SEPs

Data:
Kodiak Launch 2001
(*From Kathy Winters*)

GOES X-Rays

Flare

Flare

GOES Xray Flux (5 minute data)   Begin: 2001 Sep

ES Xray Flux (5 minute data)   Begin: 2001 Sep 27

Xray Flux (5 minute data)   Begin: 2001 Sep 30 0000 UTC

Watts m⁻²

Updated 2001 Sep 26 23:56:03 UTC   NOAA/SEC Boull 2001 Sep 29 23:56:03 UTC   NOAA/SEC Boulder   2001 Oct 2 23:56:06 UTC   NOAA/SEC Boulder, CO USA

GOES8 Proton Flux (5 minute data)   Begin: 2001 Sep 24 08 Proton Flux (5 minute data)   Begin: 2001 Sep 27 8 Proton Flux (5 minute data)   Begin: 2001 Sep 30 0000 UTC

Launch Delayed → →**Launch**

GOES > 10 MeV Proton Flux

Go
No Go

> 50 MeV

> 100 MeV

Particles cm⁻²s⁻¹sr⁻¹

Updated 2001 Sep 26 23:56:03 UTC   NOAA/SEC Boulder, 2001 Sep 29 23:56:05 UTC   NOAA/SEC Boulder 2001 Oct 2 23:56:03 UTC   NOAA/SEC Boulder, CO USA

Data:
Kodiak Launch 200
(*From Kathy Winters*)

Flare

Flare

GOES
X-Rays

SEP Onset time and time
to exceed threshold

Launch Delayed ⬅ - ⬝ - ⬝ → - - ➔**Launch**
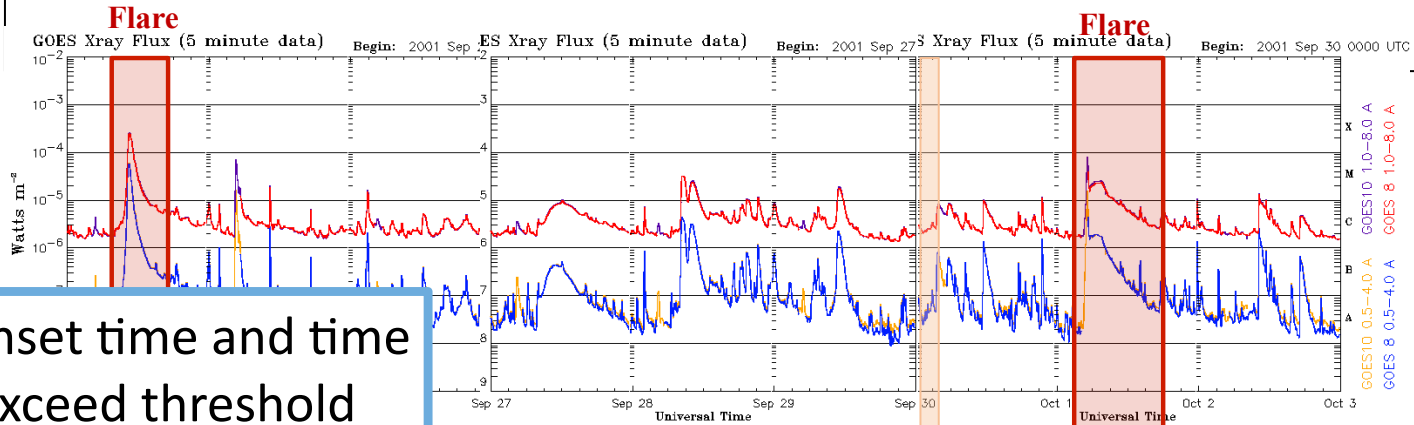
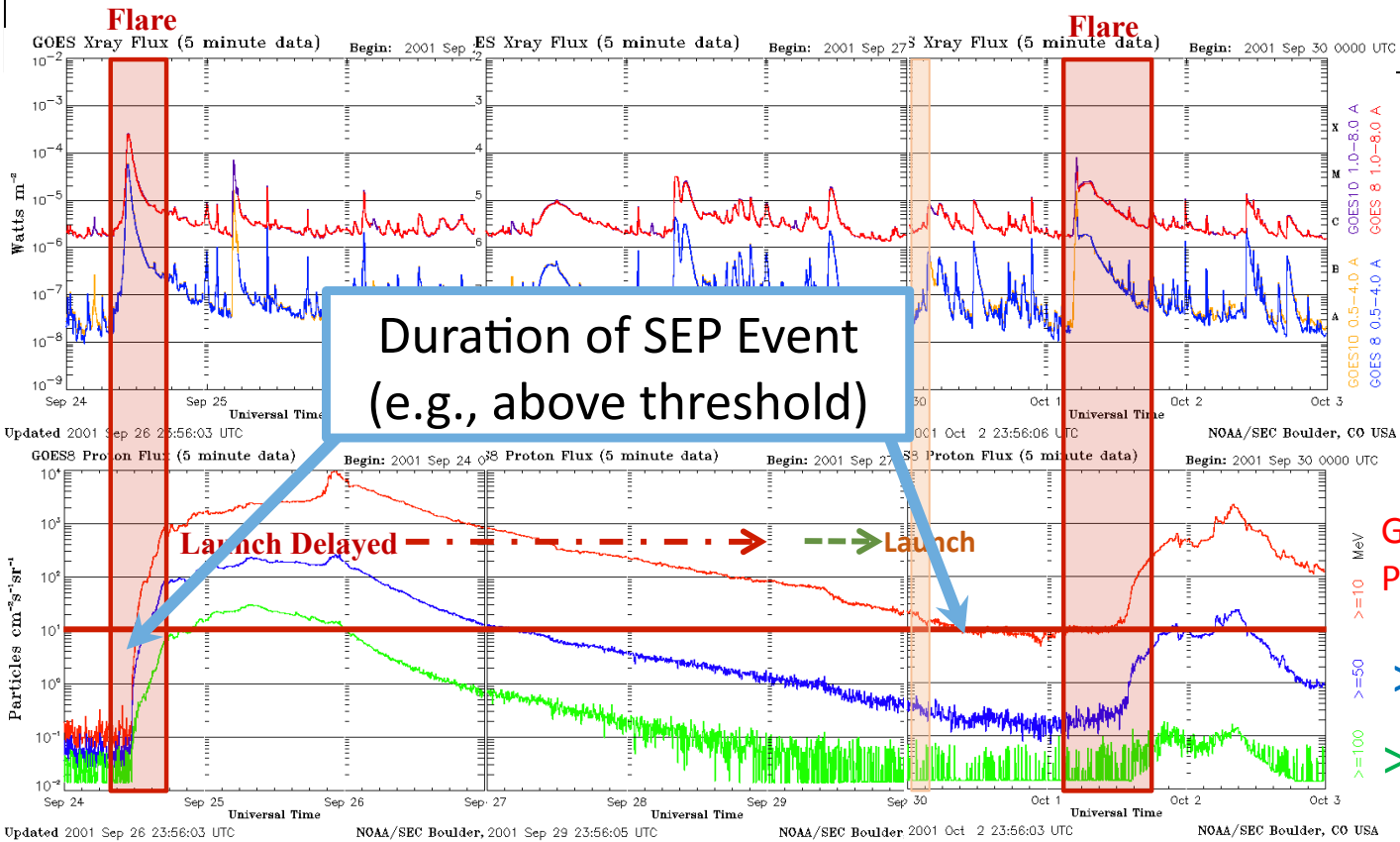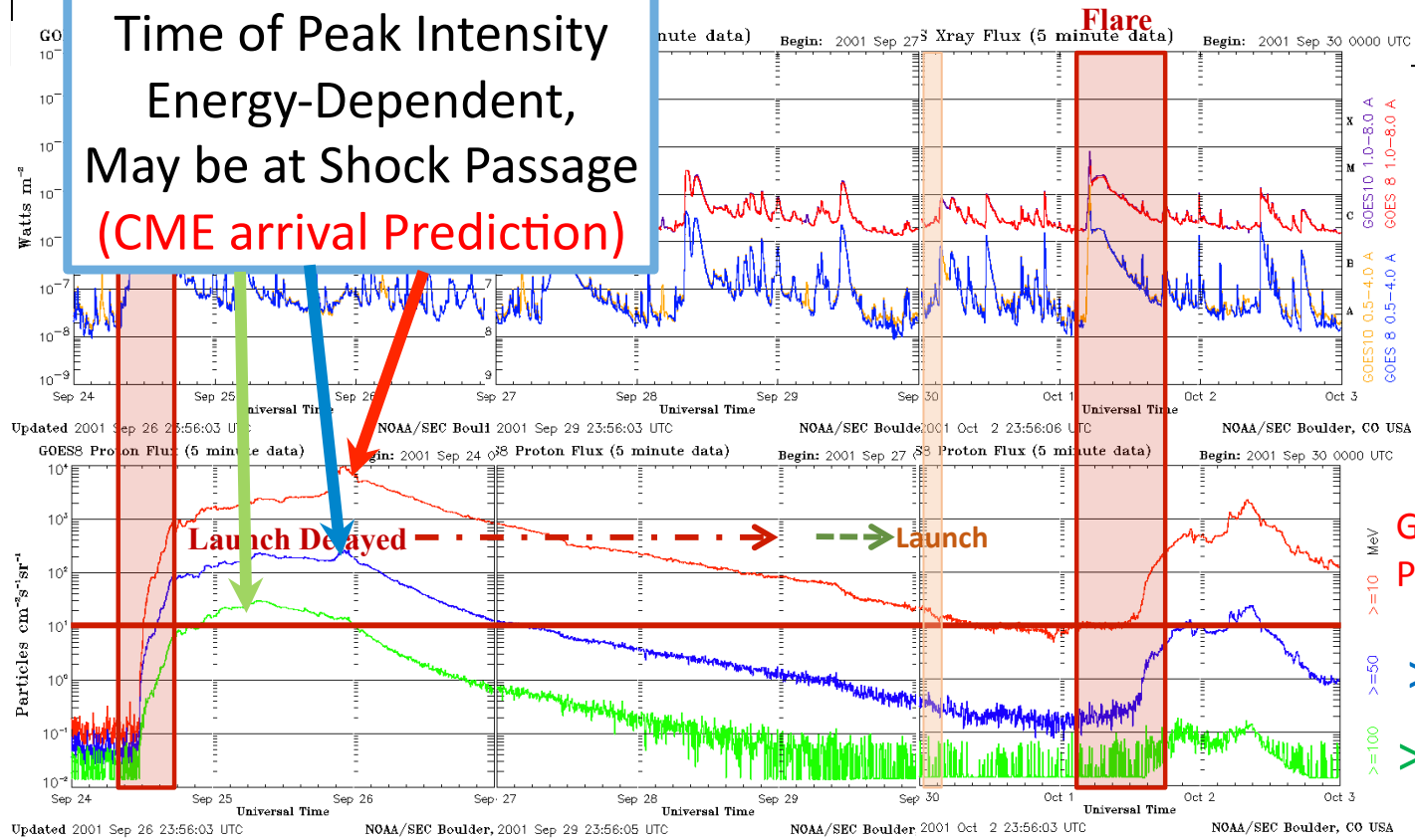GOES > 10 MeV
Proton Flux

> 50 MeV

> 100 MeV

Data:
Kodiak Launch 200
(*From Kathy Winters*)

GOES
X-Rays

Duration of SEP Event
(e.g., above threshold)

GOES > 10 MeV
Proton Flux

> 50 MeV

> 100 MeV

Data:
Kodiak Launch 200...
(From Kathy Winters)

Time of Peak Intensity
Energy-Dependent,
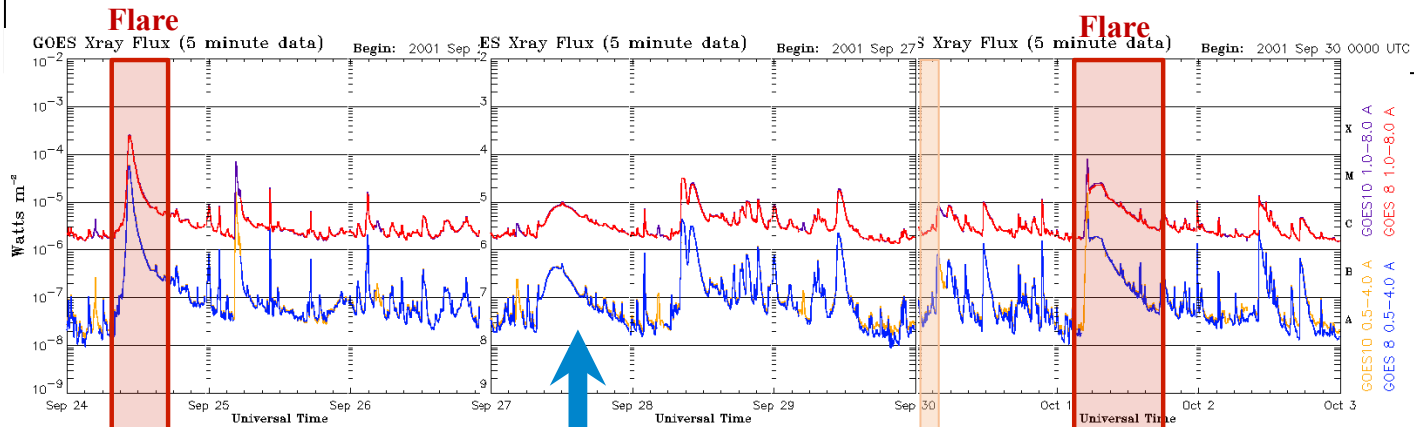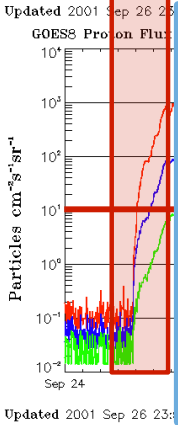**May be at Shock Passage**
(CME arrival Prediction)

Flare

GOES
X-Rays

Launch Delayed ----- Launch

GOES > 10 MeV
Proton Flux

> 50 MeV
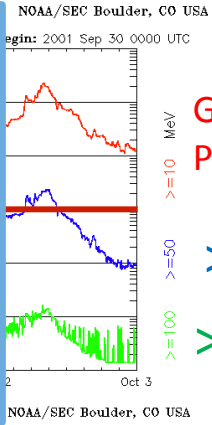
> 100 MeV

Data:
Kodiak Launch 200
(*From Kathy Winters*)

GOES
X-Rays

Which of these many flares will be
associated with an SEP event?
(e.g., fast CME, radio emission etc.)
Not necessarily the largest flares!
May be behind the limbs (~25%)
(Flare prediction, CME kinematics/topology)

GOES > 10 MeV
Proton Flux

> 50 MeV

> 100 MeV

Thursday meeting with Aviation Radiation Group.

Interested in forecasts of **100s of MeV/n SEP ion fluxes**.

Challenging to model/forecast. Usually arrive rapidly at Earth. Acceleration mechanism (flare/CME shock) still under investigation/discussion.

Poorly measured energy range – interpolate between spacecraft and neutron monitor observations. New GOES spacecraft instrument will help in this energy range.

Anisotropy is important – beamed SEPs can increase the radiation level.

Need detectors on more aircraft for validation. Currently it is a matter of luck whether an instrumented aircraft is flying across the Atlantic when an SEP event occurs.

Forecasts should minimize false alarms ("crying wolf") or will be ignored by airlines ($$$$$).

NOAA radiation storm (S) index based on >10 MeV proton flux is not useful for aviation use. New "D" index was outlined.

CME Arrival and Impact Team:
Summary of Session Discussion

- All types of CME events
  - Keep track of the different types
- Validation set : 100 events
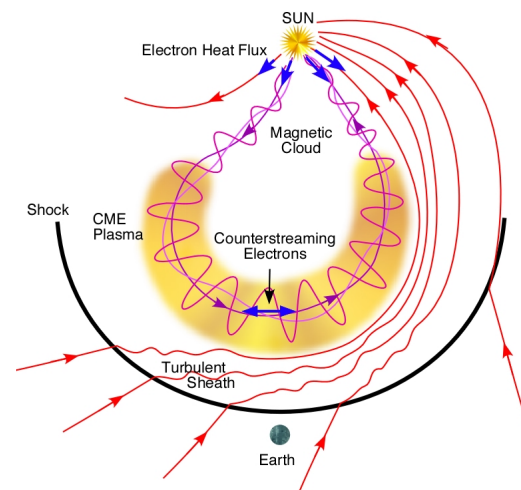- Arrival time from catalogues
- 1h averaged OMNI data

SKILL SCORES

- What is a hit?
- Contingency table
- RMSE, MAE, ME,…
- Correlation coefficients

Arrival time

Modeled and observed sheath/ICME parameters

1st CCMC-International Meeting: International CCMC-LWS Working Meeting 3-7 April 2017

CME Arrival and Impact Team: Thursday Session

Background solar wind influence:

- Modeled arrival times for the same CME can be influenced by the inputs used to drive the background solar wind in the model.

- Inputs/model also influence modeled solar wind parameters.

- Modeling may not be consistent with the expectation (used to tweak SWPC arrival time forecasts) that ICMEs propagating through fast solar wind arrive earlier than expected, but further investigation is required.