World’s First Geodynamic AI Forecasting Capability

SPACE WEATHER NOWCASTING

Space Weather Services

CONTACT: Clive Cook, CEO
clivegc@precursor-spc.com
The importance of connecting to the actual and very dynamic space environment is *The Challenge of Space*

The paradigm change to real-time, data-driven Space Weather Services is the defining opportunity
Future state of Space Weather with precursor SPC

Real-time high-fidelity Space Weather Nowcasting

**Streaming Real-time Data Capture**
- GPS, GNSS, Occultation, LEO, ISR, Ionosondes, in-situ and from Partners

**Real-time Data Assimilation**
- Derive electron density within volume and continuously update individual voxels
- High fidelity / Definable Voxel
- Nowcasting - near real-time measurement of the state (energy) of the ionosphere.
- Foundation for dynamic Space Weather Forecasting

**Real-time Ionosphere Mapping**
- Ionosphere based on ACTUAL DATA
Future state of Air Force capability in Space Weather with precursor SPC precursor Nowcasting program implemented for Air Force

- Real time Space Weather, updated in real-time
- Spatial Resolution less than 10 cubic km
- Temporal Resolution – minutes to seconds
- Leverages all currently available data and sources
- Real-time impact assessment of the Space Weather environment on assets, operations and missions
### Summary of effects and importance of real-time high-fidelity ionosphere

**Improving communication, tracking and discrimination, orbit performance**

<table>
<thead>
<tr>
<th>Ion density</th>
<th>TEC</th>
<th>Freq</th>
<th>Effects without precursor</th>
<th>Effects with precursor</th>
</tr>
</thead>
</table>
| **Communication** (VHF, UHF, SATCOM) | YES | YES | • Disruption for hours to days  
• Inability to support theater  
• Inability to support space assets | • Real time frequency mitigation  
• Updating CONOPS real time |
| **Tracking** (UHF, VHF) | YES | YES | • Loss track  
• Frequent track reacquisition  
• Limit radar resources | • Real time frequency mitigation  
• Real time track association  
• Updating CONOPS in real time |
| **Discrimination** (UHF, VHF, S, X) | YES | YES | NO | • Limited to no discrimination  
• Affect target handover  
• Affect mission timeline | • Improved target handover  
• Improved mission timeline  
• Updating CONOPS real time |
| **Satellite Orbit & Launch** (GPS, LEO, etc.) | YES | NO | NO | • Affect ballistic coefficient estimate  
• Affect object velocity estimate  
• Affect drag estimate (10% error in density – 80% error in drag)  
• Affect orbit determination | • Better ballistic coefficient estimate  
• Better object velocity estimate  
• Improved drag estimate  
• Improved orbit determination  
• Real-time deployment adjustment |