

# CCMC and Education

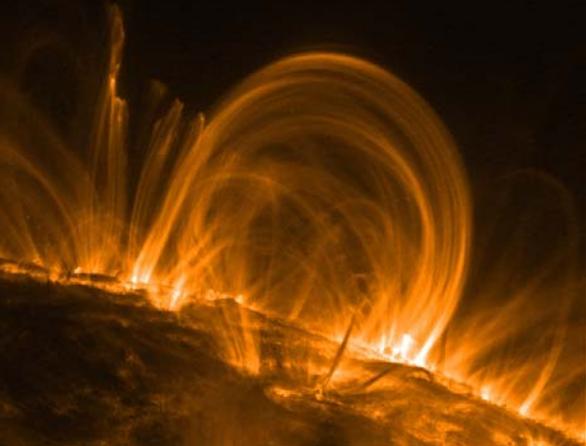
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# Premise

“CCMC allows us to think about new ways how to conduct education and research in an application motivated environment”





# Contents

- University of Michigan and CCMC
- Problem Analysis
- Solution Approach: University Space Weather Challenge



# Educational activities



- Formal education
  - Under-graduate program
  - Masters programs
  - PhD programs
- Student involvement in research
  - All levels
  - National average: 4-6 students/faculty per year



# University of Michigan



- Department of Atmospheric, Oceanic and Space Sciences
- Is in College of Engineering
- Has Undergraduate, Masters, and PhD Programs
  - Size target: 50/50/50



# Undergraduate program



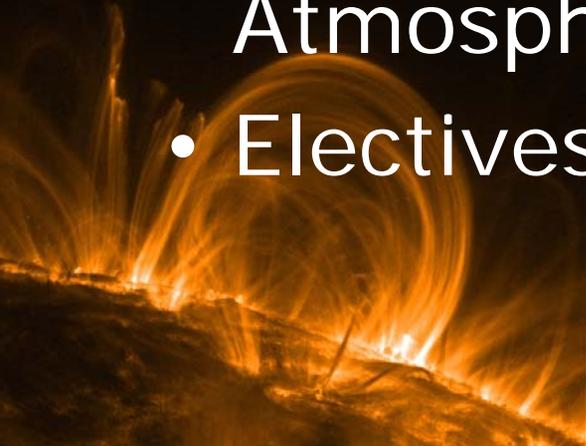
- 13 classes in Math, Physics, Chemistry
- 8 classes in Earth system, advanced programs
- 3 classes on Space science (ionospheres, Geophys. E&M, Sun-Earth Connections)
- 2 Labs
- Electives

**No forecasting**  
**No CCMC involvement**



# Masters program

- 4 classes on Spacecraft Technology, Space Systems, Policy and Instrumentation
- 4 classes on Space Environment and Space Science (Planets, Atmosphere & Ionosphere,..)
- Electives



**No forecasting**  
**No CCMC involvement**



# PhD program

- 4 Foundation Classes (Fluids, Radiative Transfer, E&M, Space Environment)
- 5 Space Science Classes
  - Plasma
  - Ionosphere and Upper Atmosphere
  - Magnetosphere
  - Sun – Heliosphere
  - Planets
- 3 Electives (CFD, others)



**No forecasting**  
**No CCMC involvement**

# Research involvement



- Almost always involves some forecasting
- Often focused on one very small aspect of Sun-Earth system, isolated view
- Small percentage of students use CCMC ( $<1/10$ )





## Other programs

- Atmospheric Science Programs
  - Have classes for forecasting, tools at all U-grad, Masters levels
- Other Space Science Programs
  - Similar absence of forecasting
  - Similar absence of involvement in CCMC
  - But, there may be some exceptions....



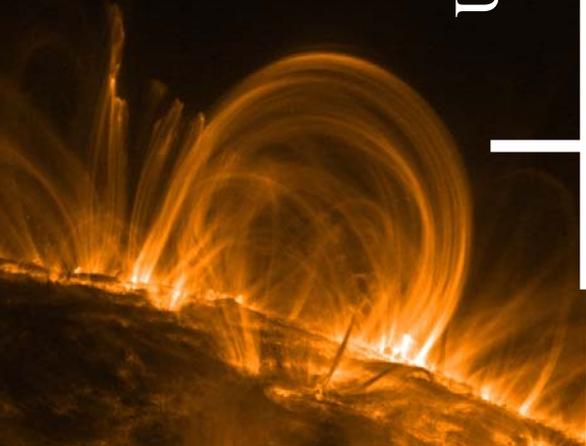
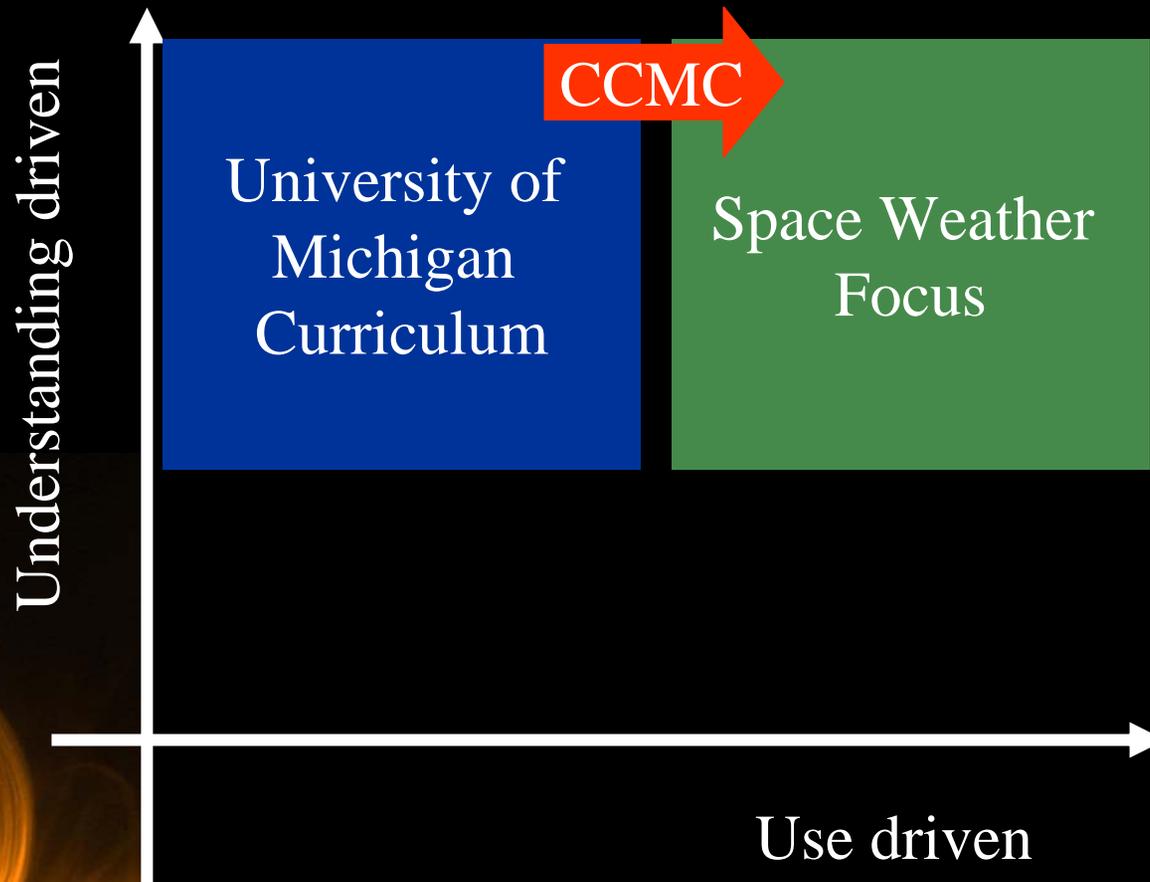


# What's wrong?

- Our educational systems are focused almost exclusively on fundamental space science.
- We have not sufficiently embraced the application to space weather!
- There are many consequences of that detrimental to all research.
  - Good tension between applications and fundamental research is not happening
  - Good examples: Weather forecasting, NIH programs



# Research and Education



# Adaptation of curriculum



- Learn from the Weather forecasters
- Undergrad
  - Include Forecasting class in curriculum
  - Add modeling using CCMC
- Focus on Masters and PhD Level
  - Add forecasting class
  - ... and make it happen





# University Space Weather Challenge

In one year from now, Fall 2006 run a National or International, University based real-time forecasting competition for the duration of one month.

Winning University is publicly announced (and rewarded)





# Why wait a year?

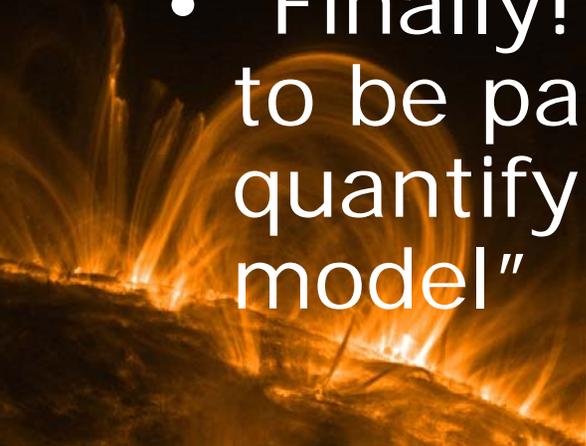
- Decide on metrics
  - Have to be sensible, but not over-engineered
- Define classes/labs
  - They have to go through regular process
- Work with CCMC, SEC on models, logistics issues
- Prepare some models that make us win...



# Would the students want this?



- Poll of all grad students in space science at the University of Michigan
- Every student was positive!
- “Finally!”, “Great idea – would like to be part of it!”, “Will allow me to quantify improvements from my model”





# University Space Weather Challenge

- This will not solve all problems identified, but provide a bold step in the right direction.
- Who wants to play?

