Space Weather Research at NSF:

What's new?

A sample by:

Therese Moretto Jorgensen

National Science Foundation

National Science Foundation
Directorate For Geosciences

New!

Division of
Atmospheric & Geospace Sciences
(AGS)

Division Director: Michael Morgan,
U. Wisconsin, July 2010

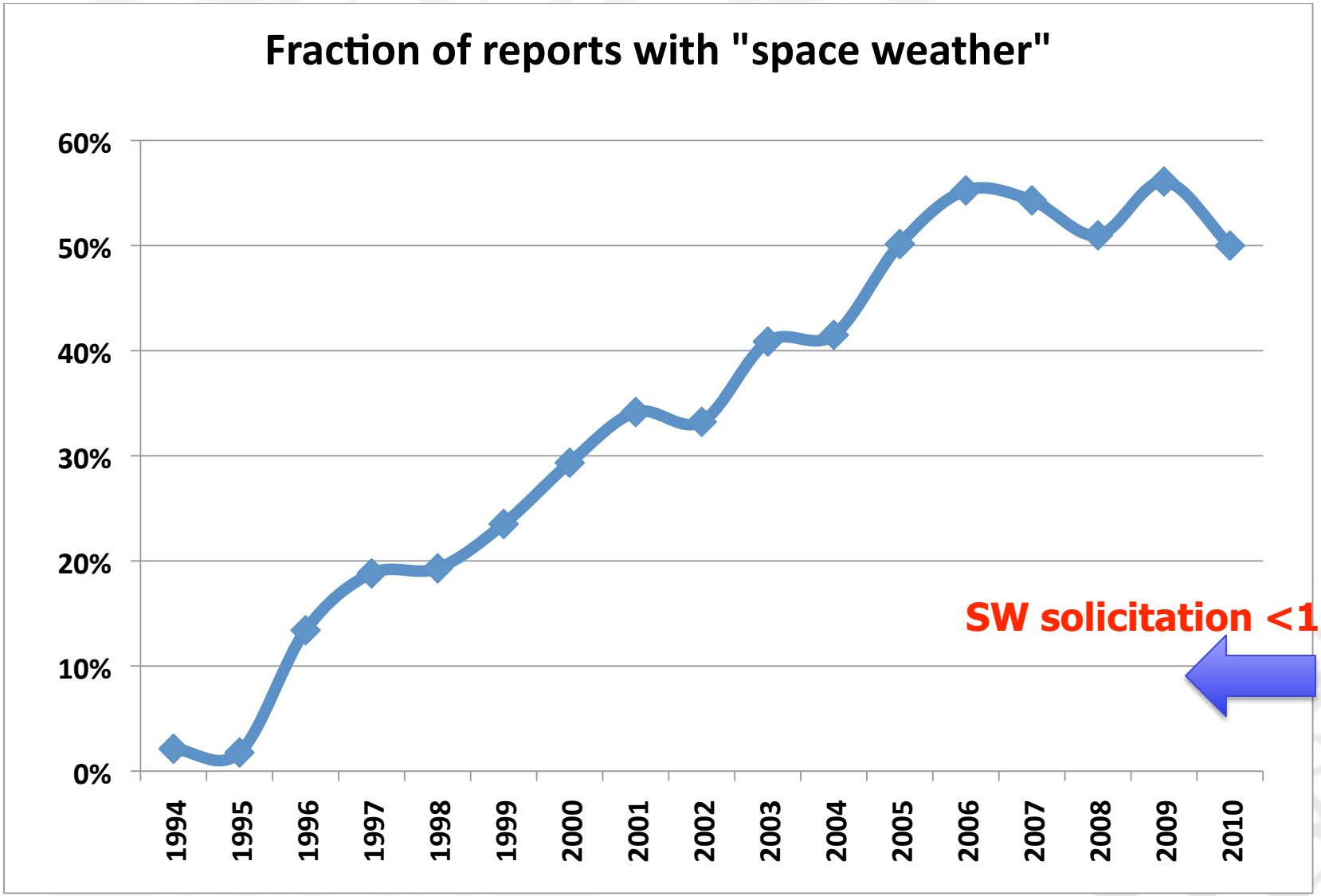
Geospace Section (GS)

Advancing scientific knowledge of
Earth's environment

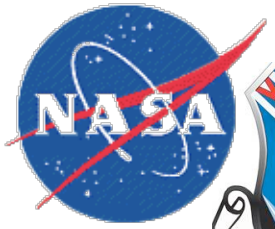
Annual Space Weather Solicitation

- Since 1996
  - Funded at a level of ~$3M/year
- This year: 49 proposal
  - Submitted in January; under review
- Thriving and productive
  - Space Weather concept successfully adopted by research community

Main-streaming of SW Research



Rethinking NSF Space Weather Funding



- Utilize overlap with CEDAR, GEM, and SHINE programs
  - Boosting funding of these slightly
- Continue Collaborative SW Modeling program
  - 6 projects funded jointly with NASA and AFOSR in 2006/7
- SW research is part of upcoming new GEO-wide program: Dynamic Earth
  - Biennially, ~$28M
- International Collaboration
  - EC Framework Program 7

COMMUNITY COORDINATED MODELING CENTER

- **The NSF view on CCMC:**
  - **A tremendous success with a vital mission ! !**

  (Rich Behnke at the CCMC Workshop in January)

- **Now established as a facility under the UAF program**

- **Hugely successful inter-agency collaboration with NASA**

AMPERE

Continuous Global Birkeland Currents from the Active Magnetosphere and Planetary Electrodynamics Response Experiment

Brian J Anderson, Lars P Dyrud
The Johns Hopkins University Applied Physics Laboratory

Jeremy Anderson

Data acquisition up and running!

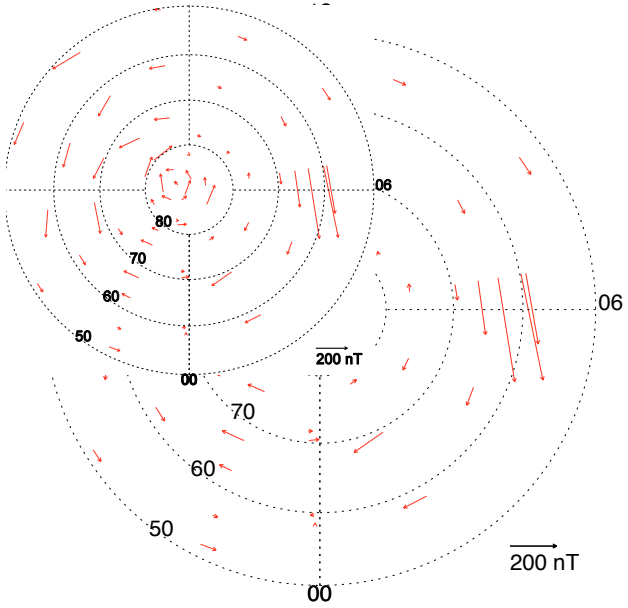
Side-by-side comparison of data acquired in 10 minutes. **Old:** **200 s/sample**

Standard AMPERE: complete coverage with ~1° lat. res. **20 s/sample**

High rate AMPERE: ~ 0.1° lat. res. **2 s/sample**

Old Data

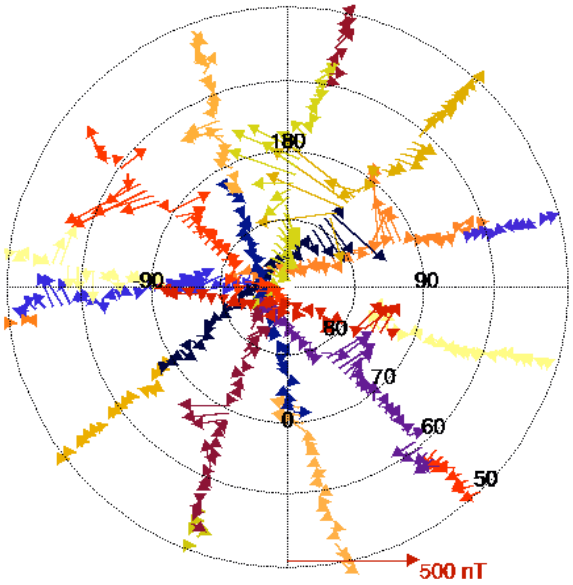
10/01/2002 11:55-12:05



TLM data from all satellites

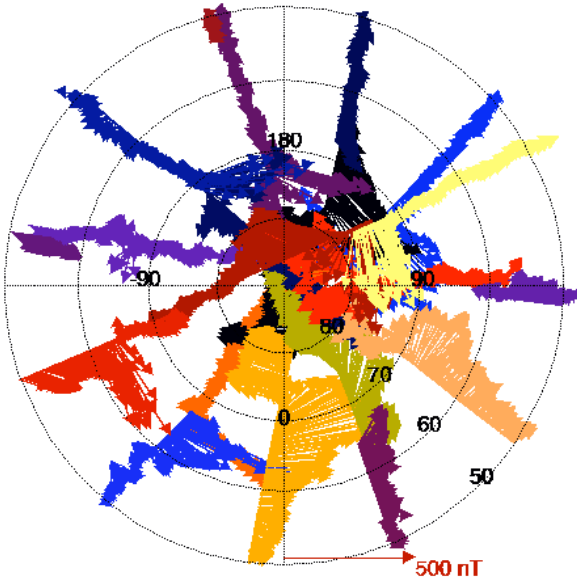
AMPERE: Standard

11/25/2009 08:45-08:55



AMPERE: High

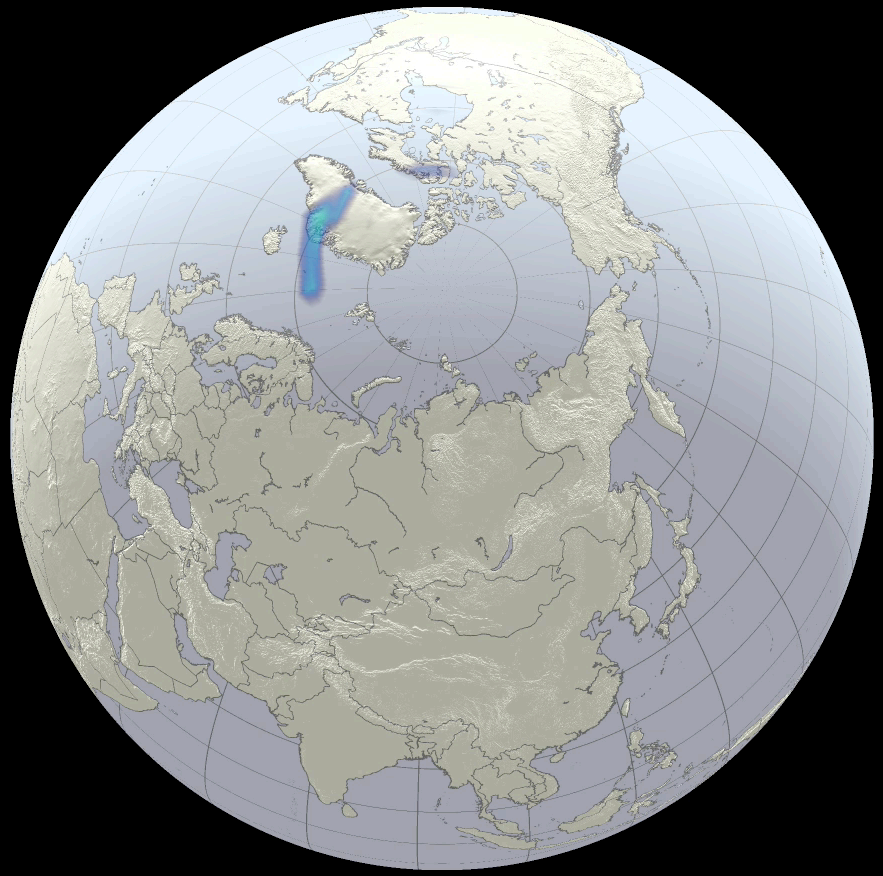
11/24/2009 18:27-18:37



Different colors denote different satellites

Continual Monitoring Tested

14 February at 1800 UT through 1200 UT on 16 February

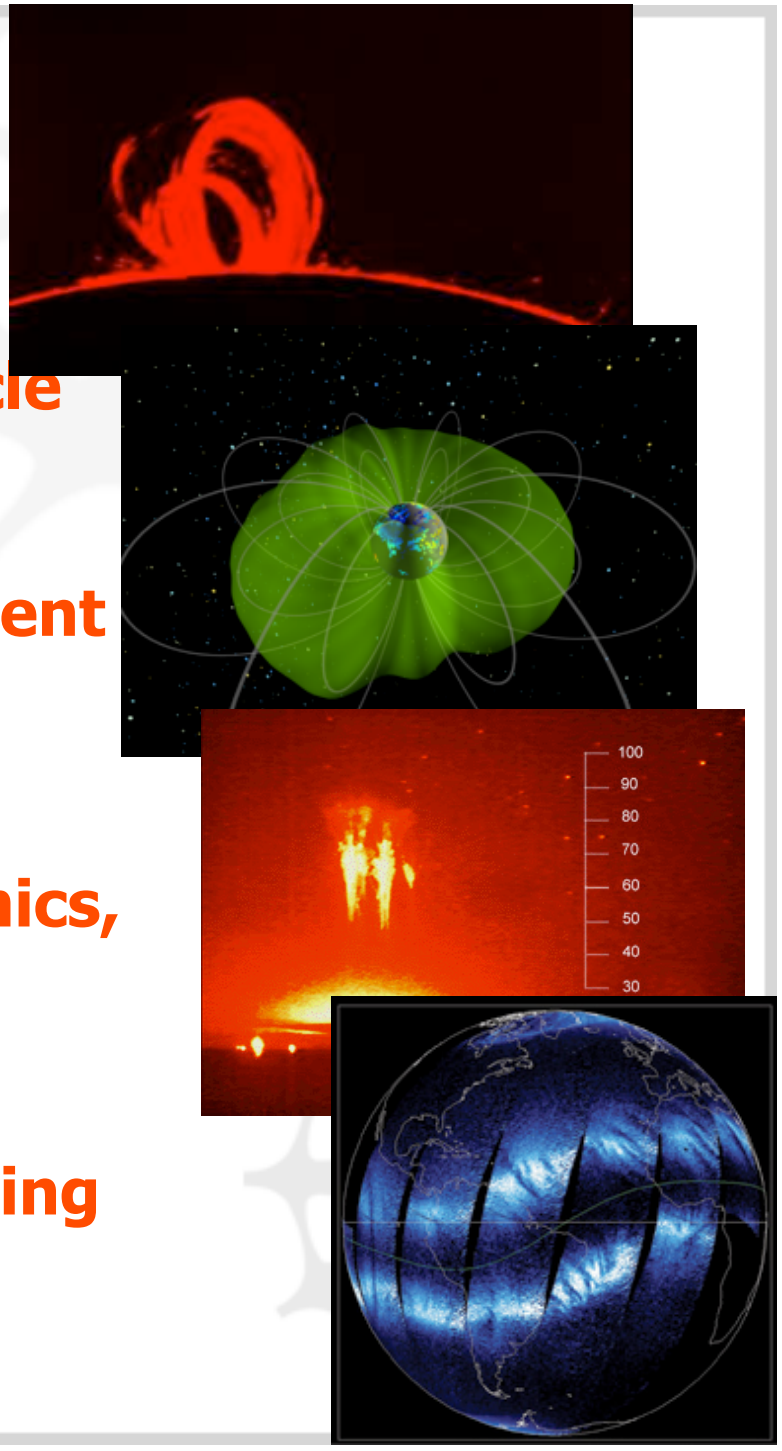


The NSF CubeSat program: Summary

- Utilize CubeSat and P-POD technology development
- Space weather & atmospheric research and education
- Started 2008
- 2-3 new science missions/ year
- Collaboration with NASA WFF on commissioning and launch services
- Collaborate with DOD, NASA, Industry on launch opportunities
- 40 missions proposed; 6 projects started

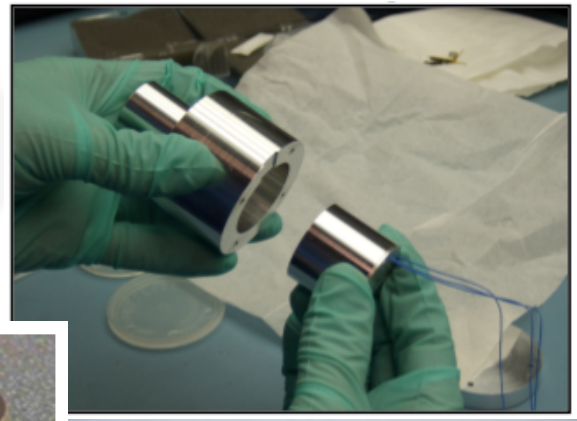
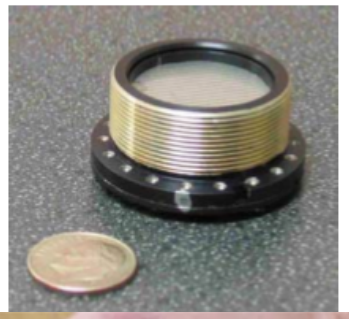
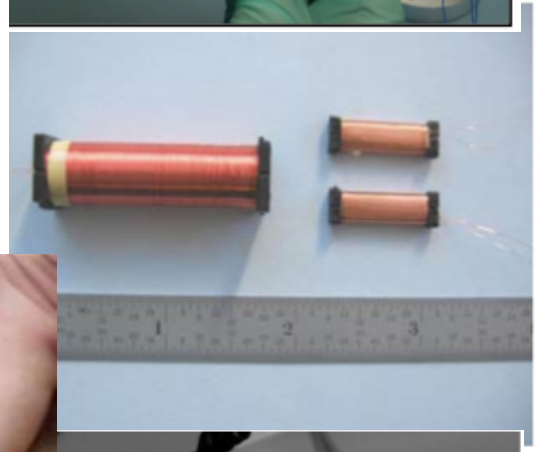
CubeSat Science

- **Solar & Heliosphere:**
  - Flares, Solar energetic particle events , CMEs
- **Magnetosphere:**
  - Radiation belts and ring current dynamics, Magnetosphere-ionosphere coupling
- **Ionosphere, Mesosphere:**
  - Irregularities, electro-dynamics, neutral interaction, composition, chemistry
- **Atmosphere:**
  - Cloud physics, albedo, lightning effects, pollution, hurricane dynamics



CubeSat Experiments

- E & M fields and waves
- Radio waves
  - VLF-UHF
  - microwave
- Plasma and particles
  - Electrostatic probes – mass & imaging spectrometers,
  - keV-MeV
- Photometers & imagers
  - near IR- UV
  - X & gamma rays

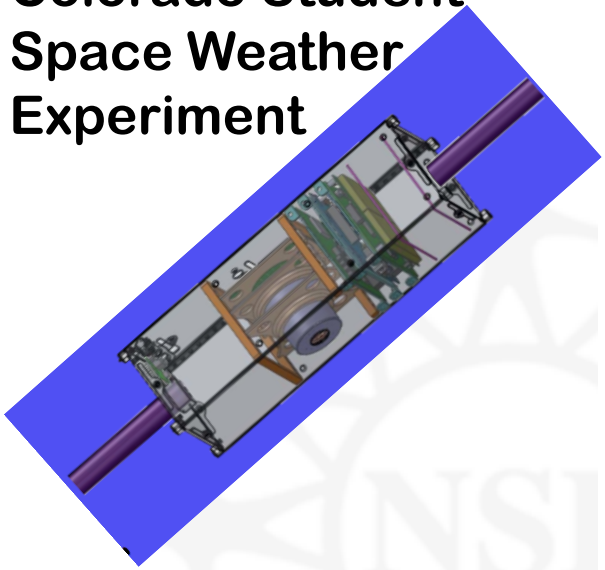

NSF CubeSat Projects

RAX
Radio Aurora Explorer

FIREFLY
NATIONAL SCIENCE FOUNDATION · SIENA COLLEGE · NASA/GSFC · USRA · HAWK INSTITUTE FOR SPACE SCIENCES

FIREBIRD
THE AEROSPACE CORPORATION
MONTANA STATE UNIVERSITY
BOSTON UNIVERSITY
Focused Investigations of Relativistic Electron Burst Intensity, Range, and Dynamics

Colorado Student Space Weather Experiment



CubeSat for Ions Neutrals Electrons and MAgnetic fields
trio cinema

Space Sciences Laboratory, UC Berkeley
Kyung Hee University of South Korea
Imperial College London

DICE
ASTRA
USU/SDL
Clemson
Embry Riddle