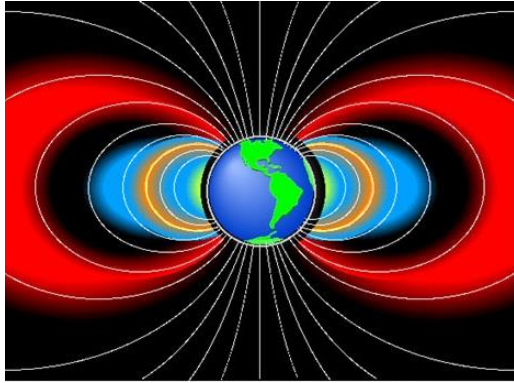


Space Radiation Environment

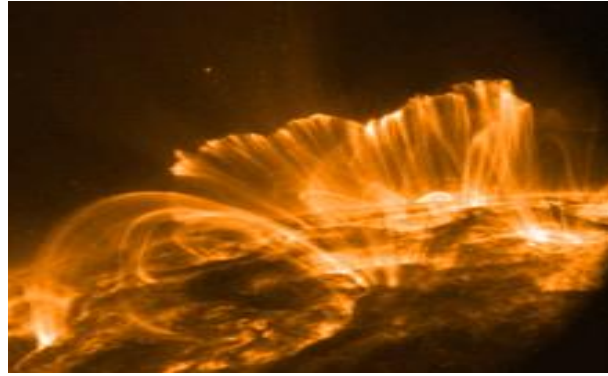
O. C. St. Cyr
Heliophysics Science Division, Code 670
NASA-Goddard Space Flight Center

Chris.StCyr@nasa.gov

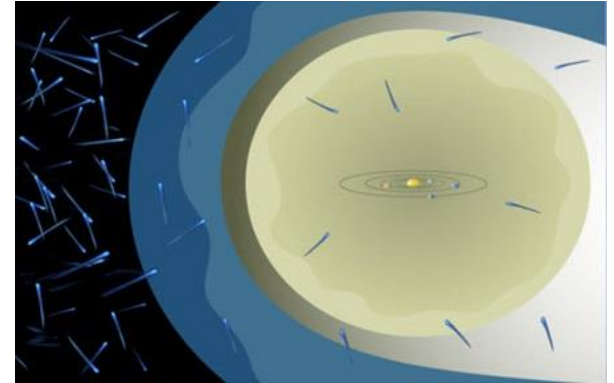
Three Primary Sources of Space Radiation in the Natural Environment



**Trapped Radiation
Belts**

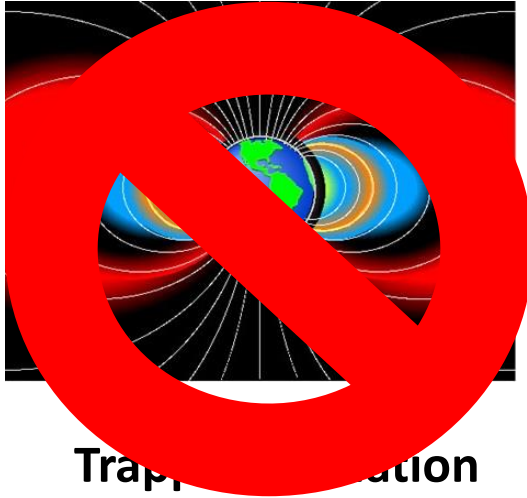


**Solar Energetic
Particles (SEPs)**

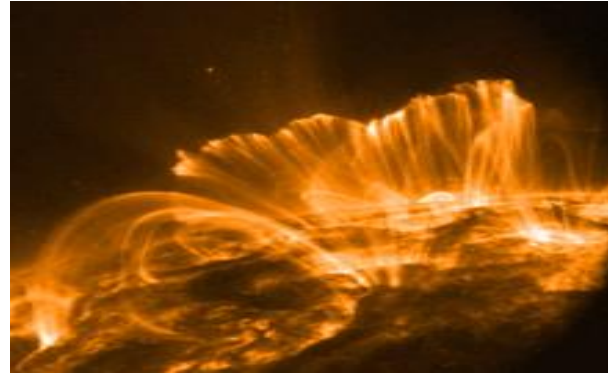


**Galactic Cosmic
Rays (GCRs)**

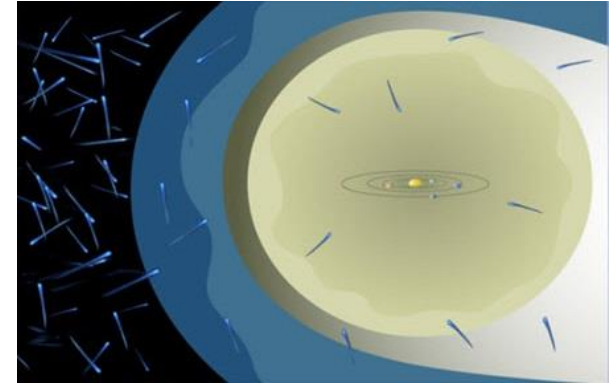
Three Primary Sources of Space Radiation in the Natural Environment



Trapped Radiation
Belts



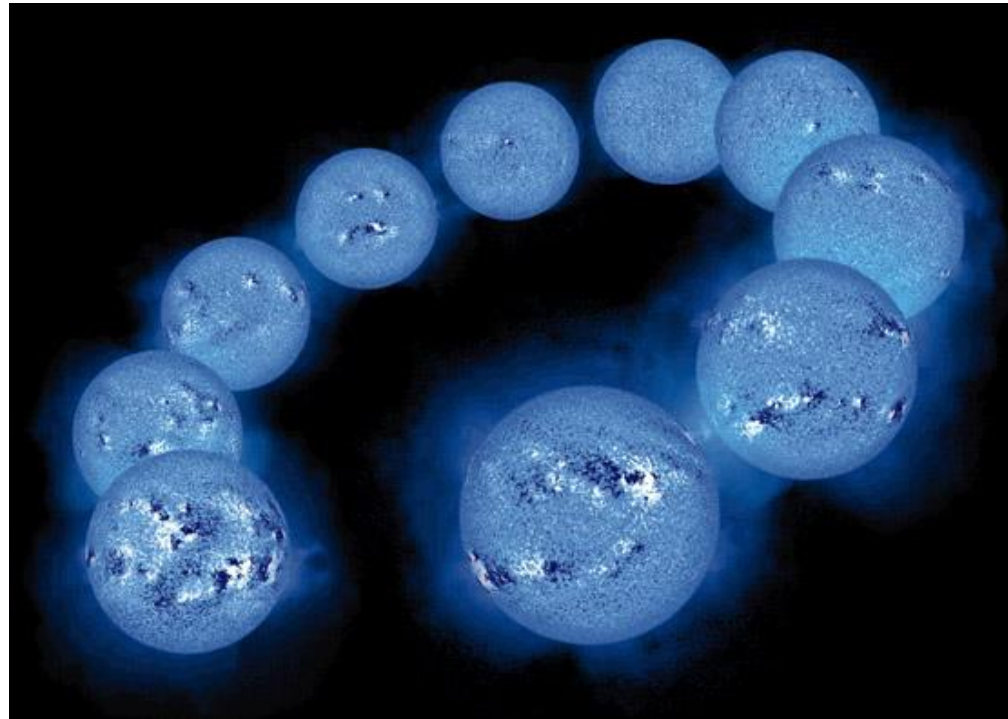
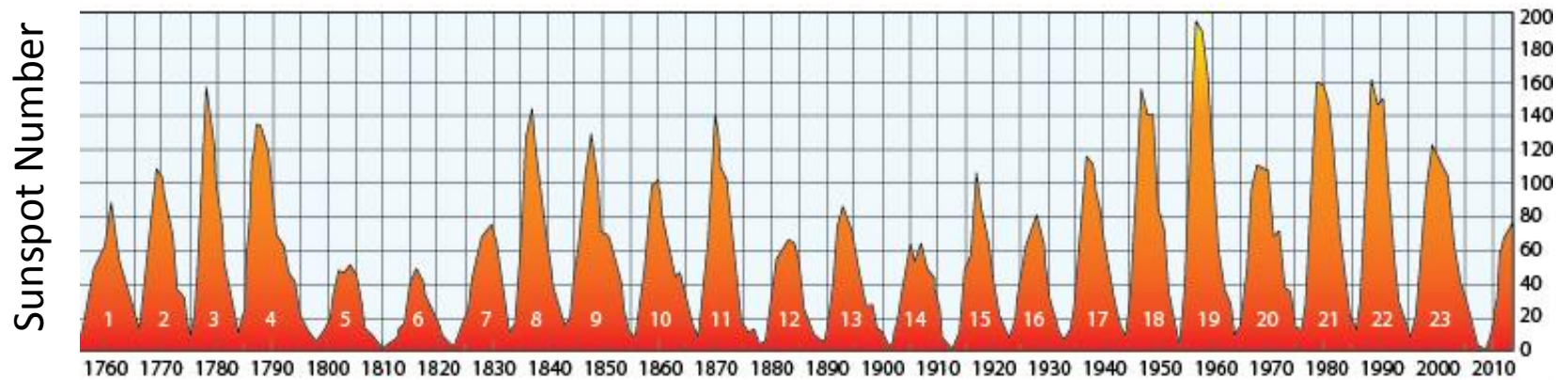
Solar Energetic
Particles (SEPs)



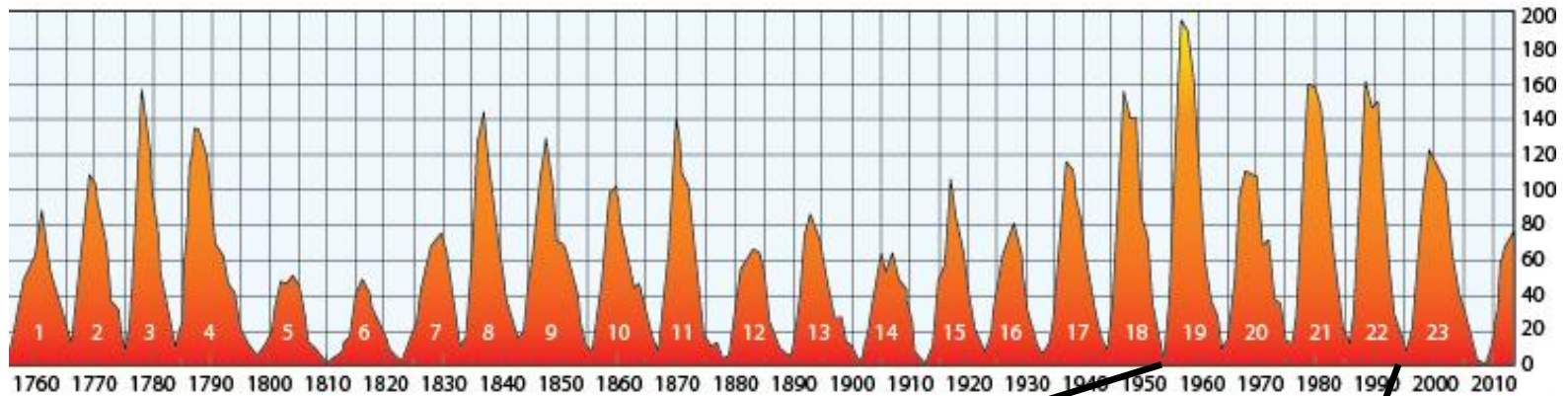
Galactic Cosmic
Rays (GCRs)

Topics for Today

The Sun is a Magnetically-VARIABLE Star



The Solar Activity Cycle Modulates SEPs



Most SEP events occur during solar activity maximum

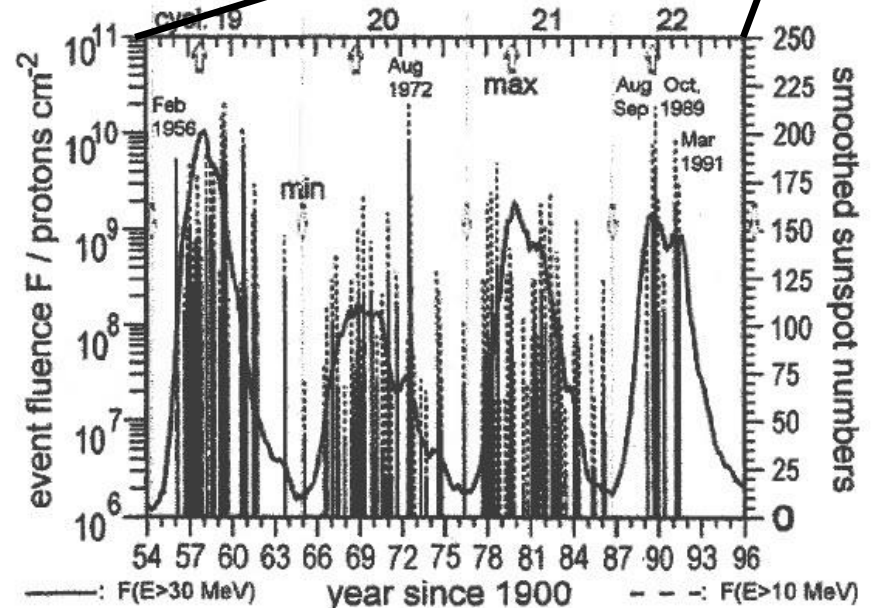
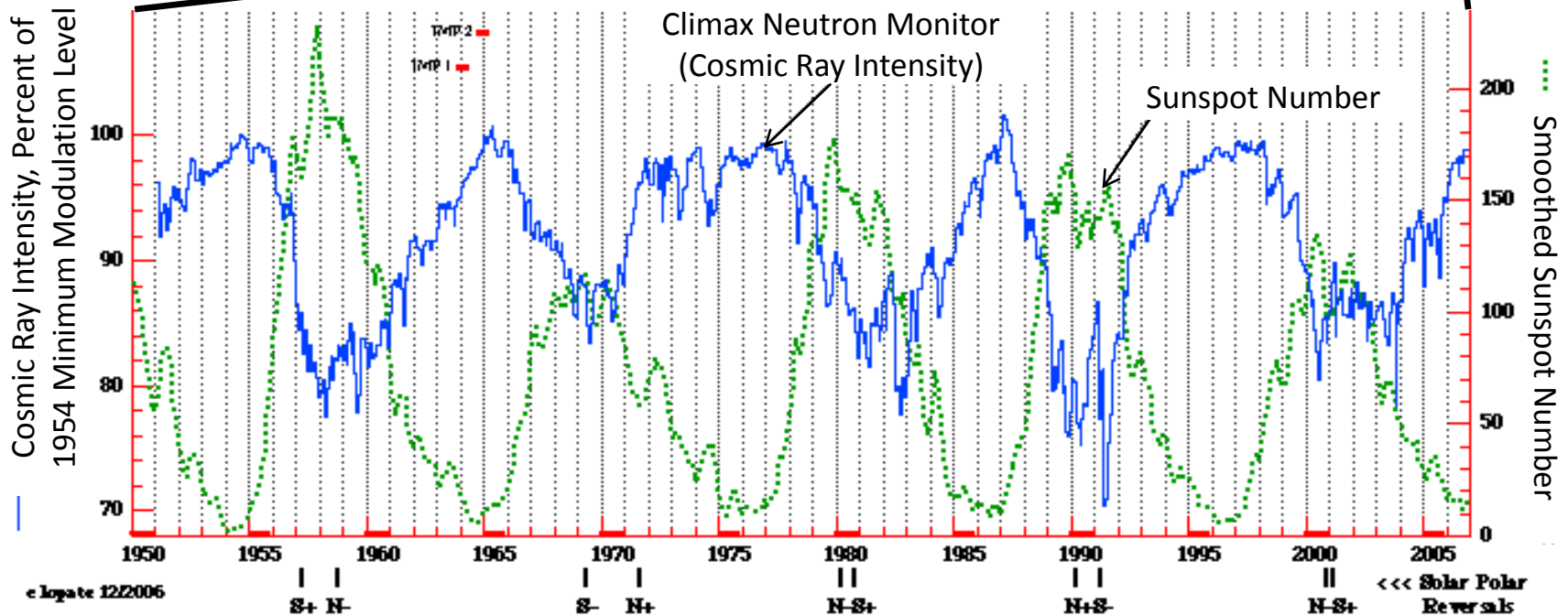
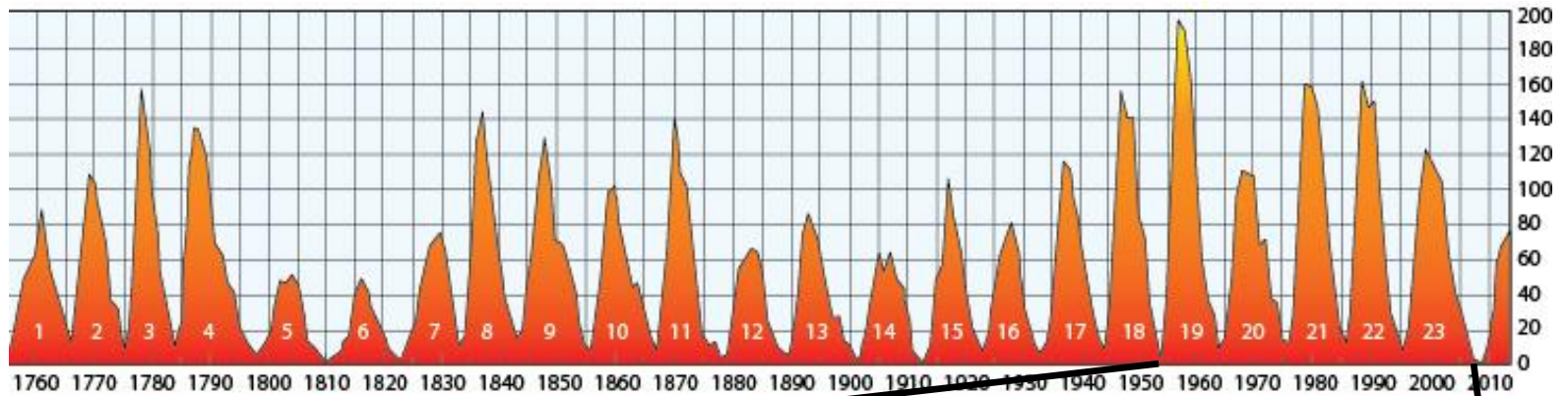


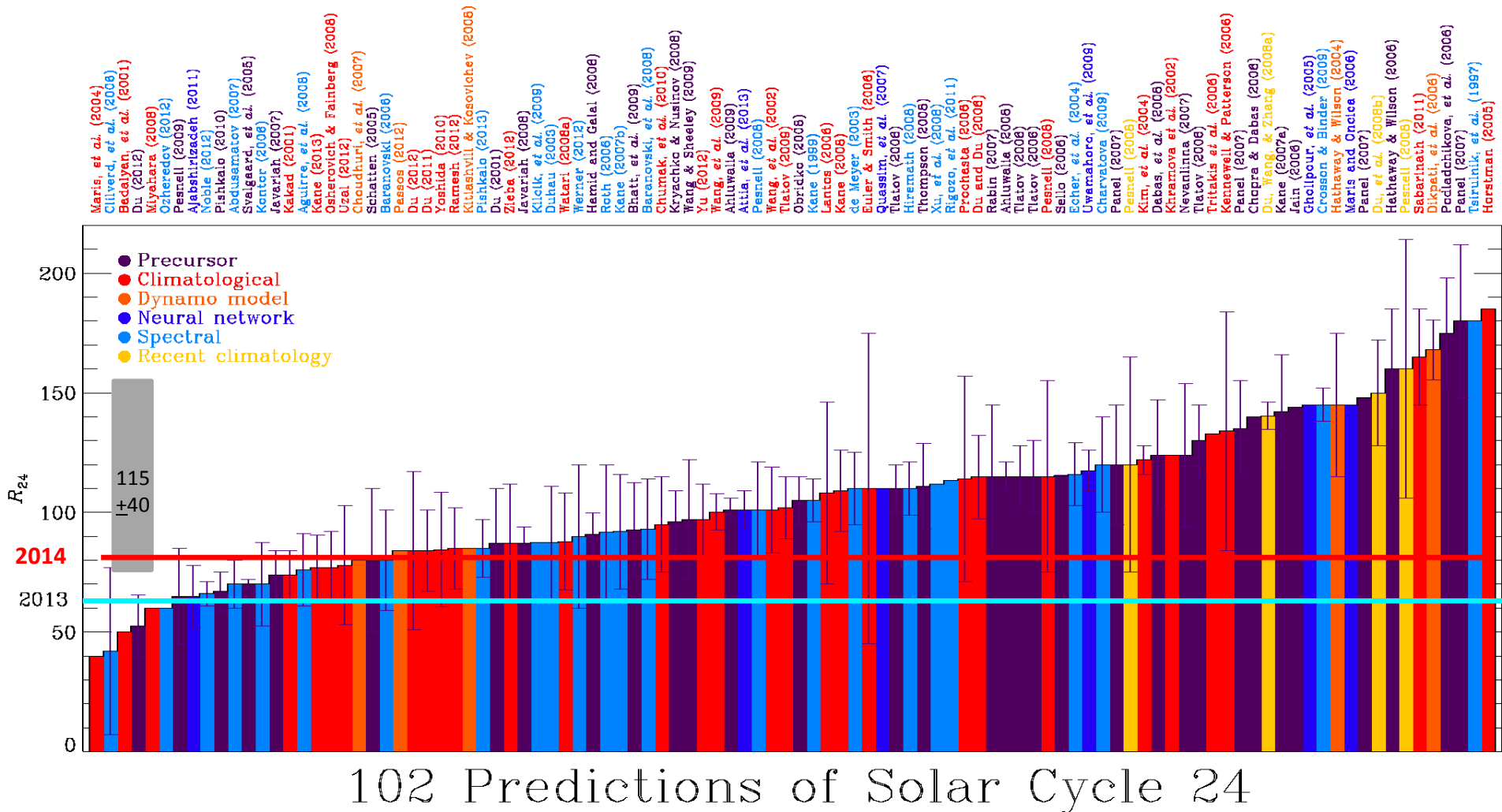
Figure 11.8. Occurrence of major and extreme solar particle events in solar cycles 19–22.

The Solar Activity Cycle Modulates GCRs



How Well Can We Predict the Solar Activity Cycle?

How Well Can We Predict the Solar Activity Cycle? [Not very well...]





Overview

- Mars Mission and Space Radiation Risks
- Health Standards Decision Framework

Steve Davison, NASA-HQ, 30 min

David Liskowsky, NASA-HQ, 10 min

Space Radiation Environment

- Introduction
- Solar Energetic Particles
- Comparison and Validation of GCR Models
- GCR Radiation Environment Predictions
- Emerging GCR Data from AMS-2

Chris St. Cyr, NASA-GSFC, 5 min

Allan Tylka, NASA-GSFC, 30 min

Tony Slaba, NASA-LaRC, 30 min

Nathan Schwadron, Univ. of NH, 30 min

Veronica Bindi, Univ. of Hawaii, 30 min

Radiation Health Risk Projections

- NCRP Recommendations, Permissible Exposure Limits, Space Radiation Cancer Risk Model, Operations and In-Flight Solar Particle Event Mitigations

Eddie Semones, NASA-JSC, 45 min

Space Radiation R&T for Risk Mitigation

- Radiobiology Research Portfolio (Cancer, CNS, Cardio) and Spacecraft Shielding Design, Analysis, and Optimization

Lisa Simonsen, NASA-LaRC, 45 min