across timescales.

Why?

- What are the relative roles of lower atmosphere and solar/geomagnetic forcing on the ionosphere-thermosphere system?
- How do atmospheric waves affect the energy and momentum coupling between the lower atmosphere and the ionosphere-thermosphere?
- What are the connections between small and large scale features in the system, e.g., ionospheric instabilities and scintillations?
- How does anthropogenic changes in the troposphere affect the thermosphere and ionosphere?
- How does the ionosphere-thermosphere vary over multiple time scales, e.g., "space weather" and "space climate"?

For Whom?

The likely user base for WACCM-X spans in academic, federal, and private sectors.

Roles and Responsibilities

NOAA – Operational (currently funds no space weather research)

NASA – Research (space based)

NSF (NCAR) – Research (ground and space based)

AFWA -- Operational

AFRL -- Research

Who does what?

Legislative food for thought . . .

1870--Weather Bureau Authorization in the Department of the Army:

1870: A Joint Congressional Resolution requiring the Secretary of War "to provide for taking meteorological observations at the military stations in the interior of the continent, and at other points in the States and Territories...and for giving notice on the northern lakes and on the seacoast, by magnetic telegraph and marine signals, of the approach and force of storms" was introduced. **Congress passed the resolution and on February 9, 1870, President Ulysses S. Grant signed it into law.** A new national weather service had been born within the U.S. Army Signal Service's Division of Telegrams and Reports for the Benefit of Commerce that would affect the daily lives of most of the citizens of the United States through its forecasts and warnings for years to come.

October 1, 1890: The weather service is first identified as a civilian agency when Congress, at the request of President Benjamin Harrison, passes an act transferring the meteorological responsibilities of the Signal Service to the newly-created U.S. Weather Bureau in the Department of Agriculture.

Space Weather is currently 40-50 years behind terrestrial weather in terms of forecasting approach but is legislatively 140 years behind!

UCAR Congressional Briefings

Future Briefing:

- Space Weather-

June of 2016

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