



Meeting The Challenges of Nature
The Impact of Space Weather on Marine Positioning Services
Solar Cycle Progression and the Maturing of GPS

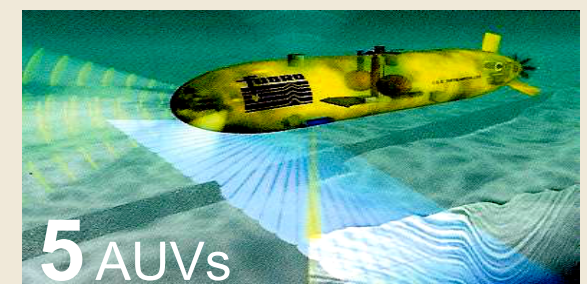
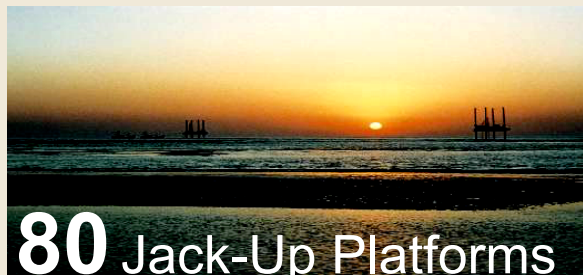
April 2007

Richard Barker, Fugro Chance Inc.

Our Mission is to Provide Superior Survey Solutions Safely

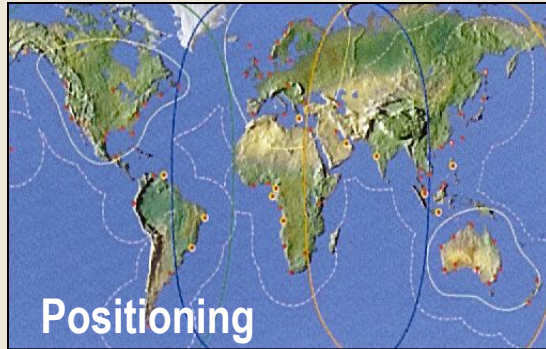


Resources

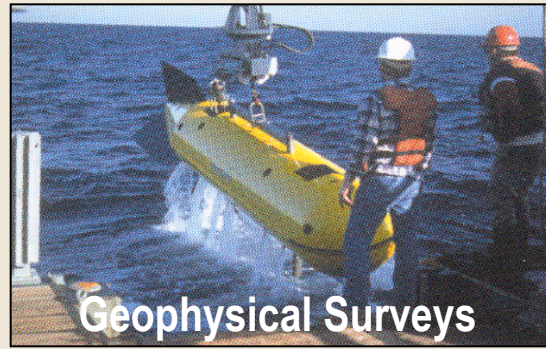




Business Lines



Positioning



Geophysical Surveys



Marine Construction Support



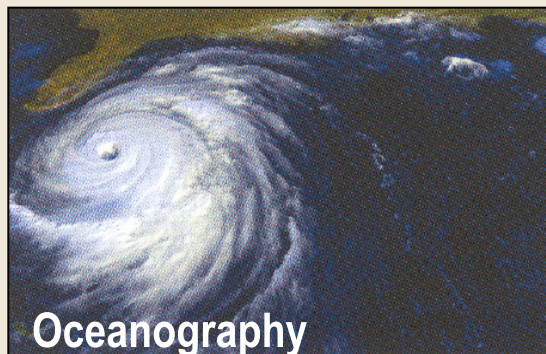
LIDAR Surveys



Seismic Data Collection



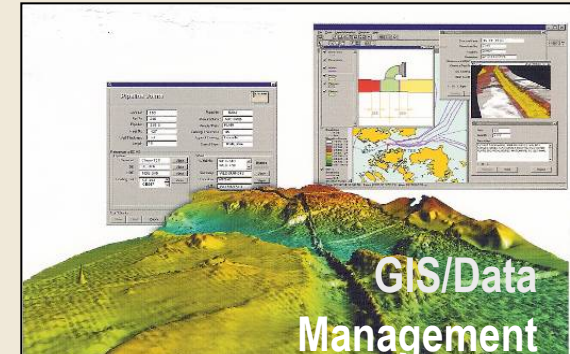
Submarine Cable Surveys



Oceanography



ROV / Diving



GIS/Data Management



Airborne LIDAR Survey





Transmission Line LIDAR Survey

Flip7 Spot Dialog

Dialog View Options Tools Drawing Layer Inquire Help

Transmission Line Sag

Transmission Line Structure

Actions: Zoom In, Pan, Plan View, Zoom Out, Previous, Profile View

Mode: Distance, Layer Attrib, Delete, Merge, Name P1, Add P1, Break, Name 2, Add P1Link

Relation: Data View, Structure, Width, Height

Mouse Pick: 1 Click, 2 Click (Diurnal), 4 Click (Intersect)

Pick Location: At Mouse Click, Snap to Lower Point, Snap to Point

Group Attributes: MOSAICS, Layer: MOSAICS, Smart Layer, Name: []

Coordinate Modes: North: 678829.86 F, East: 1444269.95 F, Highest: 259.66 F, Wire: *, Ground: 28.11 F

Buttons: Capture Points, Capture Points and Elevation, Exit

Display: Dial(3D): 0.00 F, Highest - Ground: 241.55 F, Scale: 0.29 F / pin

Select the passing line.



Fugro Chance Provides Precise Positioning Services for Various Types of Vessels, Marine Operations and Construction Support





RTK- GPS Gunfloat and Streamer Tracking For Deep Seismic Oil Exploration





Semi Submersible Rig, Tugs and Anchor Handling Vessels (AHV)





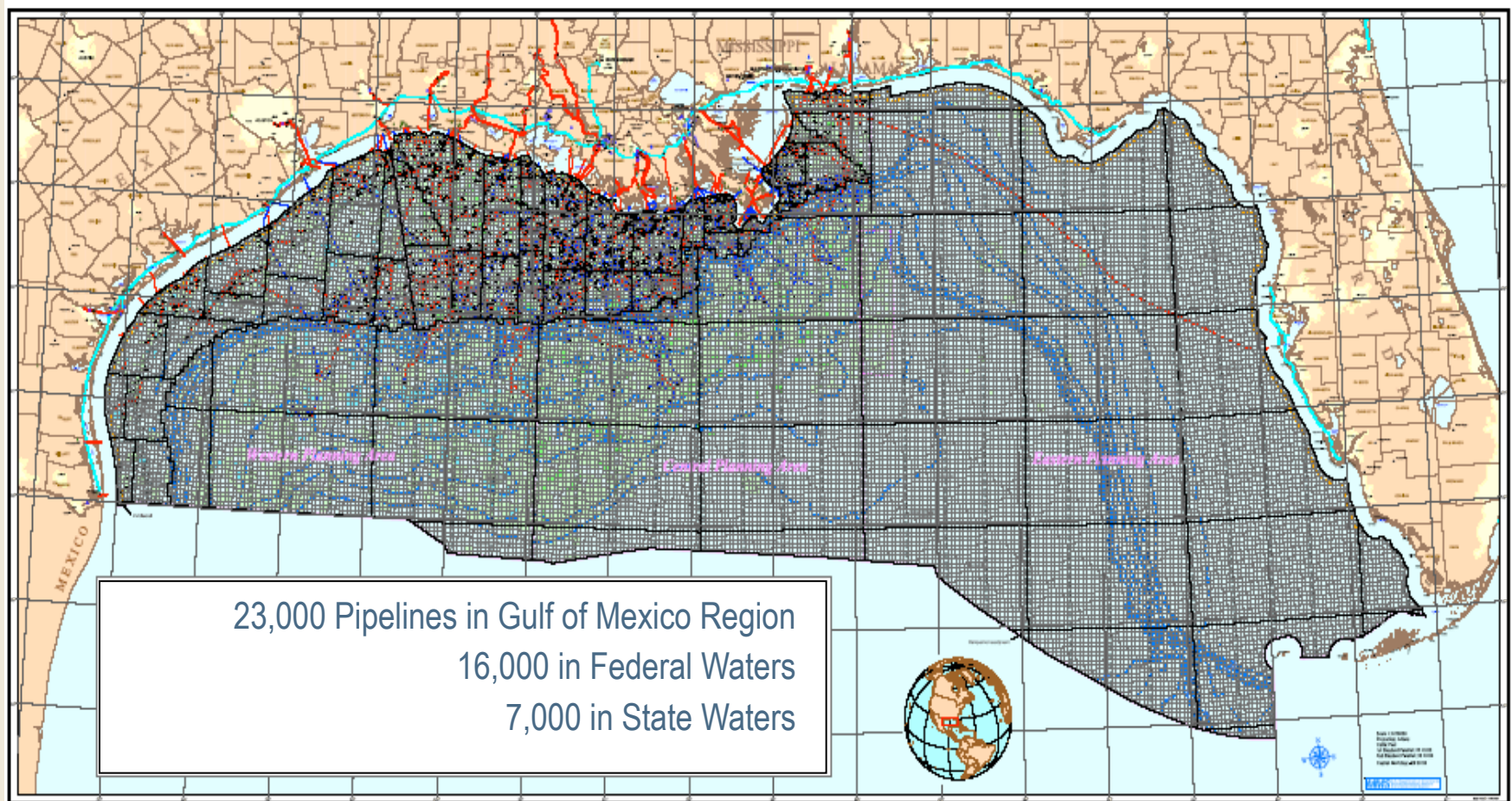
Traditional Anchor







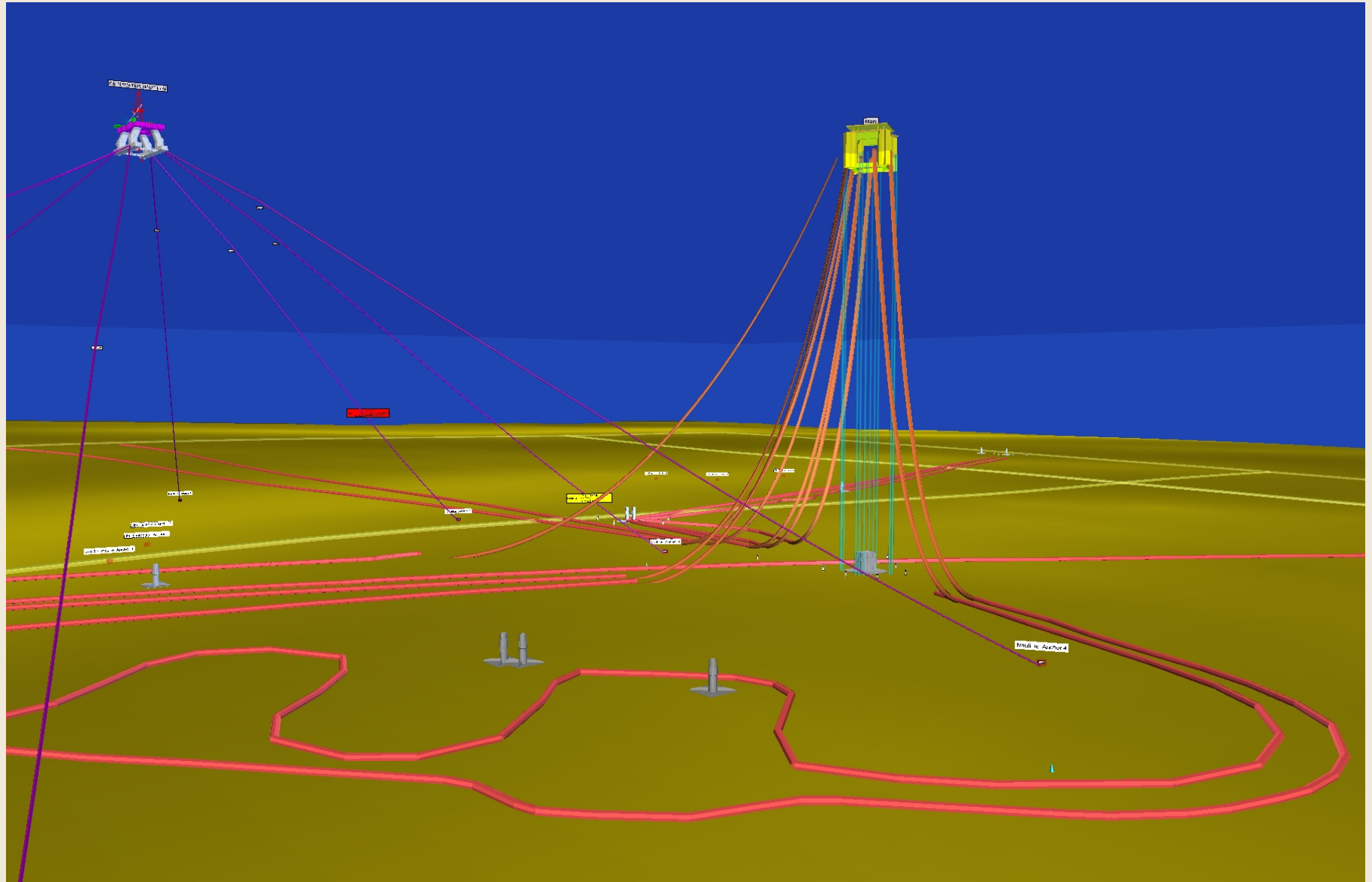
GOM Pipeline Infrastructure





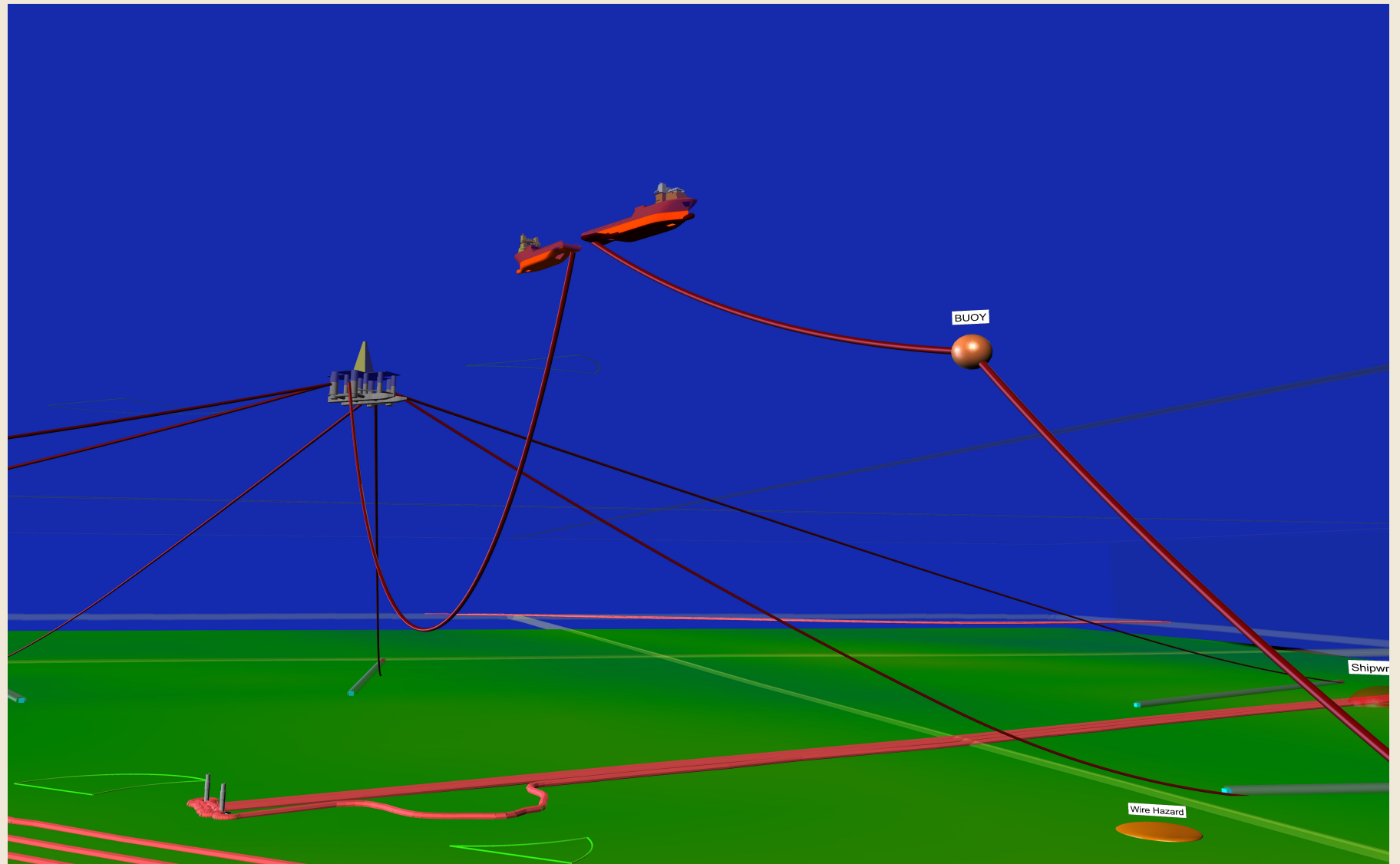
3D Representation of GOM Infrastructure

Semi Submersible Modular Drilling Unit – Tension Leg Platform





Anchor Operations



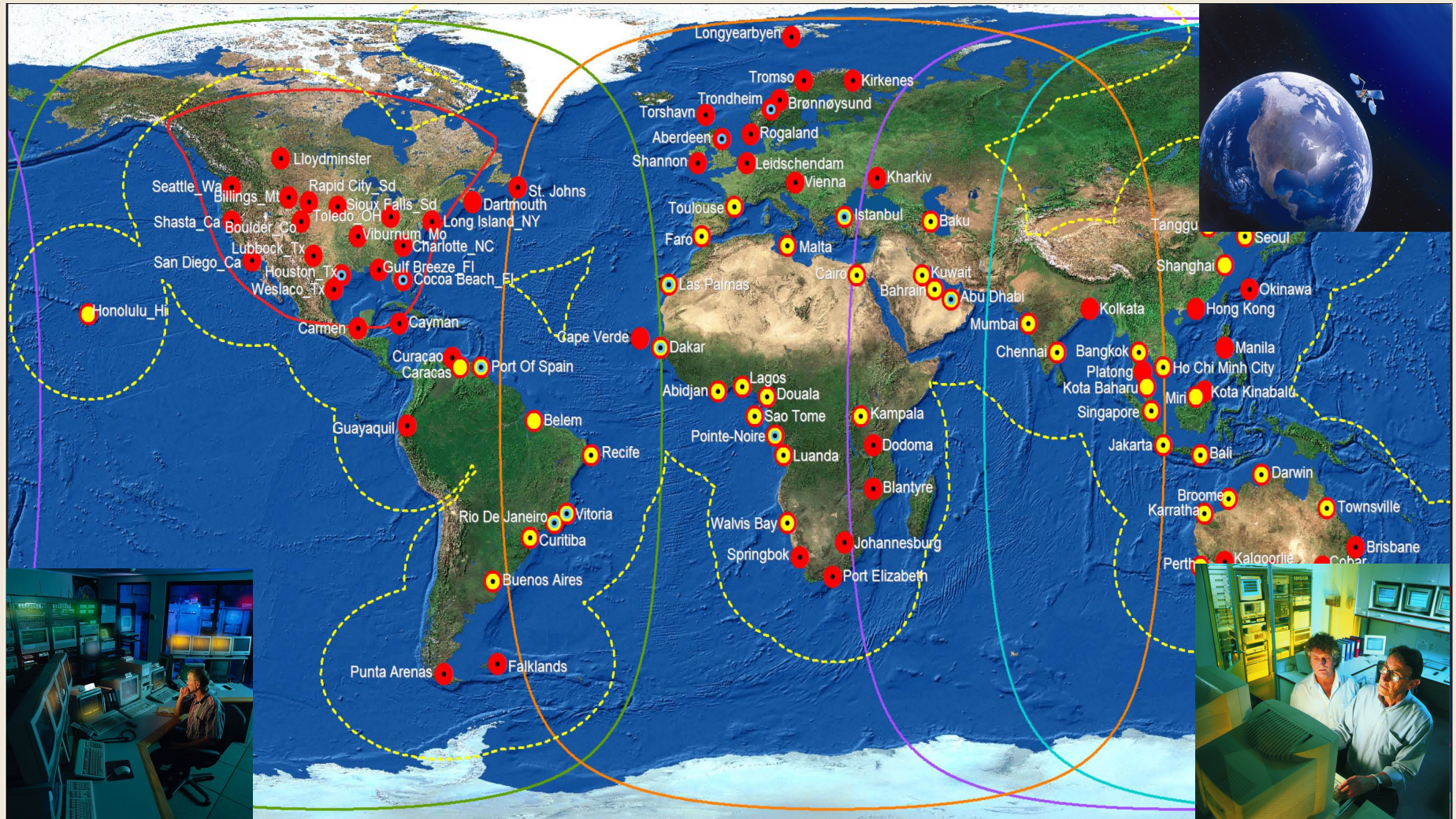


World's Leading Supplier of High Performance DGPS
Satellite DGPS Services Since 1987



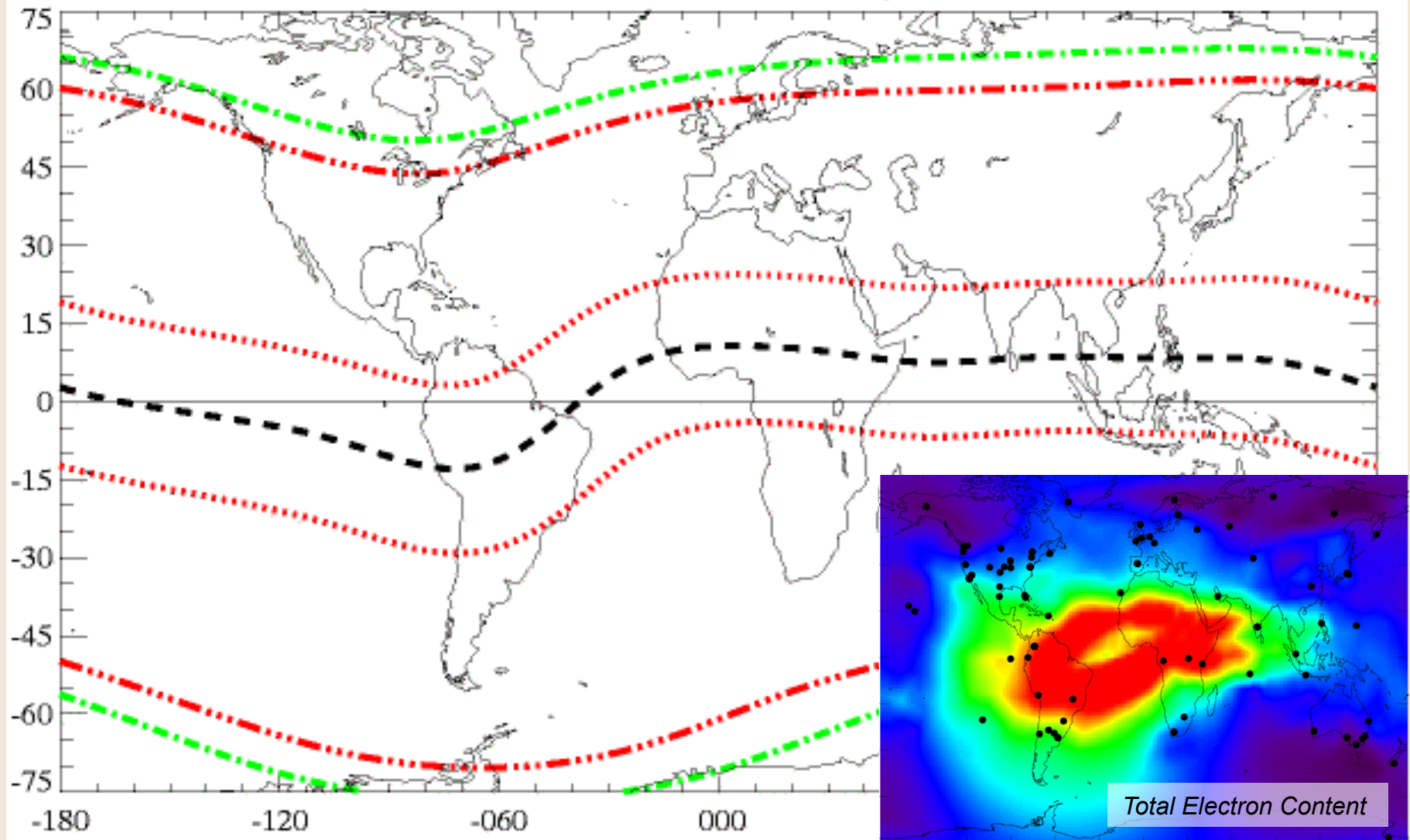


Worldwide GPS Reference Network With Signals On 14 Transponders





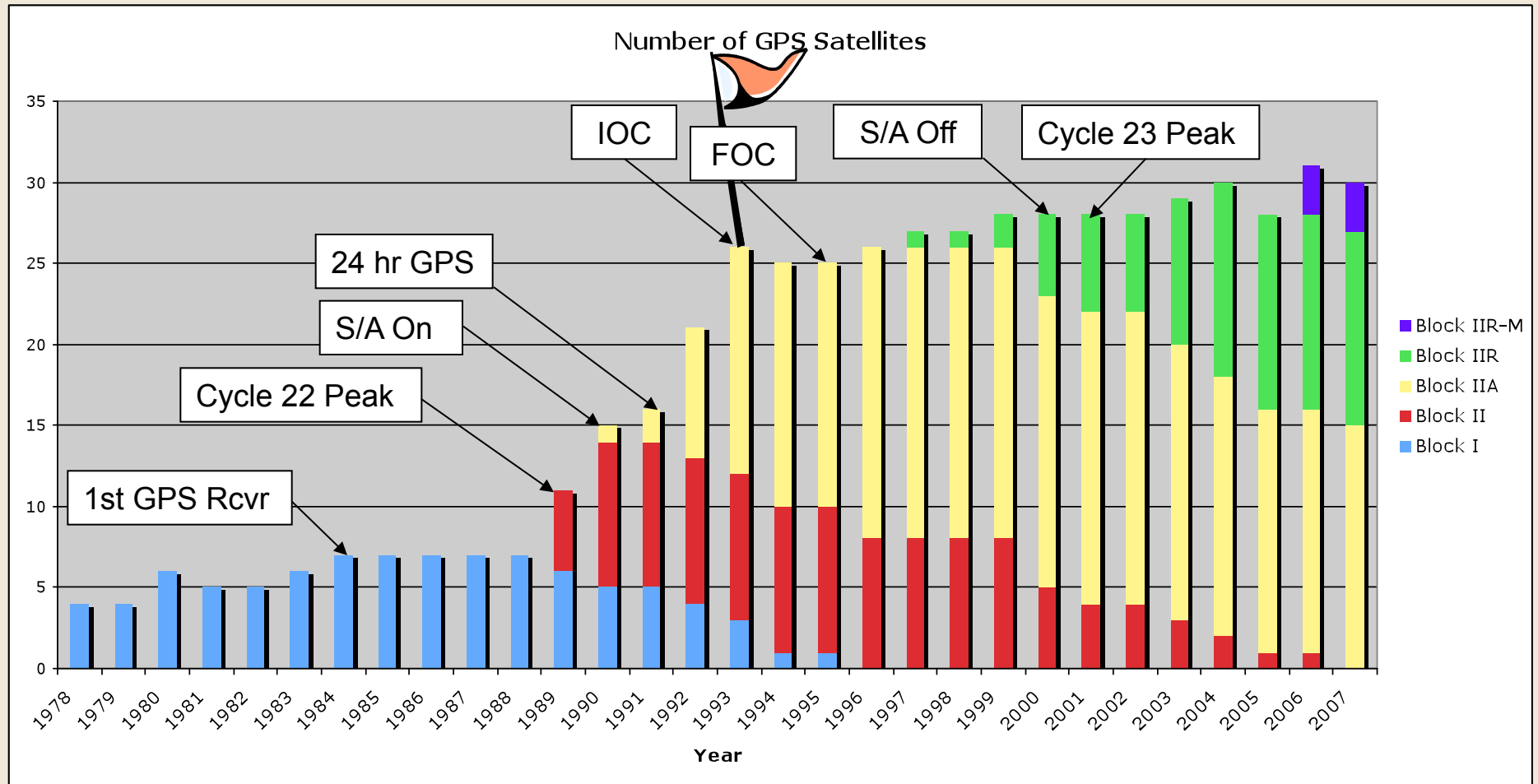
Geomagnetic Equator



Graphics: NorthWest Research Associates Inc. & NASA/JPL

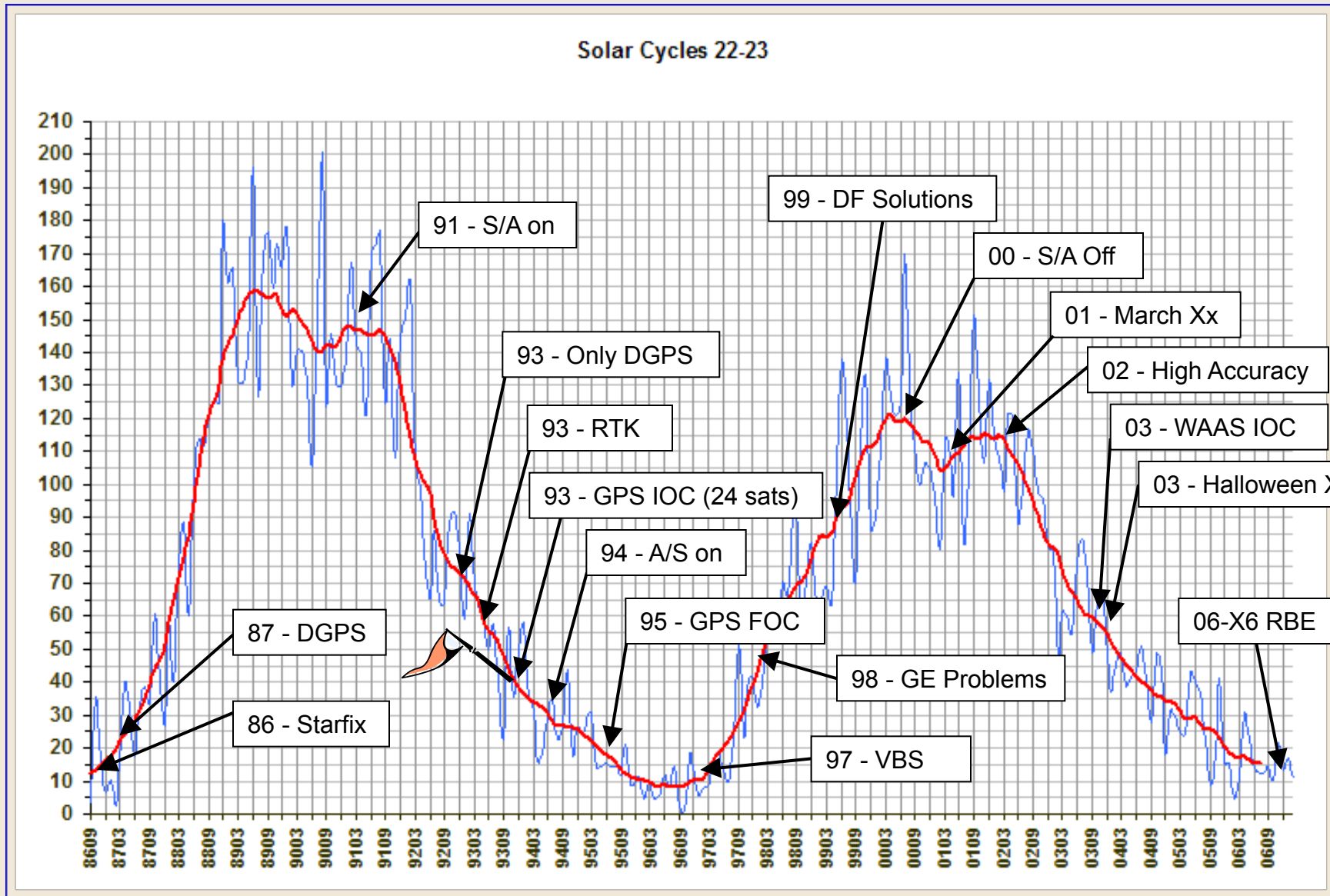


GPS Constellation Buildup





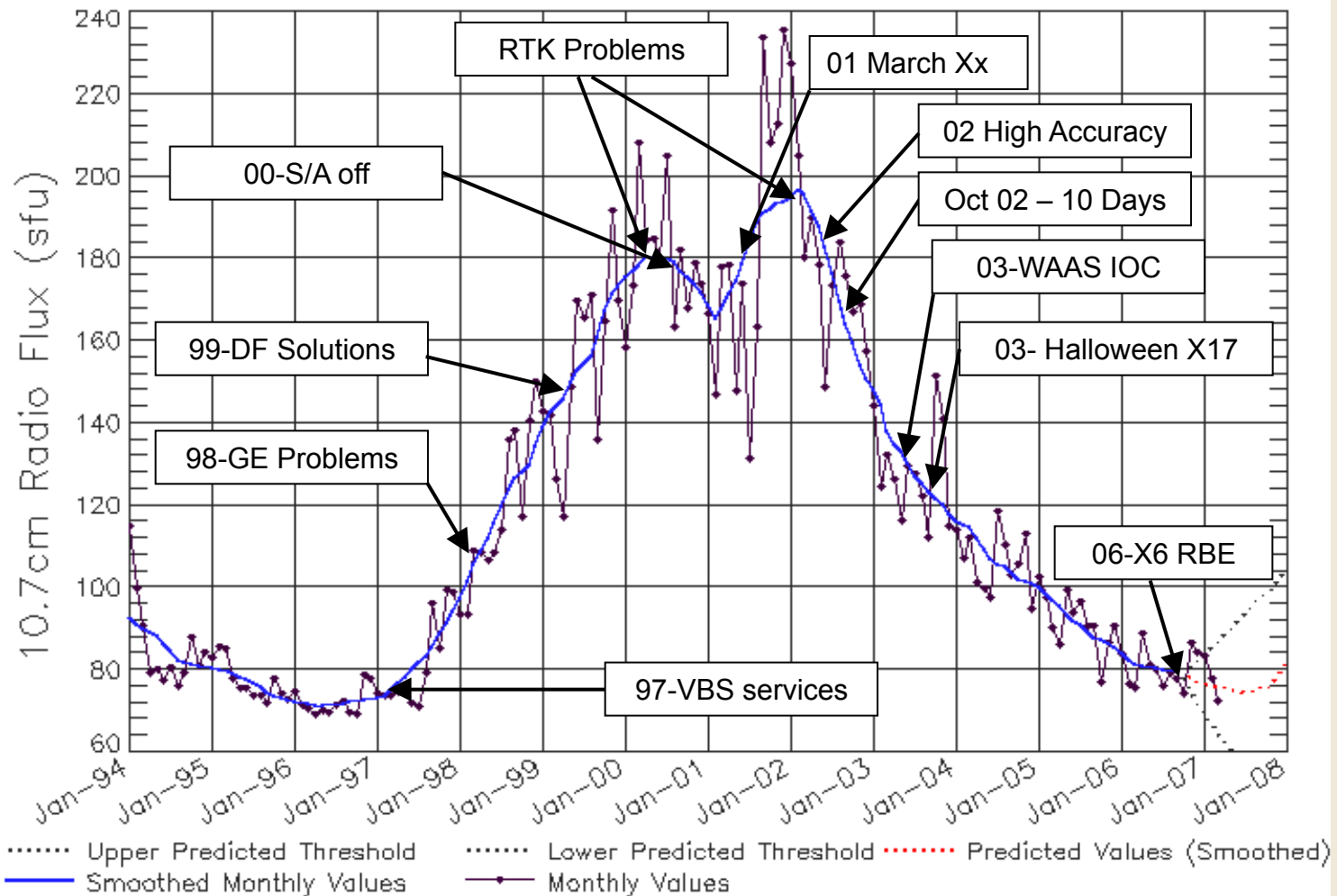
GPS and the Solar Cycle





Cycle 23 Solar Flux

ISES Solar Cycle F10.7cm Radio Flux Progression
Data Through 31 Mar 07



Updated 2007 Apr 3

NOAA/SEC Boulder, CO USA



Satellite Status / Space Weather Updates

The *Satellite Status / Space Weather Update* provides time sensitive information on satellite status and space weather forecasts that may cause operational disruptions.

Subscribed Client Organizations include (partial listing):

Allseas	PGS
BP	Spectra Precision
CGG	Seadrill
Case New Holland	Stenna
Diamond Offshore	Shell
Exxon/Mobile	Transocean
Fairfield	Trimble Navigation
Global	USACE
Oceaneering	USDA

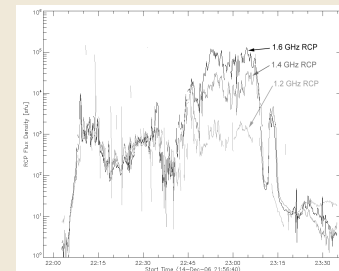
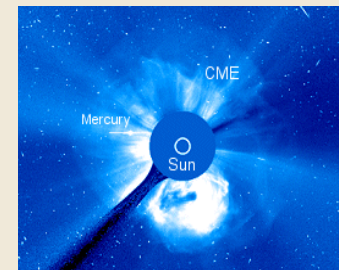
Also included are individual farmers, farm co-op's (for precision Ag), construction companies, municipalities, construction and agricultural sales and service organizations.

Over 400 individuals are subscribed to Satellite Status / Space Weather Update.



Space Weather Product / Service Needs

- What will Solar Cycle 24 look like (*Maximum f10.7 sfu*)
- Scintillation Predictions (*severe ionospheric signal scattering*)
 - Problem Regions
 - Likelihood of Expected Daily Repeatability
- Improved CME Estimates
 - Velocity, ETA
 - Geomagnetic Storm Level Estimates
- Radio Burst (*Nowcasting*)
 - Frequency Spectrum Alerts
 - Estimated Duration
 - Expected Region of Impact
- Advice on Index Interactions and Expected Effects
 - E.G., A high KP/AP index combined with a high f10.7 cm solar flux increases GPS ranging errors and reduces positioning accuracy. Where are the regions of maximum sensitivity and points of exponential increase?





Lack of Effective Forecasting Leads to Unpleasant Results

Better To Delay Than To Do It Again ...Or Worse, To Break Something Expensive



Peter Paul Rubens "Death of Achilles"