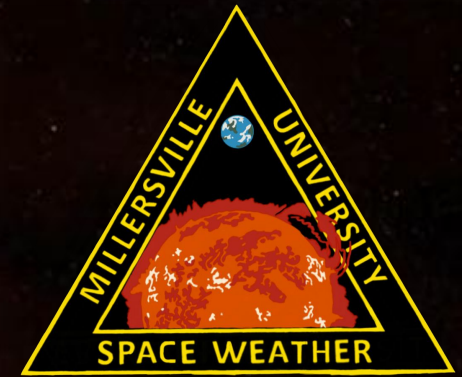


# Undergraduate and Graduate Educational Initiatives in Space Weather at Millersville University: Addressing New Workforce Horizons



- **Richard D Clark**, Dept. of Earth Sciences, Millersville University of Pennsylvania, Millersville, PA,
- Tamitha M. Skov, The Aerospace Corporation, Los Angeles, CA, and
- Michael R. Cook, Apogee Engineering LLC

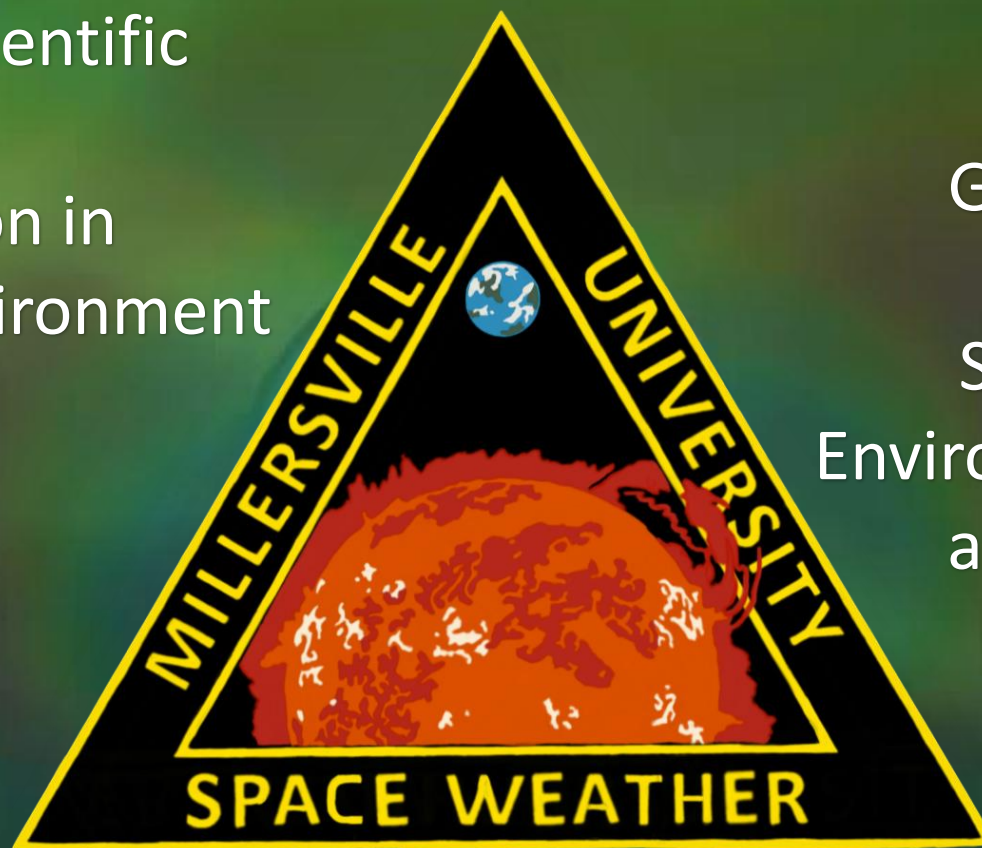
# *The Education Imperative*

*The National Space Policy includes guidance for inter-sector cooperation “to execute foundational activities and capabilities that strengthen U.S. leadership in space-related science, technology, and industrial bases through basic and applied research, and seek to create opportunities for the current space workforce and implement measures to develop, maintain, and retain skilled space professionals.”*



M.S. in Integrated Scientific  
Applications  
with a specialization in  
Space Weather and Environment

Graduate Certificate  
in  
Space Weather and  
Environment: Science, Policy,  
and Communication



Academic Minor  
in  
Heliophysics and Space Weather

# Heliophysics and Space Weather Minor

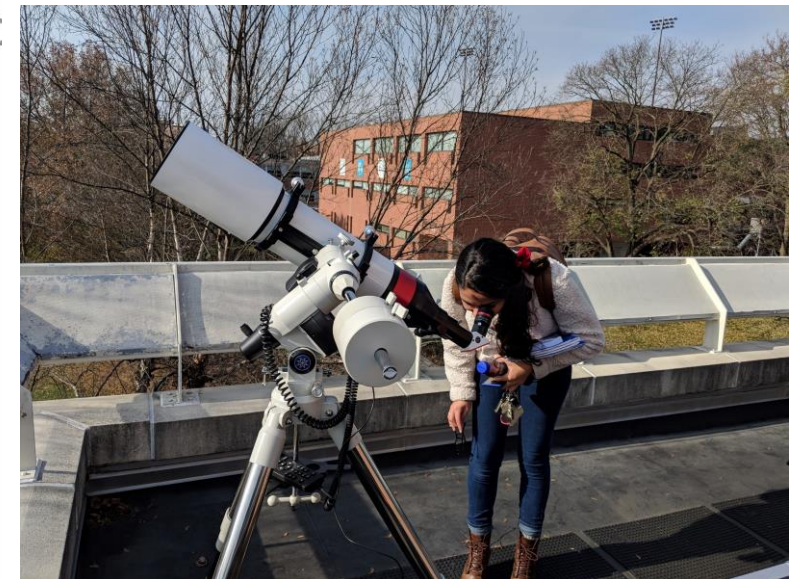
- 10% (12 students) of our meteorology majors are earning an academic minor in Heliophysics and Space Weather
- Prepares students for a range of careers not typically available to students with B.S. degrees in meteorology (e.g. aerospace engineering, space weather forecasting, graduate education in solar physics)
- Offers students an opportunity for space weather, solar physics research, numerical and empirical modeling of solar phenomena (Kunkle et al.), and new tools created for research and education (e.g. Baltzer et al.)
- Attend the Space Weather Workshop where students present their research
- Created the Space Weather Group within the larger Student Chapter of the AMS



## Curriculum

- Modern Theories of Waves and Particles
- Electromagnetic Fields I
- Electromagnetic Fields II
- Atmospheric Thermodynamics or Macro-physics and Thermo
- Statistical Physics
- Space Weather and Environment

- 18 credit hours



# **Announcing the new Millersville University Graduate Certificate**

*in*

## **Space Weather and Environment: Science, Policy, and Communication**

### **Intended Audience**

- ***Contemporary curriculum***
  - ***Expert instructors***
  - ***Fully-online delivery***
  - ***15 credit-hours***
  - ***Fully-accredited program***
  - ***Complete in one year***
  - ***Rolling Admission***
- **Broadcast meteorologists and other science-casters**
  - **Emergency Responders, Search and Rescue, and Reconnaissance**
  - **Science policy advisors and legislative assistants**
  - **Military or DoD contractor personnel**
  - **Business/Industry Management**
  - **Commercial space services providers**
  - **Amateur and Short-wave radio operators**
  - **Airline industry forecasters and related others**
  - **Space weather enthusiasts**

# SPACE WEATHER AND ENVIRONMENT CURRICULUM

- **EMGT 614: Natural Hazards Course (3 c.h.)**  
Examination of natural or environmental hazards, including space weather, and their associated risks.
- **SWEN 571: The Origins of Space Weather (3 c.h.)**  
Aurora, coronal holes, CMEs, solar flares, sunspots, solar cycle, geomagnetic storms, etc.
- **SWEN 572: Impacts of Space Weather Effects on a Technological World (3 c.h.)**  
Impacts to existing and emerging fields, including the variety of customers and operations most vulnerable
- **SWEN 673: Effective Decision-Support for Space Weather Risks (3 c.h.)**  
Protocols for preparing and responding to space weather events
- **SWEN 674: Space Weather Broadcast and Communications (3 c.h.)**  
Video projects: Learning what products, data and graphics to communicate for specific space weather events

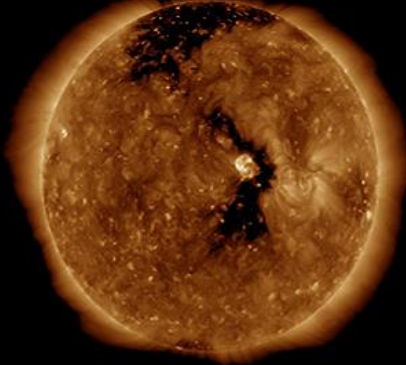


Thanks to @SpaceWxMike for this composite!

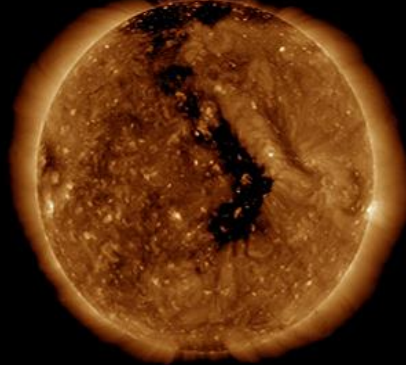
Aug 12<sup>th</sup>



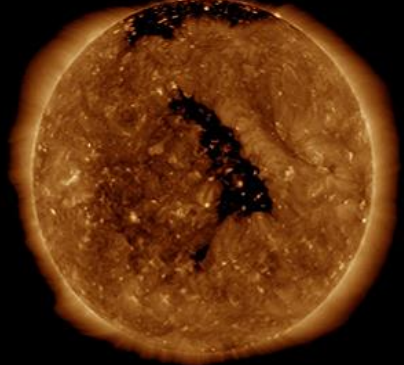
Sep 8<sup>th</sup>



Oct 5<sup>th</sup>



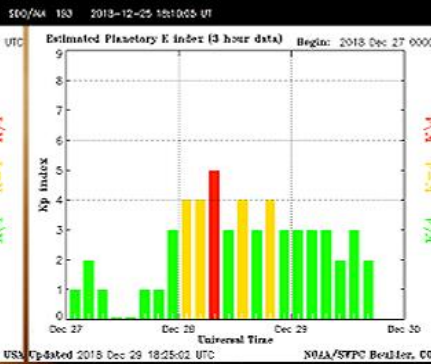
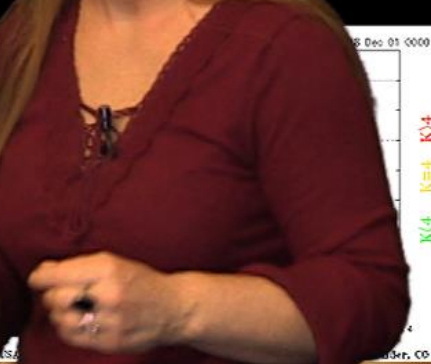
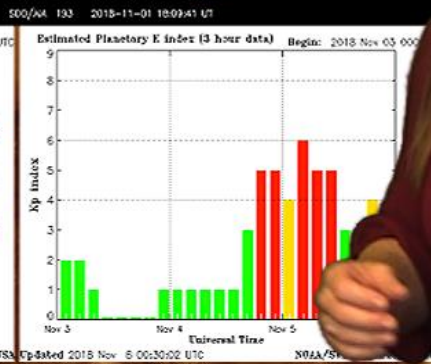
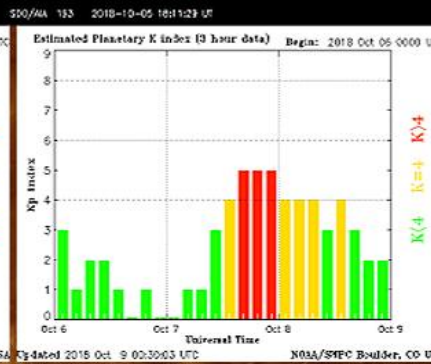
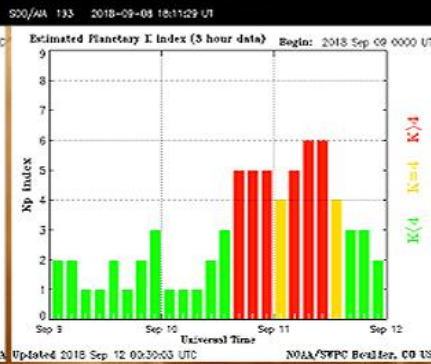
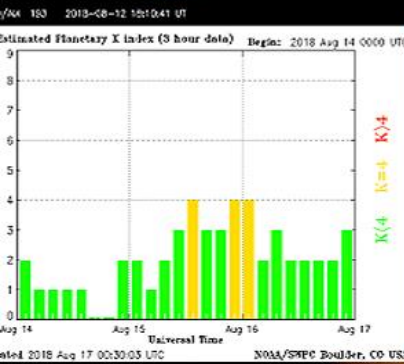
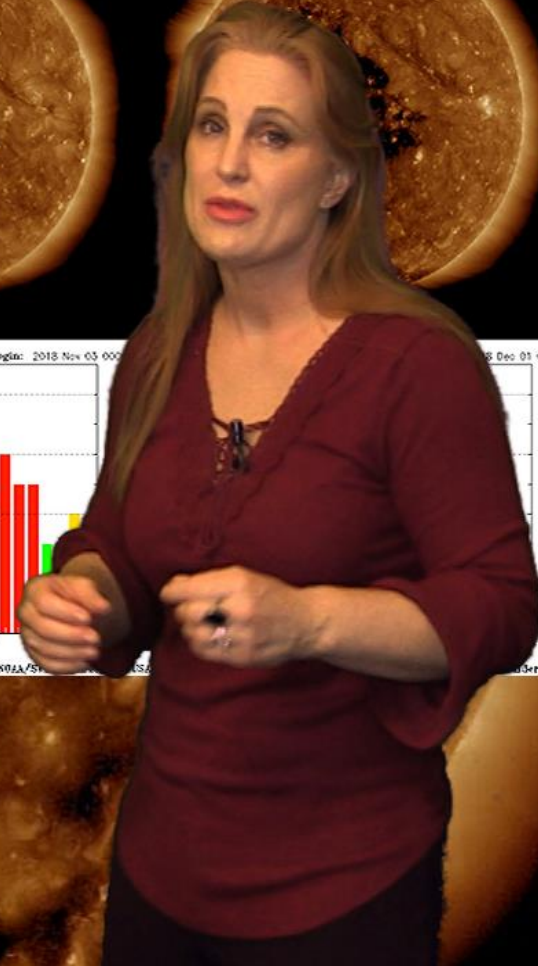
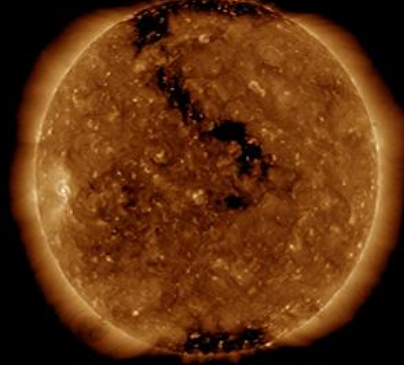
Nov 1<sup>st</sup>



Nov 28<sup>th</sup>



Dec 25<sup>th</sup>



# M.S. in Integrated Scientific Applications

To produce exemplary professionals with cross-disciplinary scientific skills and business knowledge

## Business Core

- Business Strategy and Policy
- Business Continuity
- Environmental Economics and Policy
- Statistical Applications for Decision-Makers
- Geospatial Applications
- Finance and Accounting
- Emergency Planning
- Field Practicum



## MSISA

### The business of science

36-credit hours  
Non-thesis PSM

## Specializations

- Weather Intelligence and Risk Management
- Climate Science Applications
- GeoInformaics
- Environmental Systems Management
- And now:  
***Space Weather and Environment: Science, Policy, and Communication***



Thank you. Questions?

**Space is the place!**

**Contact Information**

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717-871-7434 or 717-871-4359

[www.Millersville.edu/SWEN](http://www.Millersville.edu/SWEN)

[www.Millersville.edu/MSISA](http://www.Millersville.edu/MSISA)

[www.Millersville.edu/ESCI](http://www.Millersville.edu/ESCI)