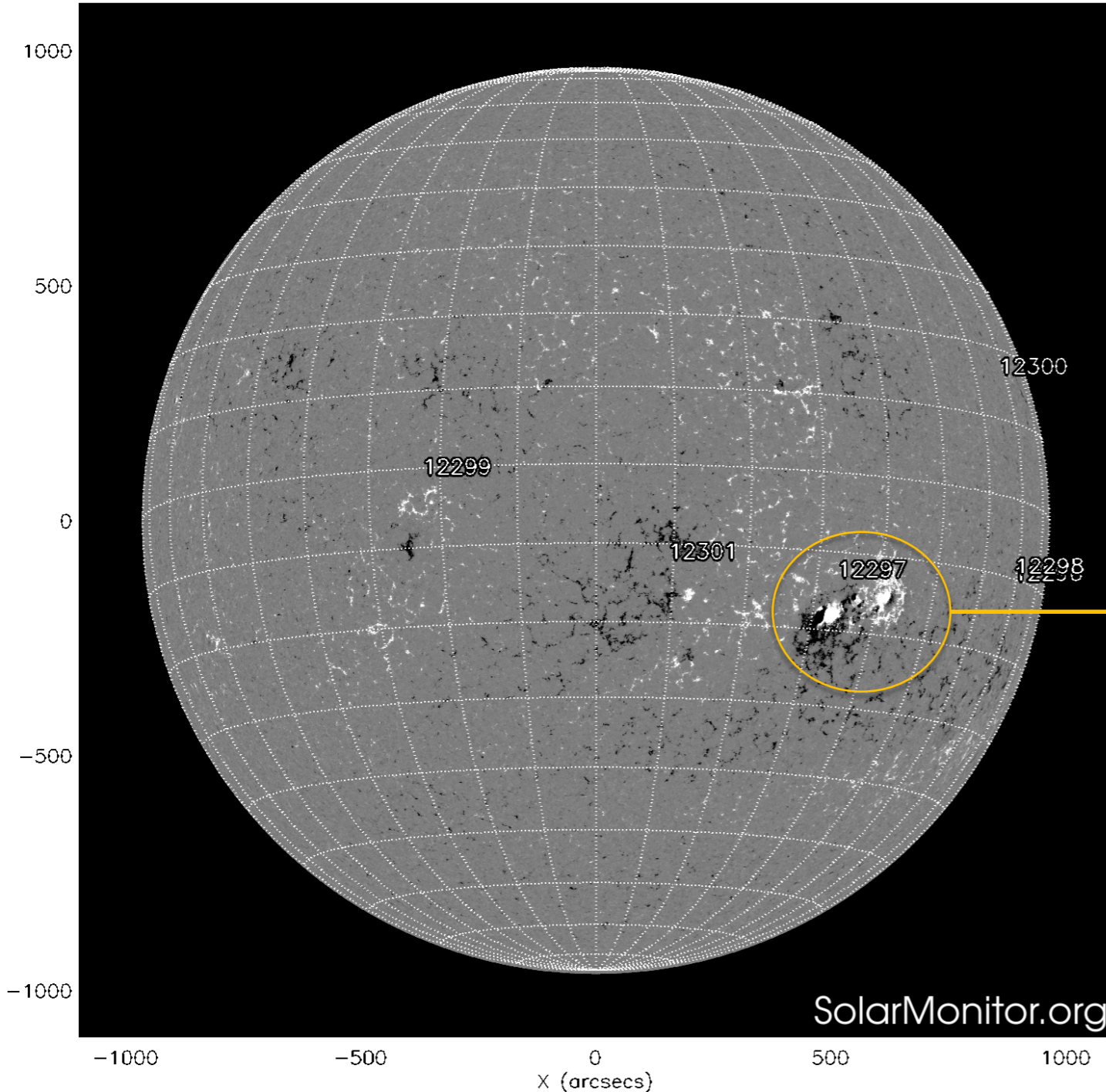


St. Patrick's Day 2015 Geomagnetic Storm

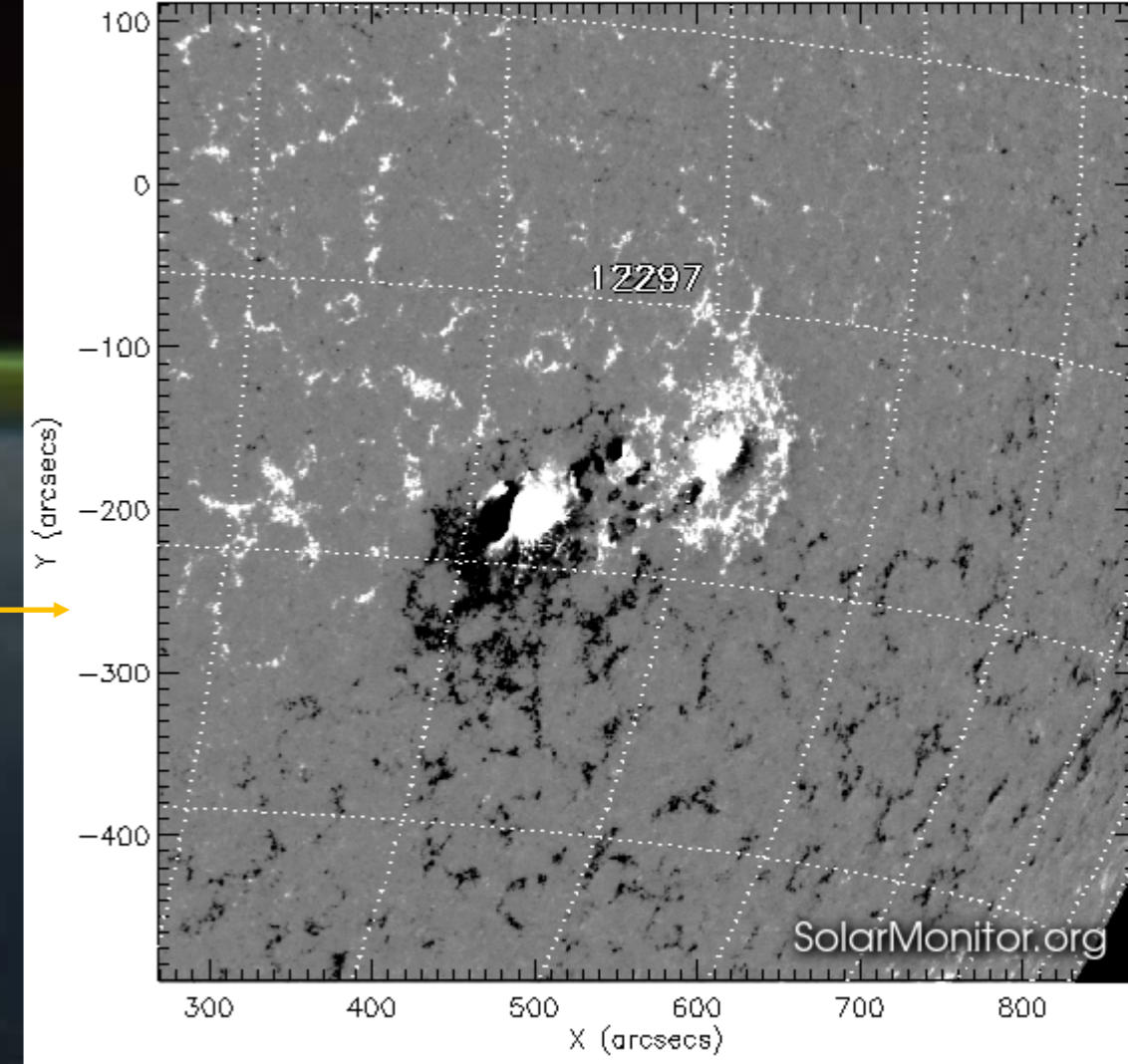
- G4 level (severe) geomagnetic storm
- Commencement: ~14:00 UT (10:00 EDT)
- Duration: ~18 hours (G3/G4 conditions sustained for 12 hours)
- Maximum magnetic field (Bz): -30 nT (-20 nT sustained)
- Strongest G4 storm of Solar Cycle 24 (out of only 5)
- No proton or electron radiation enhancement with this storm (unusual)
- Cause: Coronal mass ejection(s) at ~0200—0230 UT on 15-March
- Impacts:
 - 200 mV/km induced electric field calculated for NE powerplant locations (about 1/10 of the March 13, 1989 values). No power failures reported to date.
 - Severe ionospheric density depletion above 45° latitudes; strong scintillation at equatorial latitudes reported (e.g. Brazil).
 - Spectacular auroral sightings from Michigan to Alaska and as far south as southern Colorado (Montrose county) on early morning of 17-March.
- Forecast accuracy:
 - CME was 15 hours ahead of forecast
 - Maximum geomagnetic storm predicted = G1 on 18-March-2015

St. Patrick's Day 2015 Geomagnetic Storm

SDO HMI Magnetogram 15-Mar-2015 21:58:14.700

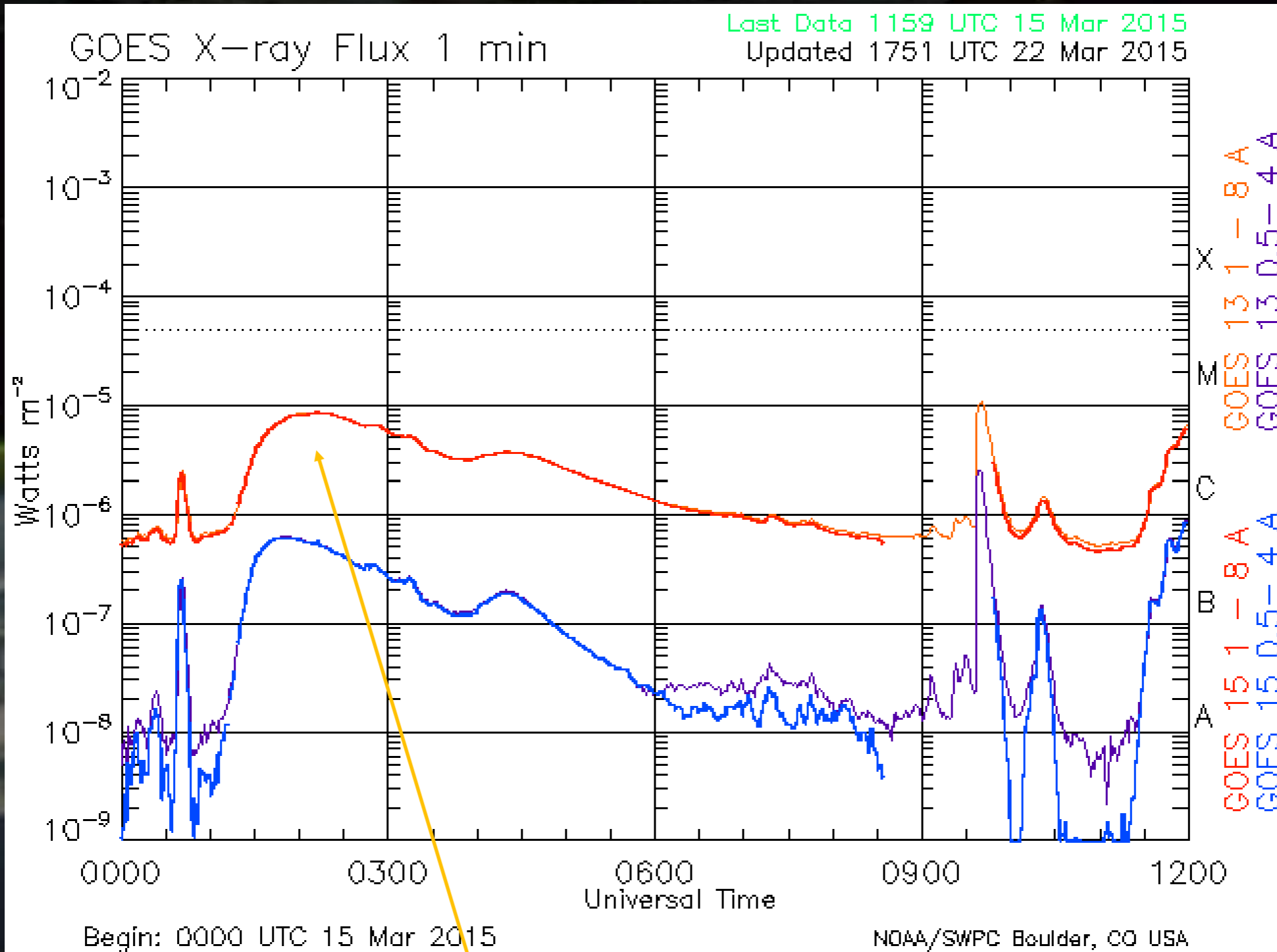


HMI Magnetogram 15-Mar-2015 21:58:14.700



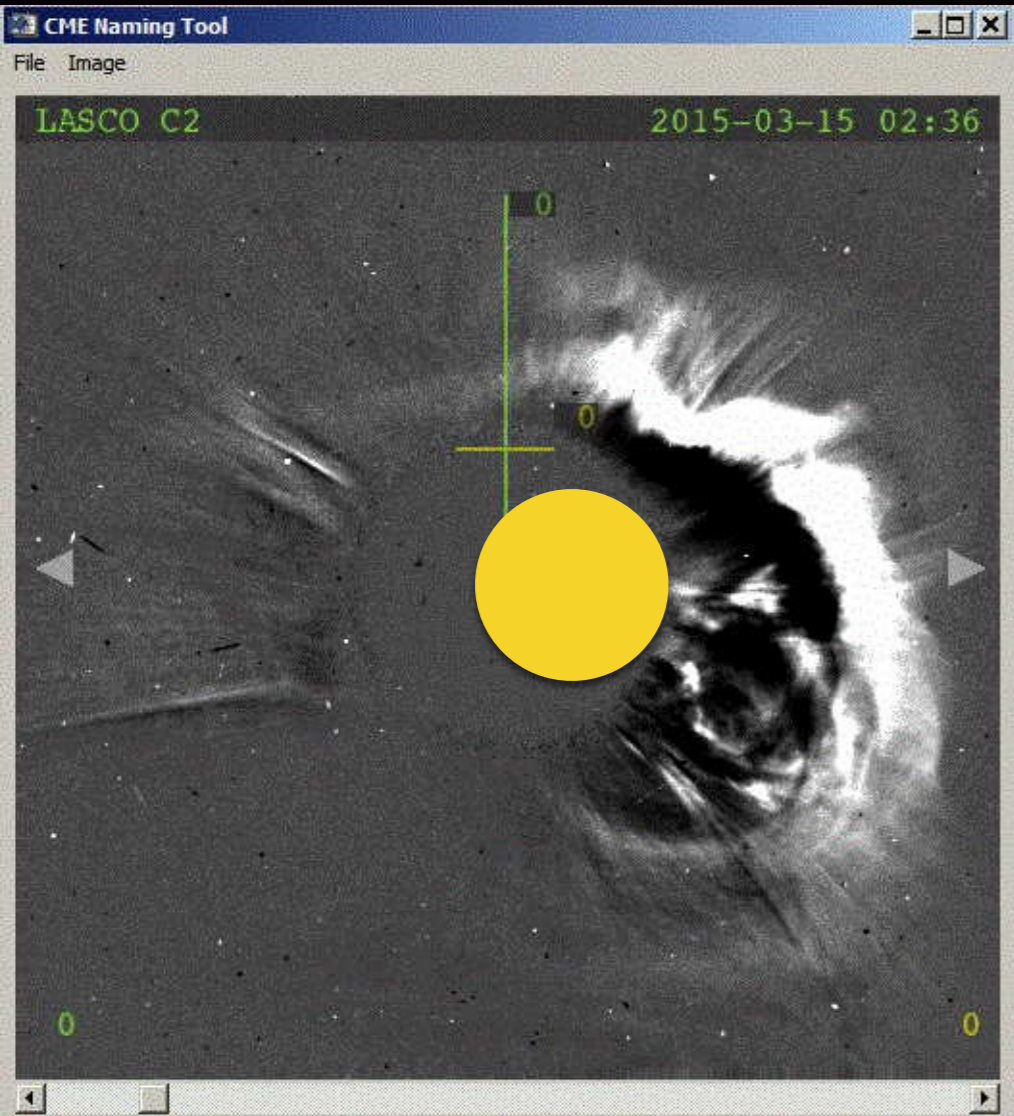
NOAA AR12297 on 15-March-2015: Ekc/Beta-gamma-delta

St. Patrick's Day 2015 Geomagnetic Storm

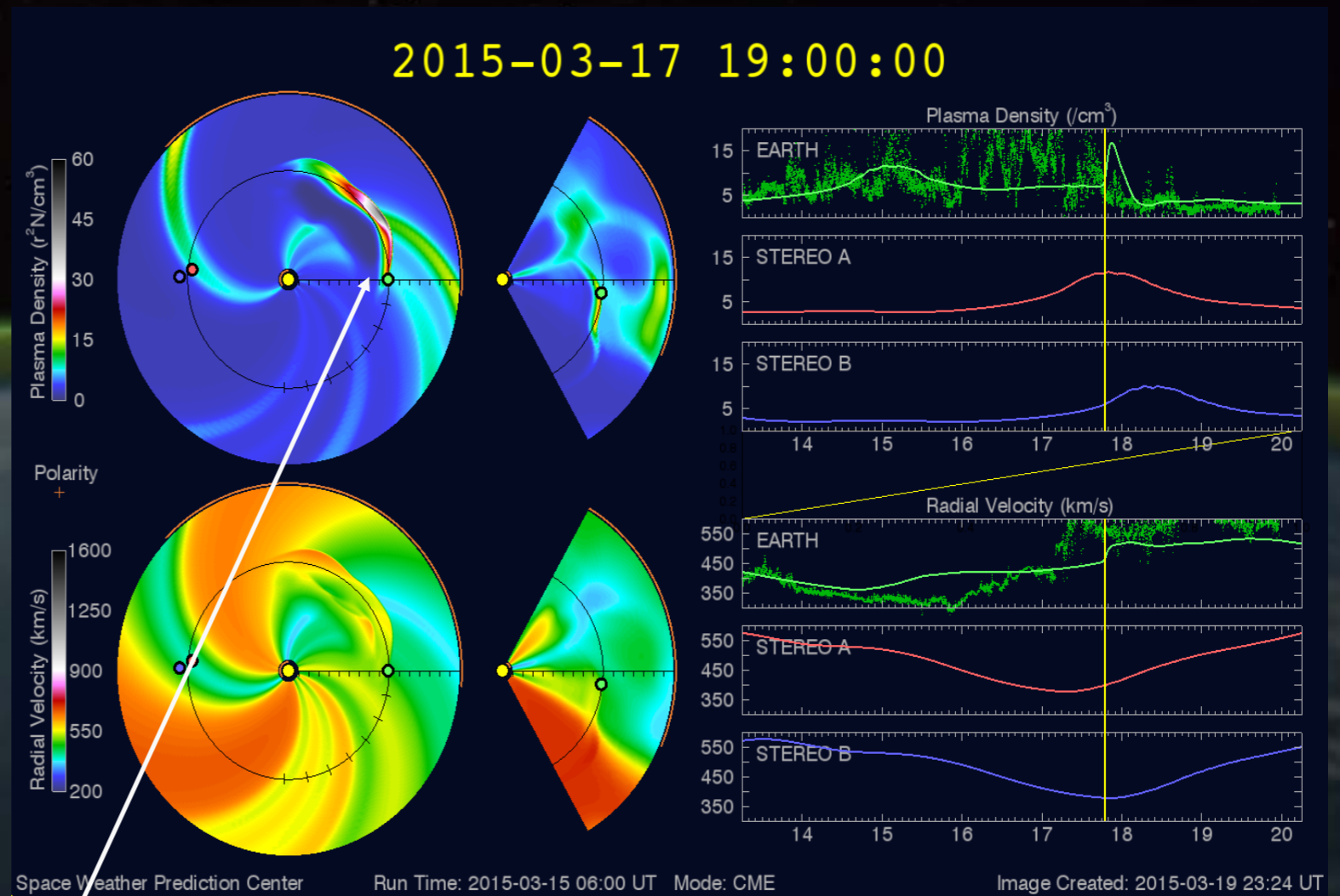


Long-duration C9/1f flare from AR 12297
GOES XRS Peak: 0213 UT
Type II radio emission: 745 km/sec

St. Patrick's Day 2015 Geomagnetic Storm



AR 12297 CME 15-Mar-2015



WSA/Enlil Run shows only "glancing blow" at Earth

St. Patrick's Day 2015 Geomagnetic Storm

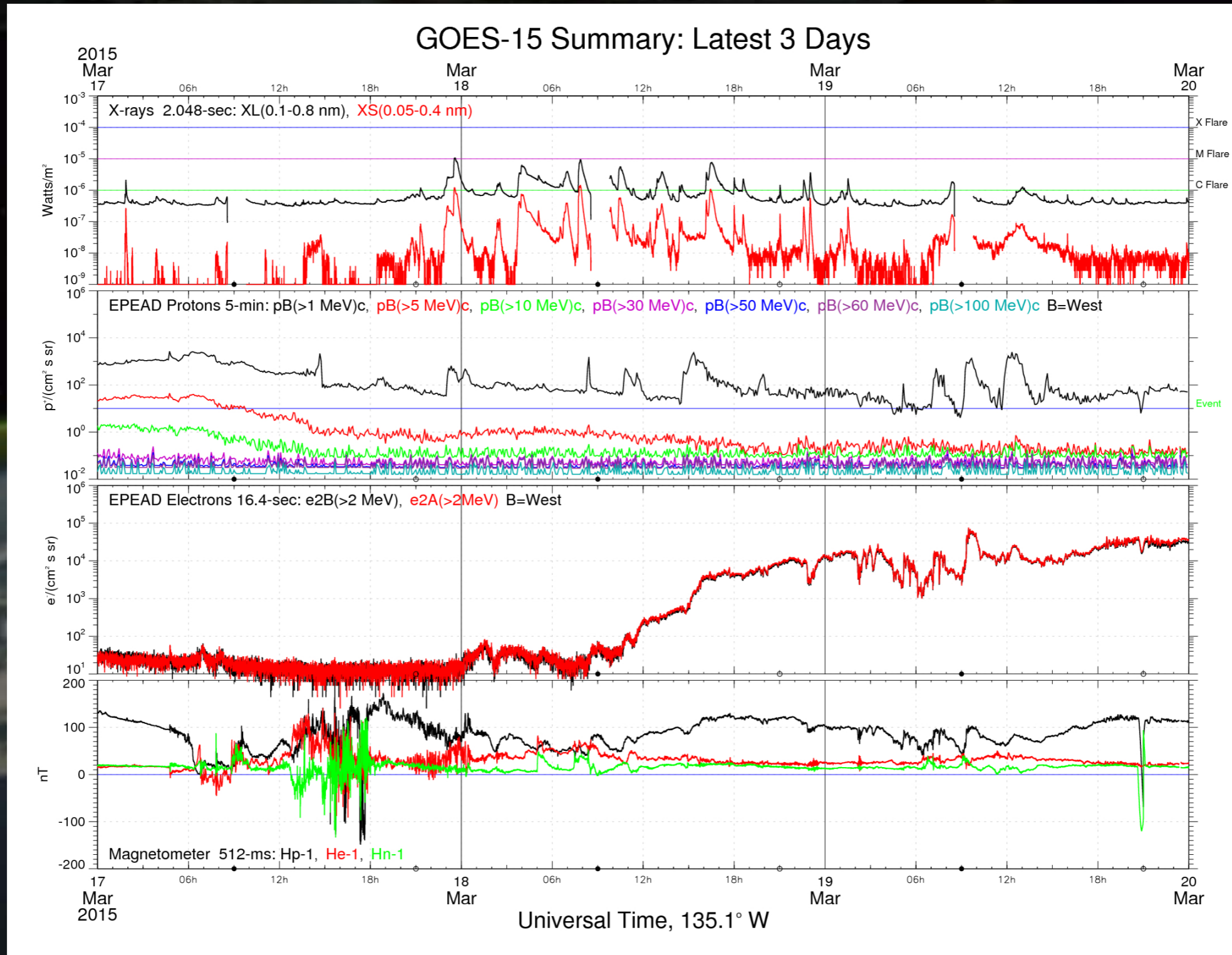
24 hours of ACE data

Shock arrival at ACE ~33 min before Earth

Sustained Bz south from ~1400 EDT onwards

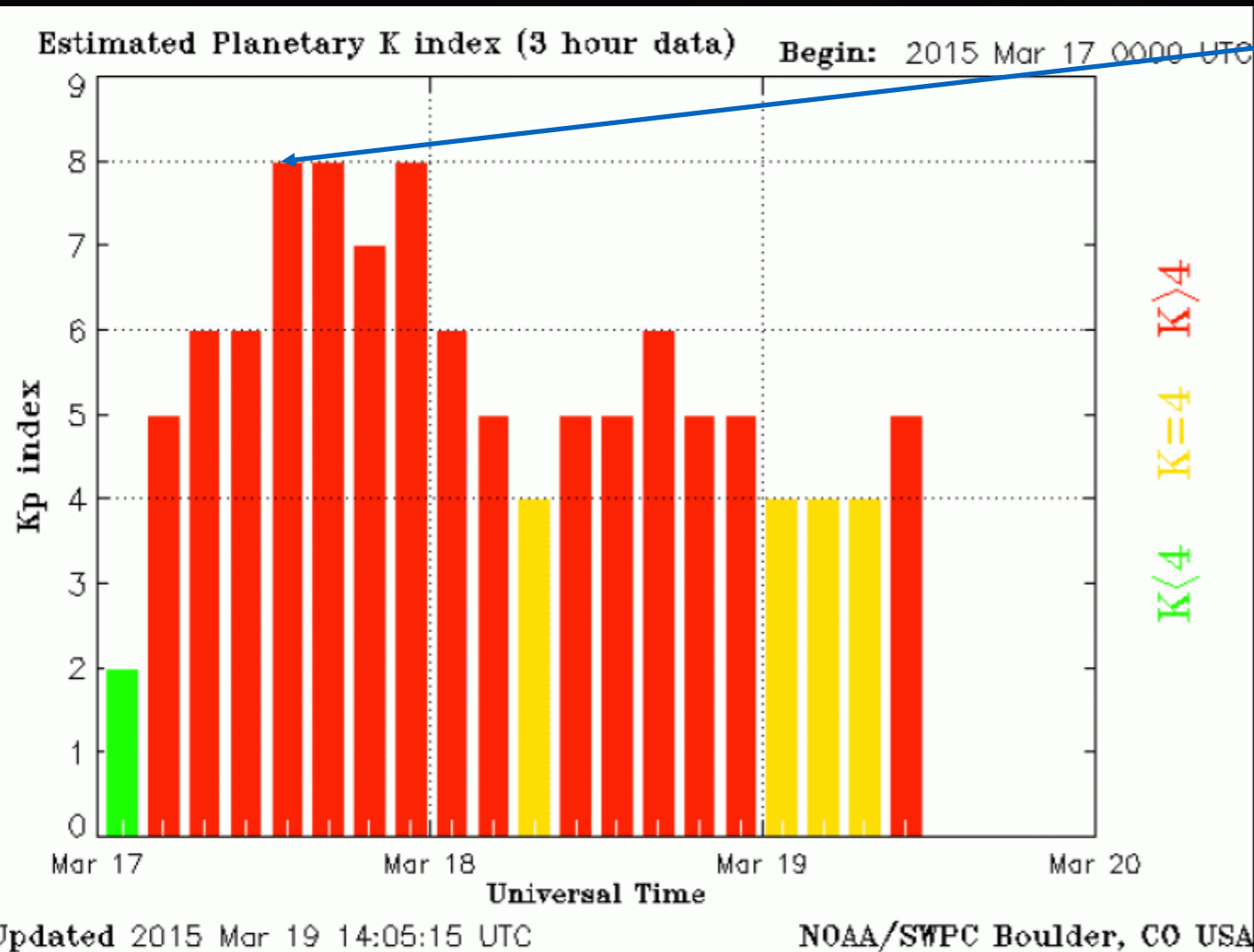
Maximum wind speed ~680 km/sec

St. Patrick's Day 2015 Geomagnetic Storm



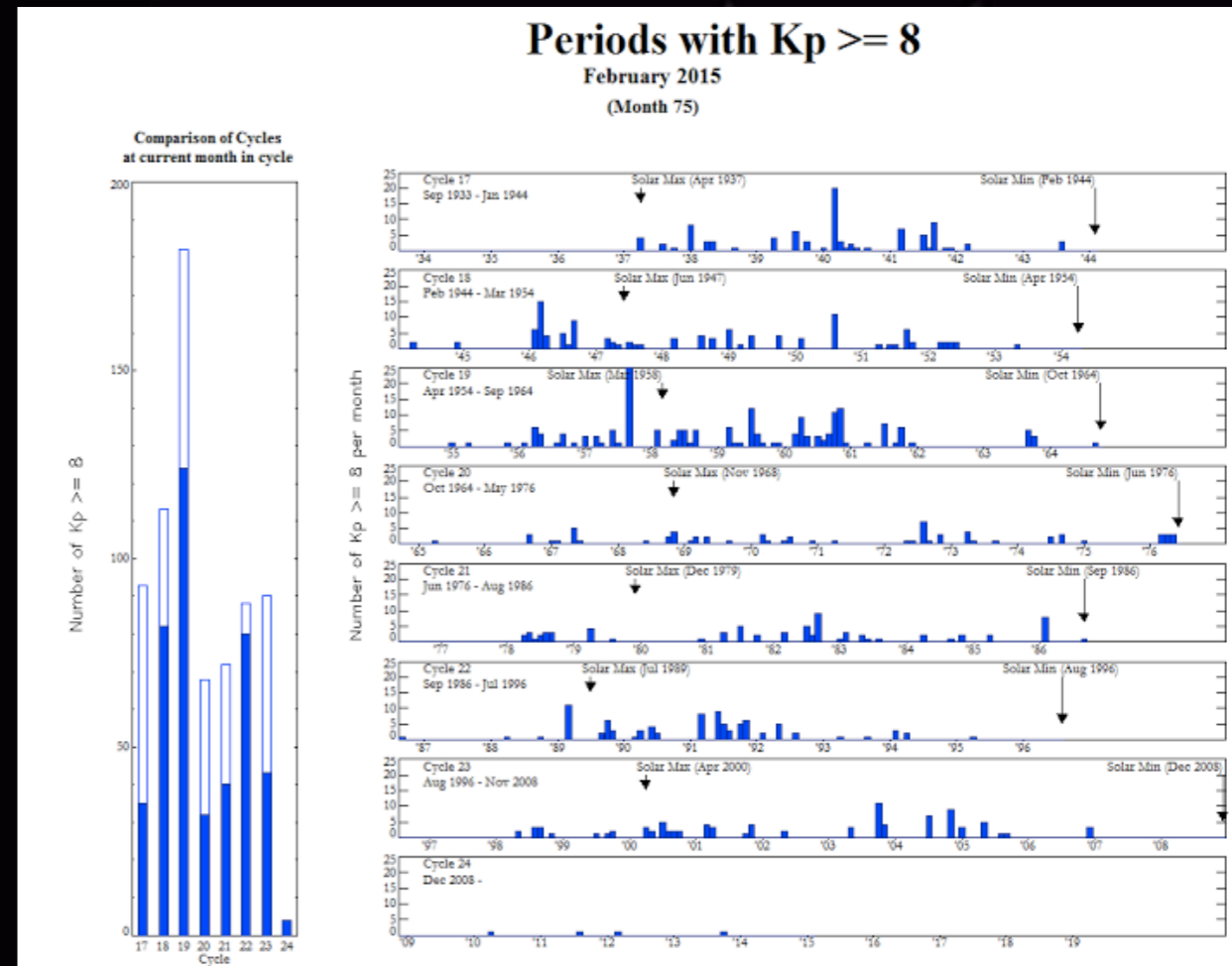
Geomagnetic response: ~1300 UT

St. Patrick's Day 2015 Geomagnetic Storm



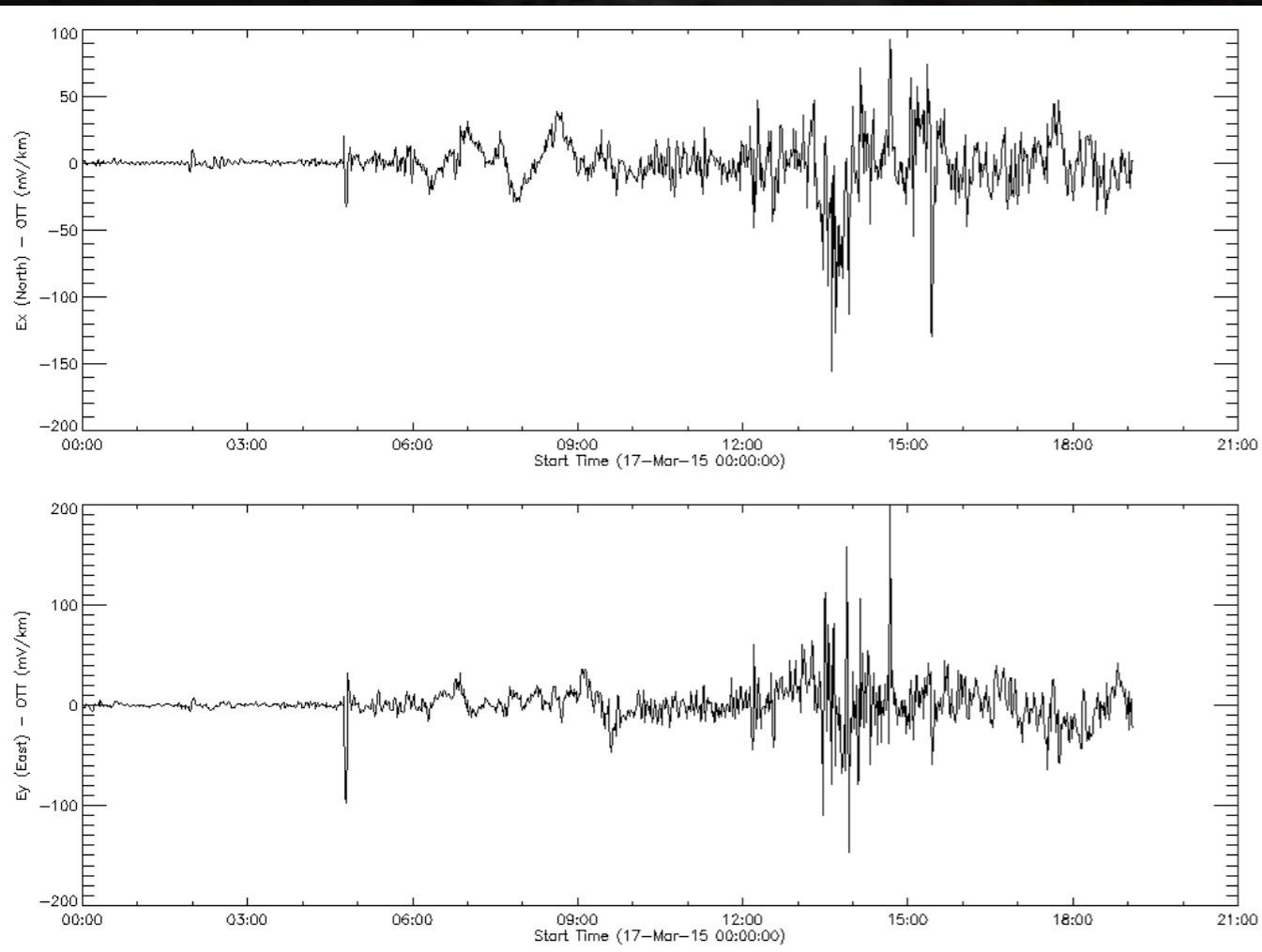
G4 onset at ~14:00 UT

Kp Index plot

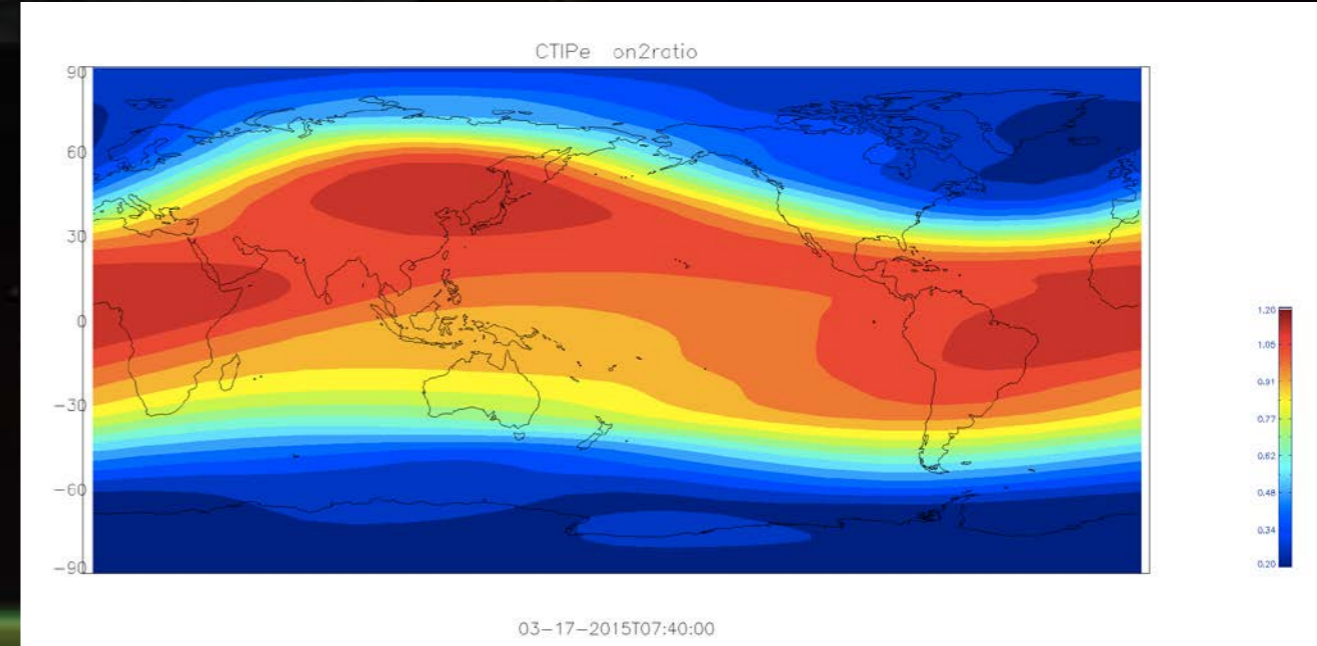


Historical Kp ≥ 8 Periods
Solar Cycle 24 anomalously low

St. Patrick's Day 2015 Geomagnetic Storm



Calculated induced E-field at Ottawa
peak = 200 mV/km



Modeled Atomic Oxygen depletion above ~ Lat 45°
"No ionosphere"



Alaska, early morning of 17-March