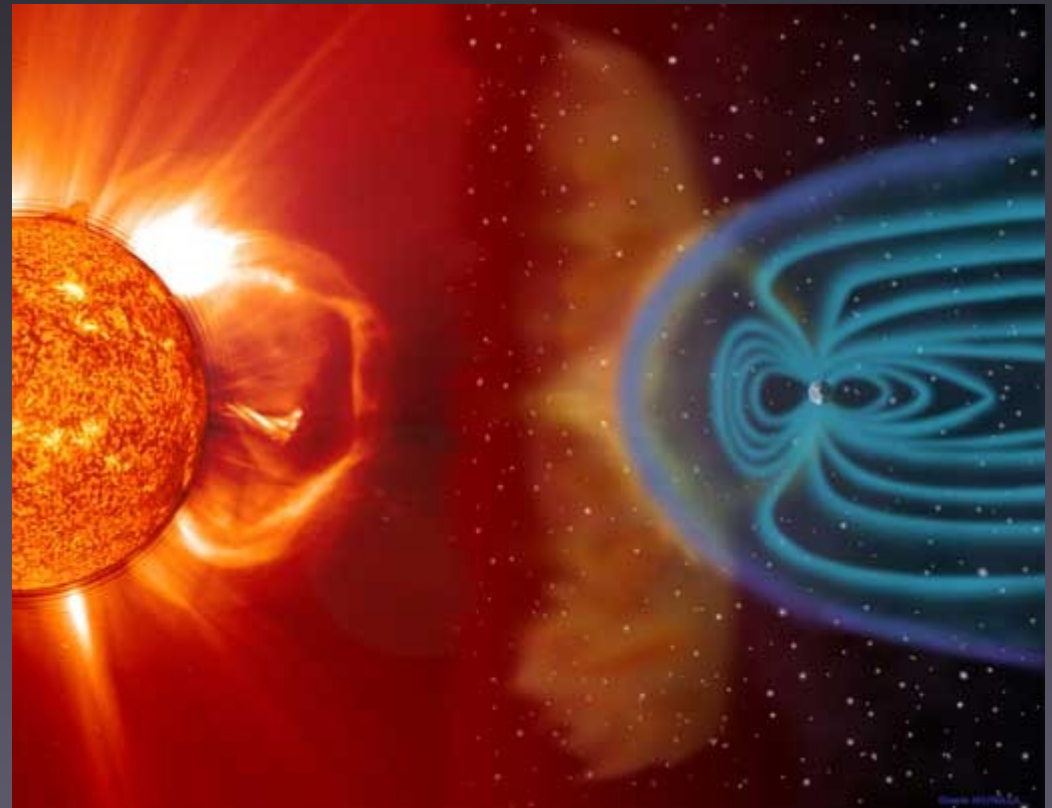


Solar activity (space weather) data: Facilitating cross-disciplinary studies

Maria T. Patterson
New Mexico State University

Joshua D. Eisenberg
Florida International University

Rafael D. Suarez
University of Chicago, OSDC



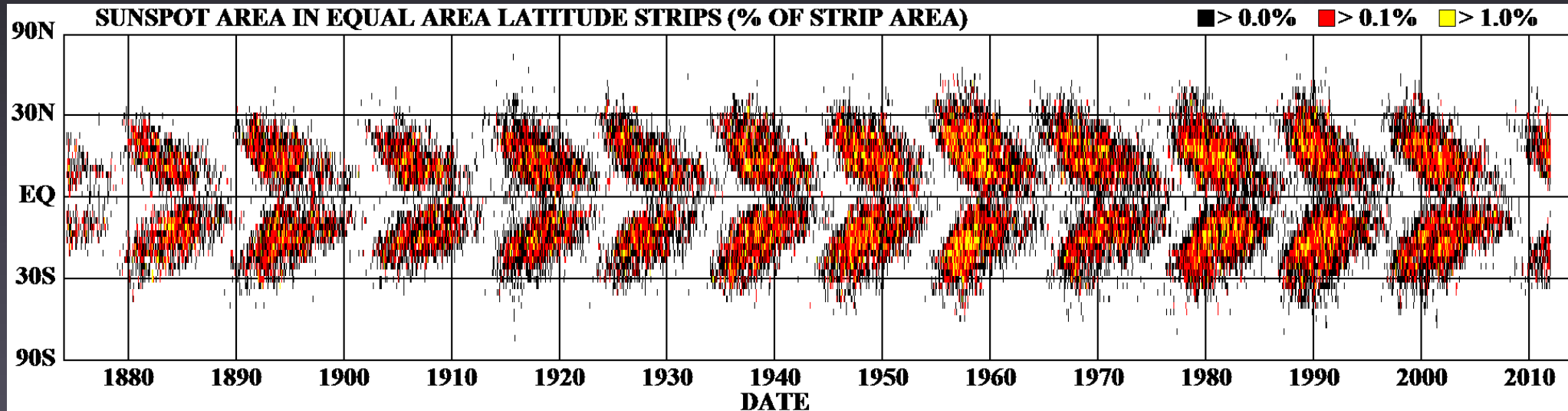
(Image credit: NASA)

Solar Activity

Solar activity varies on “long” timescales.

The solar magnetic field reverses polarity every 9 – 14 years.

→ Solar activity (sunspots, flares, etc) rises and falls over this period.



Plot of sunspot coverage as a function of time

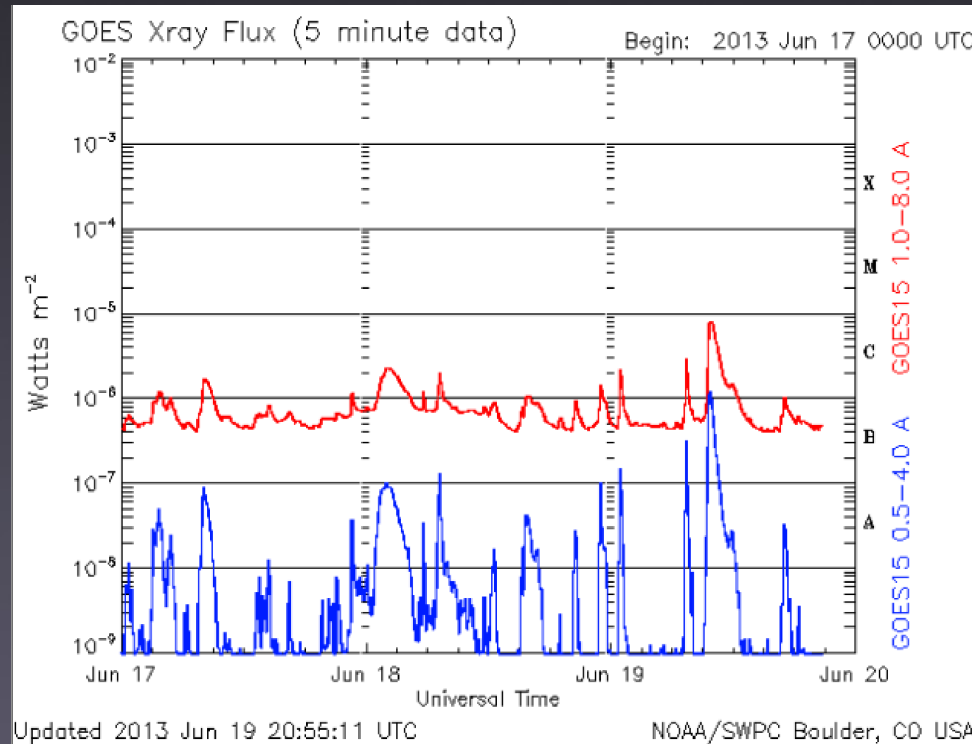
(Image credit: Hathaway and NASA Marshall Space Flight Center, updated monthly)

Solar Activity

Solar activity varies on “short” timescales.

Flares and Coronal Mass Ejections (CMEs) are sudden (minutes).

→ Solar activity (x-ray flux, charged particle solar wind) varies over the course of a day.



Plot of solar x-ray flux as a function of time

(Image credit: solarmonitor.org, June 19, 2013)

Space Weather Data Sets

Space Weather Prediction Center

GOES (Geostationary Operational Environment Satellites) data

→ solar X-ray flux time series data (1 min, 5 min cadence)

→ charged particle time series data (1 min, 5 min cadence)

SOHO (Solar and Heliospheric Observatory) data

→ recorded information for every Coronal Mass Ejection (CME) from 1996 to present

Sunspot coverage over time since 1749

Cross Disciplinary Research Impact

Cross-correlating solar activity with relevant time series data

Climate/weather

→ Lower sea temperature over the Pacific Ocean during solar maximum (National Research Council, 2013)

Geophysics/agriculture

→ Solar activity → CO₂ in atmosphere → plant life?

→ Solar activity → geomagnetic field → seismic activity?

Public health

→ Solar activity → incidence of health problems such as skin disorders?

Global communication infrastructure

→ Solar flares cause communication power outages (like 2013 Mother's Day flare/ radio blackout).