

# Introduction to Enterprise Electronics Corporation Satellite Ground Terminals

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**POWERFUL INTUITIVE ROBUST TURNKEY AFFORDABLE**

**CSPP/IMAPP Users' Group Meeting**  
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# Overview

- Introduction to Enterprise Electronics Corporation
- Radar Products
- TeleSpace
- GOES-R Ground Systems
- Himawari Ground Systems
- Current Customer Base





# Innovative Technology Protecting Assets

PROTECTING YOUR ASSETS



## History

In 1971, a group of radar engineers formed a company in south Alabama. Their dream was to develop and manufacture affordable, high quality meteorological radar systems and market them to the world. With corporate headquarters based in Enterprise, Alabama, they called their new company Enterprise Electronics Corporation now known as EEC.

- EXCLUSIVELY DEDICATED TO COMMERCIAL WEATHER RADAR
- COMPLETE IN-HOUSE DEVELOPMENT AND MANUFACTURING OF HARDWARE AND SOFTWARE
- PRODUCTION CAPACITY – 40+ SYSTEMS PER YEAR





# Factory & Office Space

## Manufacturing

- To ensure our products perform up to the most stringent engineering specifications, we make our own components – from tiny printed circuit boards to huge antennae
  - 3,595 Square Meters
  - 3 Test Towers
  - 10 Antenna Test Pads
  - Far Field Antenna Test Range
  - In-House C and X Band Radar Systems





# Worldwide Installations



## Global Presence

- More than 1,000 Radar & Satellite system installations in over 100 countries on every continent
- Covering the world with a diversified customer base





# GLOBAL SUPPORT SERVICES

Enterprise, Alabama

Meckenhiem, Germany

Melbourne, Australia

## Three Support Centers

- Service centers in Enterprise, Alabama (Headquarters); Meckenhiem, Germany; Melbourne, Australia
- Strategic positions – Quick & Efficient response



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# Key Customer Listing

## Radar Systems

- Korean Meteorological Agency – 11 S-Band systems
- German Weather Service (DWD) – 19 C-Band systems
- Swedish Weather Radar Network (SWERAD) – 12 C-Band systems
- AustroControl (Austrian FAA) – 4 C-Band systems
- Over 40 systems delivered to 8 different customers in Brazil
- Australian Weather Service (AUSBOM) – over 60 S and C-Band systems
- US Navy (SPAWAR) – 15 C-Band systems (installed at remote overseas locations and testbeds in the US)



**SMHI**



**Australian Government**  
Bureau of Meteorology





## Key Customer Listing

### Radar Systems

- Indonesian Weather Service (BMKG) – over 30 S and C-Band systems
- TV stations + Universities (US) – over 130 installations, nationwide, including new project with NBCUniversal (12+ systems)
- US Army (Dugway Proving Grounds) – 2 systems (fixed C-Band + mobile X-Band)
- Thailand Metrological Department – over 30 C-Band and mobile X-Band systems
- Mexican Weather Service (SMN) – 8 C-Band systems
- Over 50 systems delivered to customers in India (Weather Service, Air Force, Research, etc.)
- Tanzania Weather Service – 2 S-Band systems
- **Over 1,100 Radar Systems Delivered Worldwide since 1971!**



## RADAR SYSTEMS



# Defender Radar Systems

## C-BAND



DEFENDER C250, DEFENDER C350,  
DEFENDER C500, DEFENDER C1000,  
DEFENDER CK250

### The Global Choice For Protection

- For geographic areas with diverse and dynamic weather conditions
- The choice of weather services, national governments, broadcasters, and businesses around the world
- EEC can custom configure a C-Band solution for almost every need.

## S-Band



Defender S850, Defender S1000,  
Defender SK850, Defender  
SK1000H

### The Power to Predict

- Long-range view
- Ability to plan, predict and protect – before severe weather strikes
- Massive power makes our S-Band systems ideal for covering huge expanses of land and water, analyzing multiple fronts of heavy precipitation.

## X-Band



Defender X200

### The Perfect, Practical, Precise Solution

- For short to mid-range accuracy, X marks the spot
- Ideal for short and medium range applications that require any combination of accuracy, mobility and of course, reliability
- Shorter wavelength X-Band weather radar can detect tiny particles such as high altitude water droplets or light snow.

## Ranger®



Ranger-X1, Ranger-X5

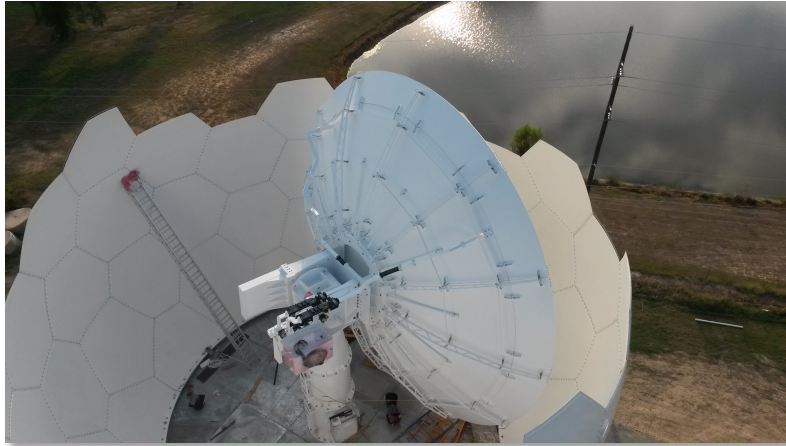
### This is the Future of X-Band

- The new era of X-Band is here!
- Everything you want in an X-Band is in EEC's new Ranger weather radar system
- The Ranger system features dual-polarity accuracy, solid-state transmitters, and low power consumption, all in one affordable and portable unit

# Defender Radar Systems

## Full-Spectrum of Radar Solutions

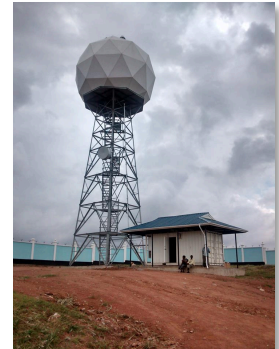
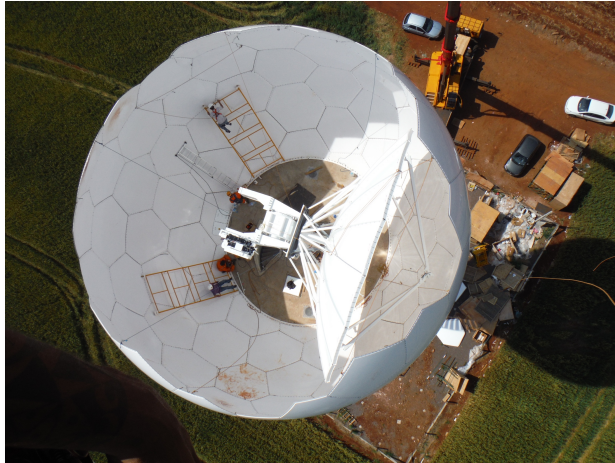
- S, C, and X-Band Solutions
- Klystron, Magnetron, and Solid-State Transmitters (Ranger)
- Fixed and Mobile applications



# Defender Radar Systems

## Defender S-Band

- Single and dual-pol
- Up to 1MW of power; kylstron & magnetron
- Standard and High-Frequency
- Maximum storm penetration





# Defender Radar Systems



## Defender C-Band

- Single and dual-pol
- Up to 1MW of power; klystron & magnetron
- Super High-Resolution Model (8.5m antenna; <0.5 degree beam width)



# Defender Radar Systems

## Defender X-Band

- Single and dual-pol
- Up to 200kW power (magnetron)
- Ideal for mobile applications





# Ranger Radar Systems

## Ranger® Series

- X-Band
- Dual, Solid-State Transmitters (100W or 500W)
- Single or dual-pol
- Fixed or Mobile



# Endurance Radar Systems

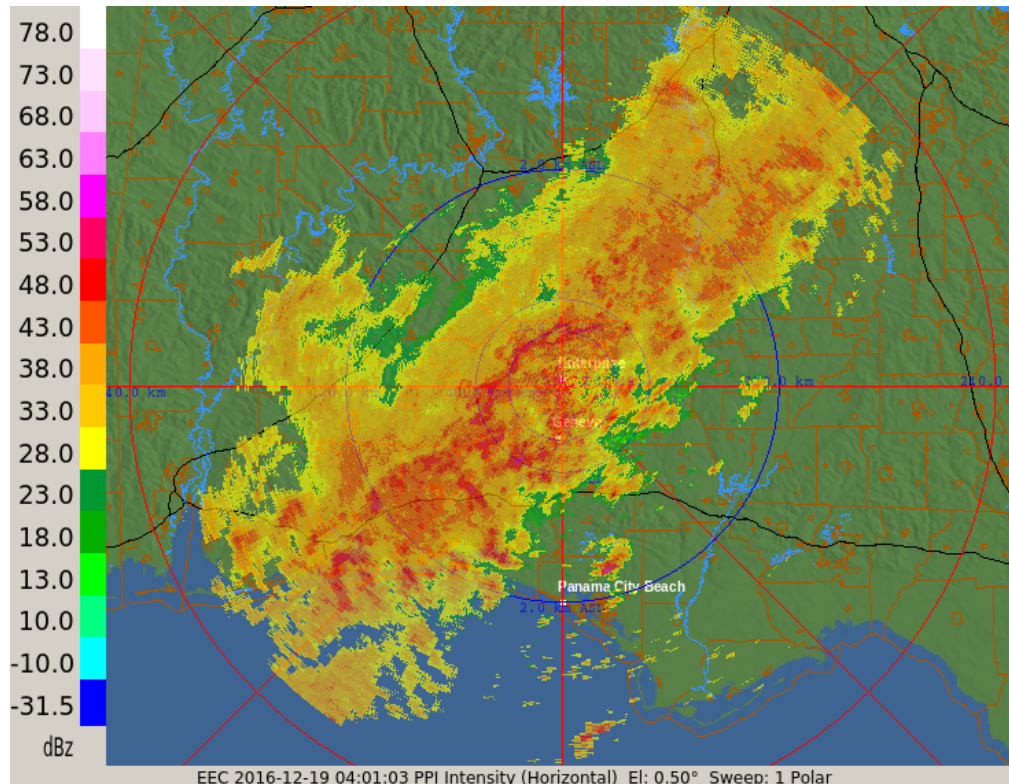
## C-BAND



ENDURANCE C

### The Solid-State of Things to Come

- Systems come standard with a fully solid-state transmitter
- Reduced life-cycle maintenance costs thanks to no reliance on consumable tubes
- Ultra-wideband performance from 5200-5900 MHz; no risk of interference

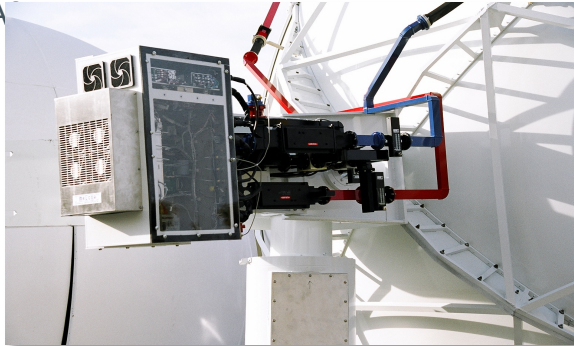




# EEC Systems and Solutions

## Upgrades/Repairs/ Maintenance/Training

- Upgrade competitors' systems
- Dual-pol upgrade kits
- Site visits for pre-installation surveys, calibration, troubleshooting, repair, & upgrade analysis
- Spares/A





## IQ2 Digital Signal Processor

### Most advanced signal processor on the market today

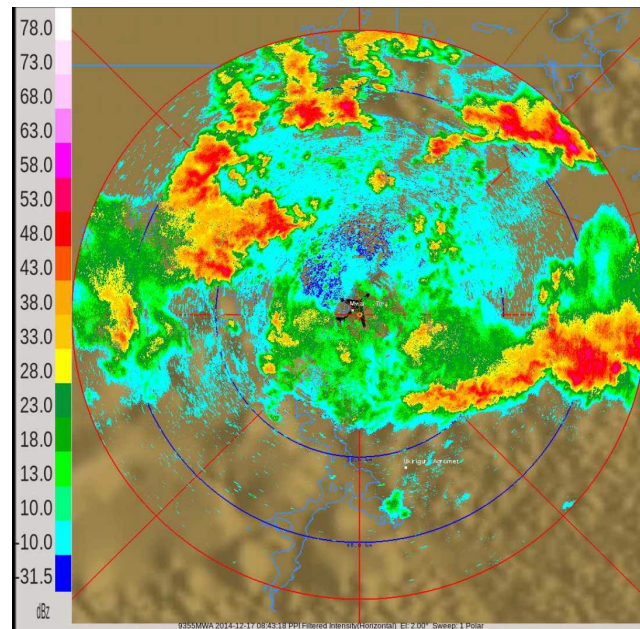
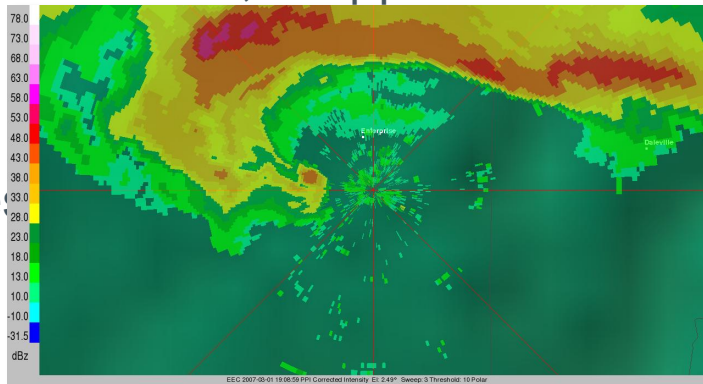
- Fully digital
- PC-based; technology not sun-setting
- Supports data transfer speeds up to and beyond Gigabit Ethernet; no data loss/delays
- Fully supported and spares/parts available
- Up to 8000 range bins (4000 minimum) ensuring HD resolution
- Clutter filtering > 45dBZ; most robust on the market today
- Dual-Pol Ready



# EDGE Software System

## Latest, Fully-Supportable Software System

- Works with IQ2 and EDRP-9 signal processors
- Seamless integration with WSI MAX Systems
- 16-bit, 256 colors; supports HD outputs
- Linux OS,
- Built-In Test standard

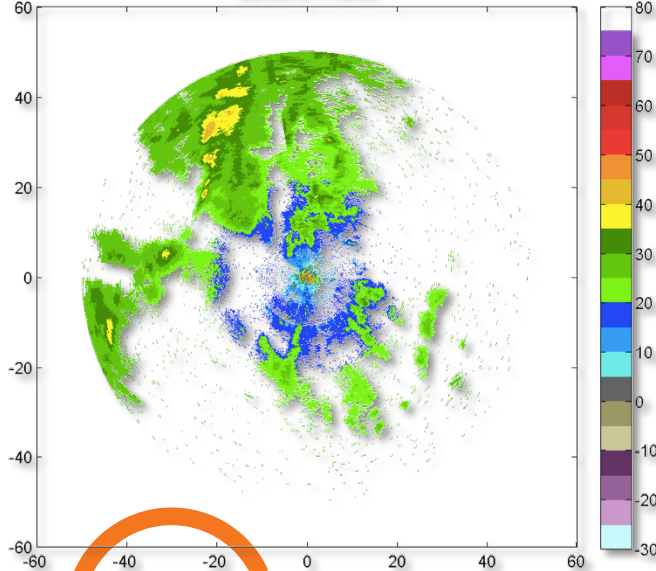




# Ranger Features:

- Dual-Polarity accuracy
- Solid-state transmitters
- Low power consumption
- Compact design – 400 lbs/180 kg
- 100W (Ranger-X1)
- 500W (Ranger-X5)

EEC201211130420



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# Ranger's Applications

Radar networks provide significant improvements to traditional, stand-alone radars

Dual-Doppler analysis provides two-dimensional wind field data, which can give better insight into weather dynamics

Redundancy improves the reliability of the network

Gap Filling

Shipboard or Mobile Operations

Wind Turbine siting

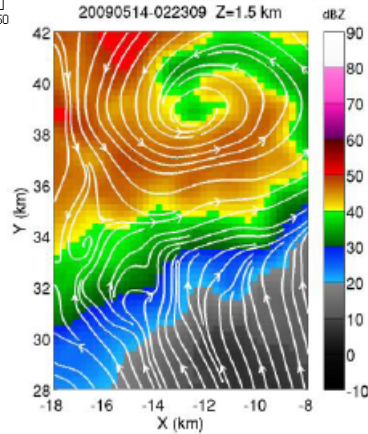
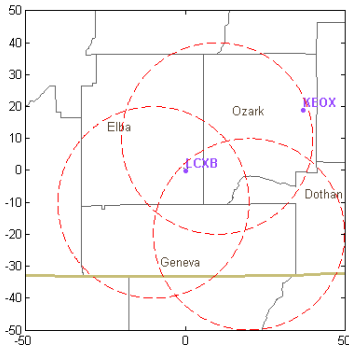
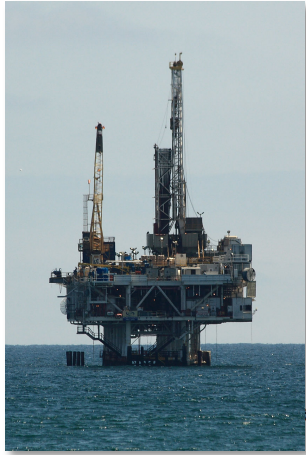


Fig. 3 Horizontal wind field for an EF-2 tornado observed on May 14, 2010 by the CASA IP1 network



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Chandrasekar, V.; Martinez, M.; Sean Zhang; , "CASA Dual-Doppler System," *Geoscience and Remote Sensing Symposium (IGARSS), 2010 IEEE International* , vol., no., pp.4138-4141, 25-30 July 2010



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PROTECTING PEOPLE AND ASSETS



TELESPACE

Satellite Ground Stations From EEC



# Environmental Systems and Services



- Private Australian Company – based in Melbourne
- Approx 45 employees
- Production of meteorological satellite groundstations for 25 years
- Since 2000, incorporating seismic and geotechnical sub-divisions

# TeleSpace PRODUCT LINE

## CAPELLA-GR™



**GOES-R GRB**  
**MODELS: 4.5M, 6.3M**

### GOES-R Groundstation

Powerful Processing system to handle the dramatic increase in data over the current GOES series

42 inch display coupled with **PROTEUS** Satellite Data Visualization and Analysis software

## TELESTO™



**GOES, COMS, MTSAT, FY2**  
**GVAR/LRIT/HRIT/SVISSR**  
**MODEL: 3.7m**

### The Practical Meteorological Satellite Solution

- **Fixed Geostationary Groundstation**
- **Powerful Turnkey system with intuitive integrated displays**
- **The choice of weather services, national governments, broadcasters, and businesses around the world**

## eTELECAST™



**EUMETCAST**  
**GEONETCAST AMERICAS**  
**CMA-CAST**  
**HIMAWARI-CAST**  
**MODEL: 2.4M, 3.7M**

### eTeleCast Groundstation

- Automatic , Decryption, Decompression, Output, and Processing
- **PROTEUS** Satellite Data Visualization and Analysis software

## OBERON-XL™



**NOAA, METOP, SUOMI-NPP**  
**AQUA, TERRA, FY3**  
**XL MODELS: 2.4m, 3.6m**  
**XLE MODELS: 2.4m, 3.0m**

### The X-band Solution

- Everything you want in a Polar Orbiting XL Groundstation is in EEC's new OBERON System
- The OBERON-XL and OBERON-XLE systems feature dual-polarity accuracy and low power consumption, all in one affordable and rugged unit
- Over 160 level-2 products available for display and analysis with the included **PROTEUS** software suite.

## OBERON-S™



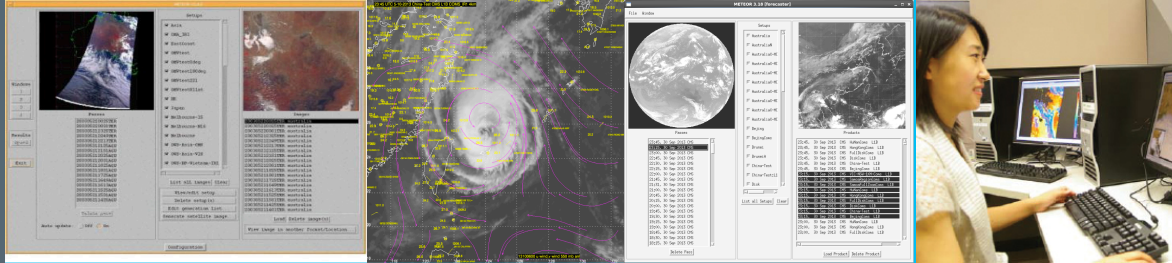
**NOAA, METOP**  
**MODEL: 1.2M, 1.5M**

### The Precise Solution

- Everything you want in a Shipboard Polar Orbiting Groundsystem is the EEC's latest OBERON System
- The OBERON-S systems feature marine stabilized platform and low power consumption, all in one affordable and rugged unit
- Over 30 level-2 products available for display and analysis with the included **PROTEUS** software suite.

# TeleSpace PRODUCT LINE

## PROTEUS™



NOAA, METOP, SUOMI-NPP AQUA, TERRA, FY3, GOES, MTSAT, COMS, MSG

### The Choice for Satellite Data Visualization & Analysis

- Integrated Software Suite that performs visualization, analysis and export.
- In addition to **TeleSpace developed algorithms**, the output of the following are displayed.

CSPP (University of Wisconsin)  
IMAPP (University of Wisconsin)  
IAPP (University of Wisconsin)  
IPOPP (NASA DRL)  
AAPP/OPS-LRS (UK Met)  
Metopizer (EUMETSAT)



## PROTEUS FEATURES

- MULTIPLE IMAGE DISPLAY**
- IMAGE ZOOMING AND ZOOMBOX PANNING**
- GRIB OVERLAYS**
- COAST OUTLINE OVERLAYS**
- TOPOGRAPHY AND RIVER OVERLAYS**
- ANIMATION LOOPS (AUTO UPDATABLE)**
- RANGE/BEARING AND SPEED CALCULATIONS**
- MULTIPLE MAP PROJECTIONS**
- APPLICATION OR USER DEFINED COLOR TABLES**
- HISTOGRAM, SCATTER & TRANSECT PLOTS**
- IMAGE HISTOGRAM EQUALIZATION**
- BRIGHTNESS AND CONTRAST IMAGE ENHANCEMENTS**
- INTEGRATION WITH DATA DISSEMINATION OPERATIONS**



**GOES-R**



# GOES- R WITH EEC TeleSpace



SATELLITE GROUND STATIONS

POWERED BY





# Motorized Azimuth and Elevation Control





# Acquisition Server (AWS)



	Requirements	Provided
CPU	12 Core 2.4GHz CPU	2 X E52630; 20 Core
MEMORY	32 GBytes	32 GBytes
HARD DISK	100 Gbytes min	2 x 2TBytes
LAN		4 x Gigabit Ethernet
POWER SUPPLY		Dual Redundant Hotplug
Operating System	64 bit CentOS 6	64 bit CentOS 6.6

# Data Processing Server (DPS)



	Requirements	Provided
CPU	20 Core 2.4GHz CPU	2 X E52650; 24 Core
MEMORY	192 GB	192 GB
HARD DISK	14 TB min	Raid 5 480GB SSD Raid 10 18TB Hard Disk
LAN		4 x Gigabit Ethernet
POWER SUPPLY		Dual Redundant Hotplug
Operating System	64 bit CentOS 6	64 bit CentOS 6.6

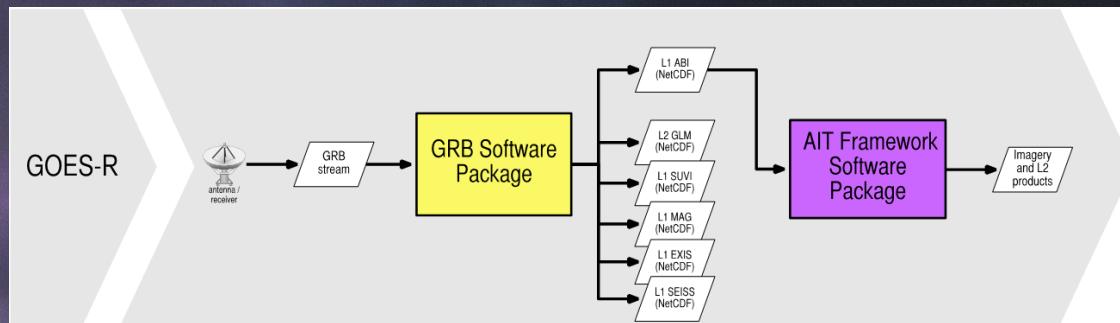
# Visualization Workstation (VIS)



	Requirements	Provided
CPU		E3-1270v5; Quad Core
MEMORY		32 GB
HARD DISK		1TB Boot Hard Disk 2TB Hard Disk
LAN		Gigabit Ethernet
Monitor		42" UHD LED Monitor (3840 x 2160)
Operating System	64 bit CentOS 6	64 bit CentOS 6.6



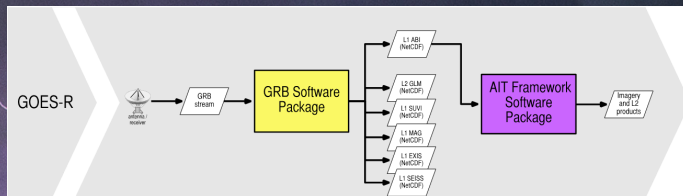
# GOES Rebroadcast System (GRB)



- Processes the raw GRB stream in real-time
- Extracts data payloads from packets, decompresses and constructs datasets in NetCDF4 format
- Level 2 GLM, Level 1 all other instruments, including ABI
- As of version 0.3, all GOES-R instruments are supported
- Users are currently integrating and testing the pre-launch versions of GRB software as they set up their receiving systems
- Version 0.4.4 has been released



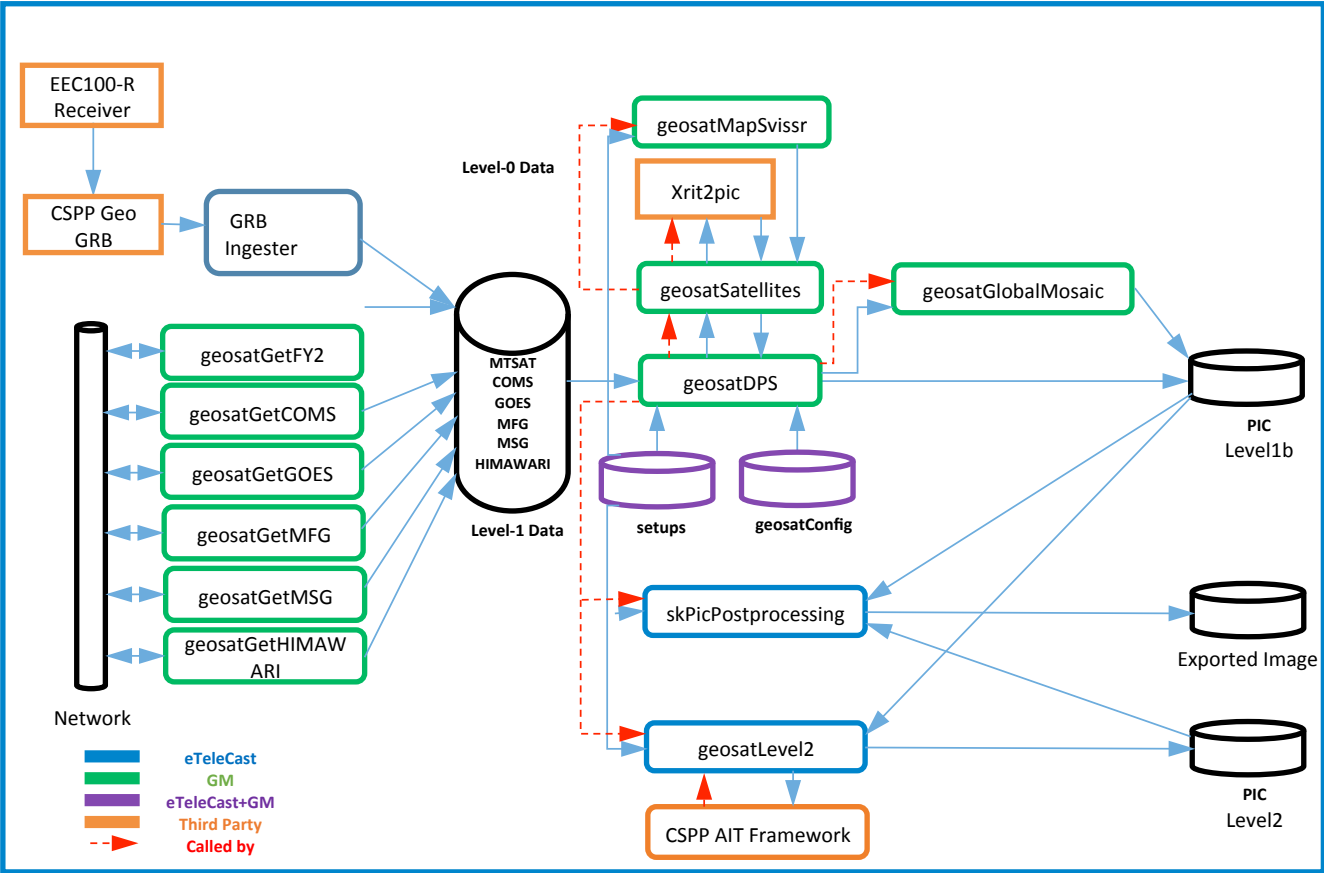
# ABI Level 2 Products from AIT Framework Software Package



## Products planned for initial release:

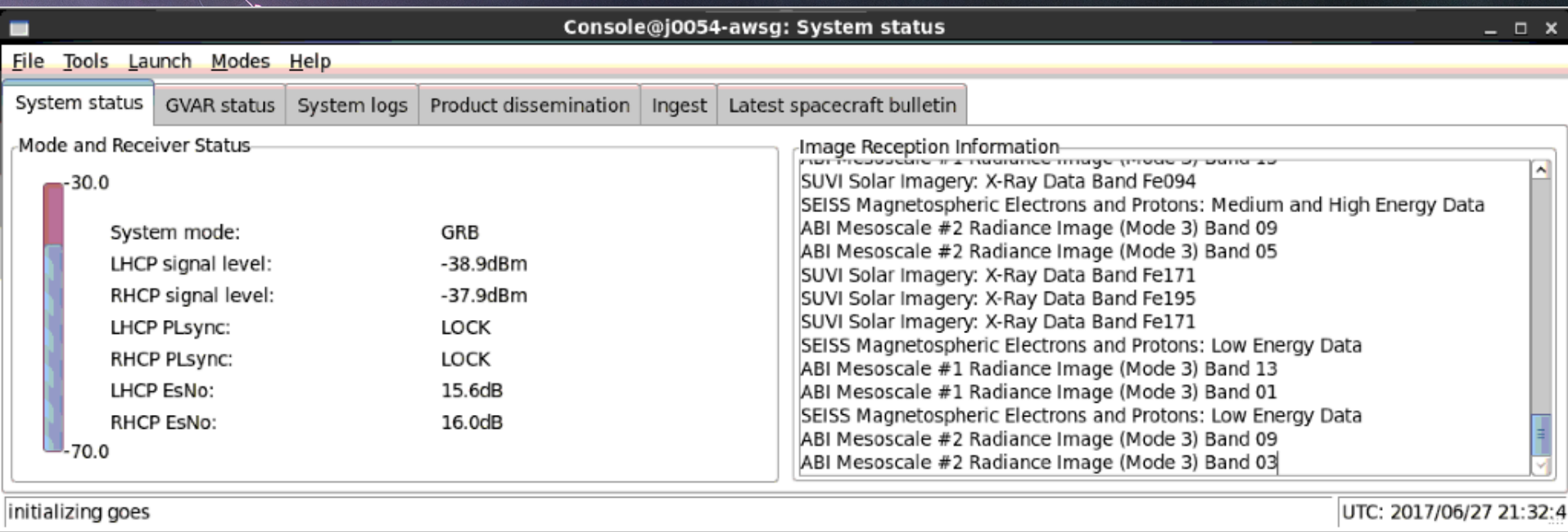
- The AIT Framework in CSPP Geo will process L1 ABI data from the GRB Software Package
  - AIT is the NOAA STAR “Algorithm Integration Team”
  - The AIT Framework is a processing system that was developed by the AIT as an integration point for GOES-R Level 2 algorithms
  - The initial version will produce a subset of baseline products
- Aerosol Detection: Smoke and Dust
  - Aerosol Optical Depth
  - Clear Sky Masks
  - Cloud and Moisture Imagery
  - Cloud Optical Depth (day/night)
  - Cloud Particle Size Distribution (day/night)
  - Cloud Top Height
  - Cloud Top Phase
  - Cloud Top Pressure
  - Cloud Top Temperature
  - Land Surface Temperature (Skin)

# Geosat & Satkit Software Flow Diagram

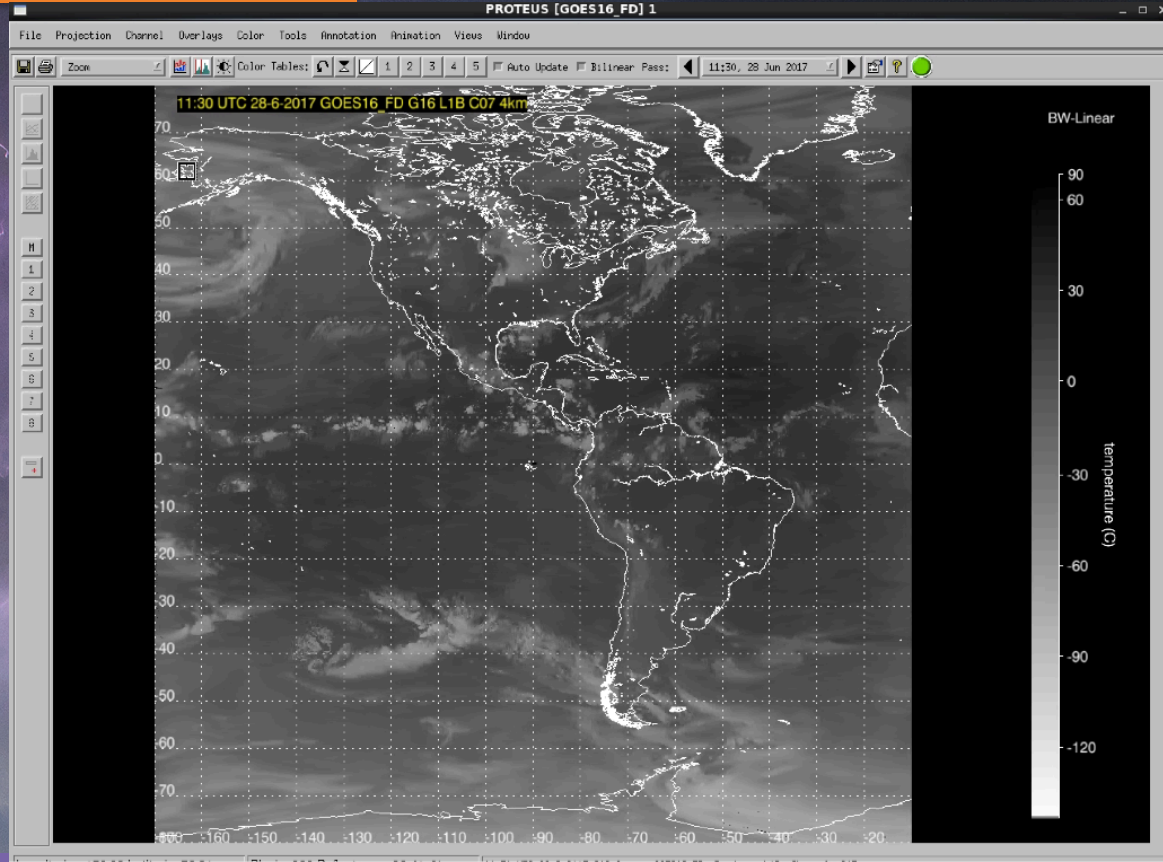




# GRB Console Monitor

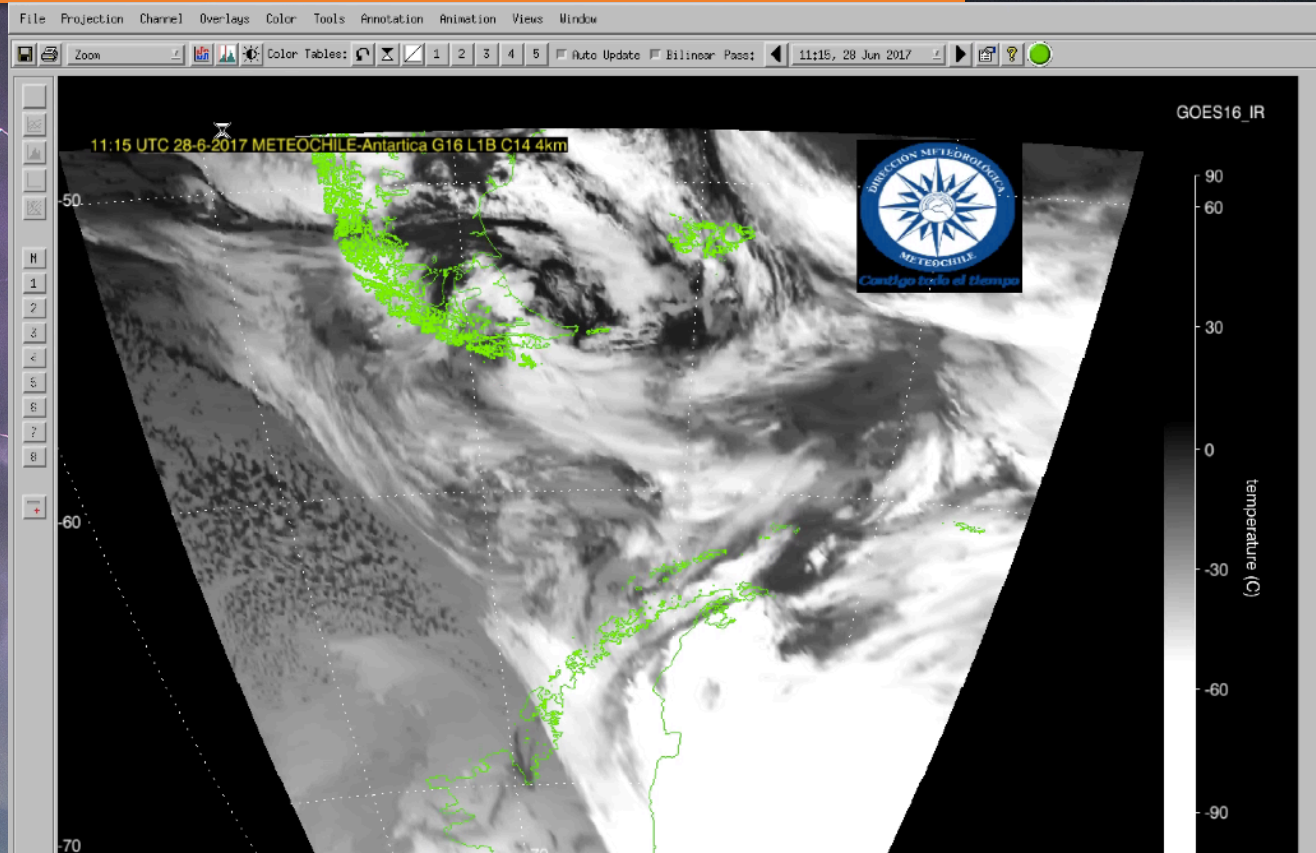


# Level1b ABI Channel 7 FD





# Level1b ABI Chnnel 14 Punta Arenas & Base Frei













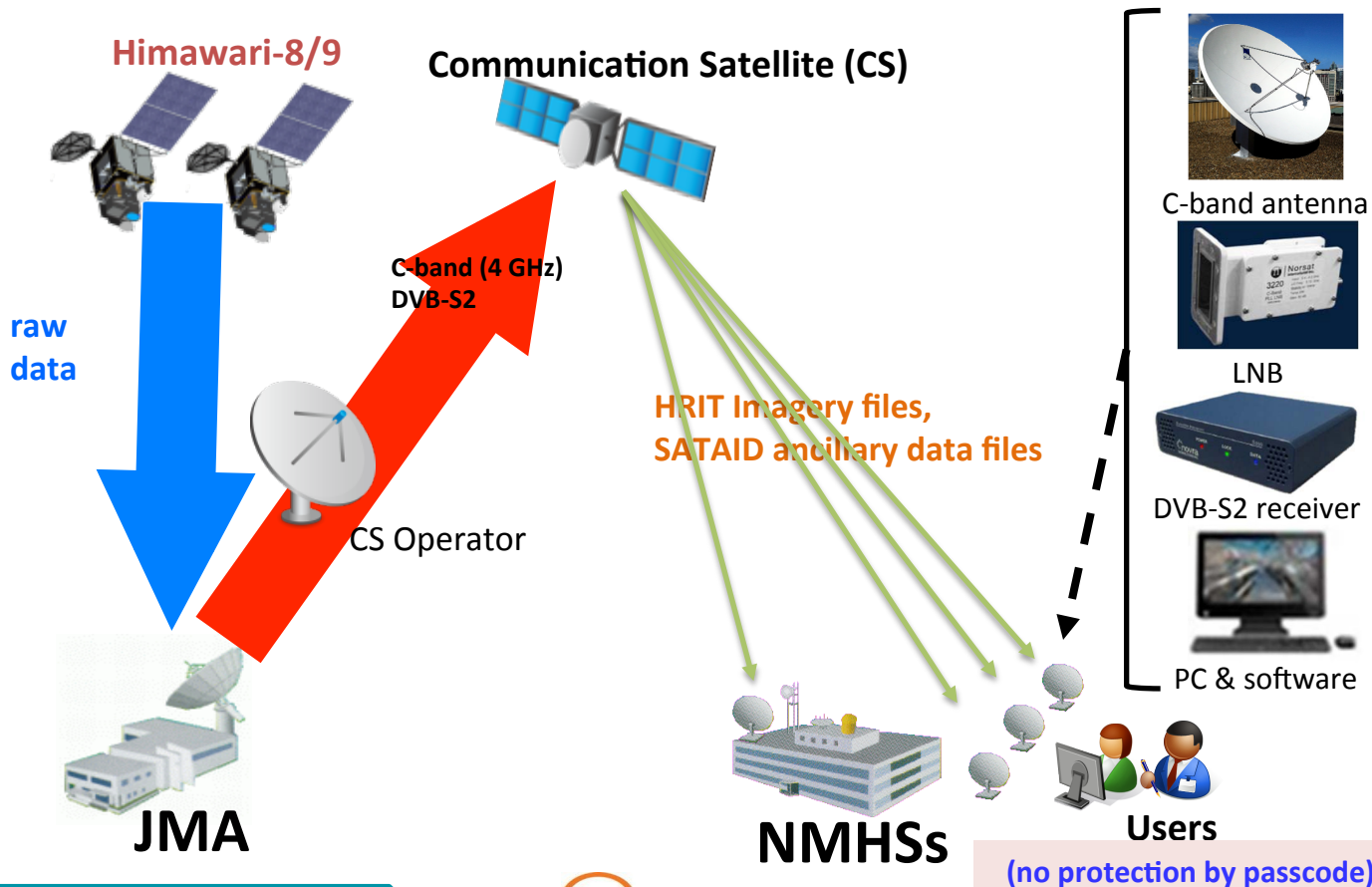


## EEC HIMAWARI-8 GROUNDSTATION





# Himawari-8 Imagery Data via HimawariCast



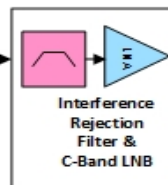
Linear/Circular  
Polarization Feed



2.4/3.7 m  
C-band Antenna

Satellite Transmissions:  
3.4 – 4.7 GHz

## Himawari-8 Ground Station Configuration



IF Cable  
950-2250 MHz

EEC100-R  
DVB-S/S2 Receiver



PROTEUS Visualization  
Workstation

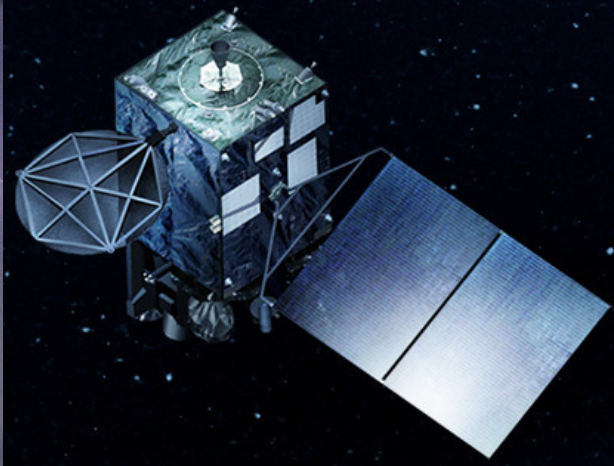


128 South Industrial Blvd  
Enterprise, AL 36330

May 20, 2015

GEONETCAST  
Ground System

# Himawari Cast WITH EEC TeleSpace



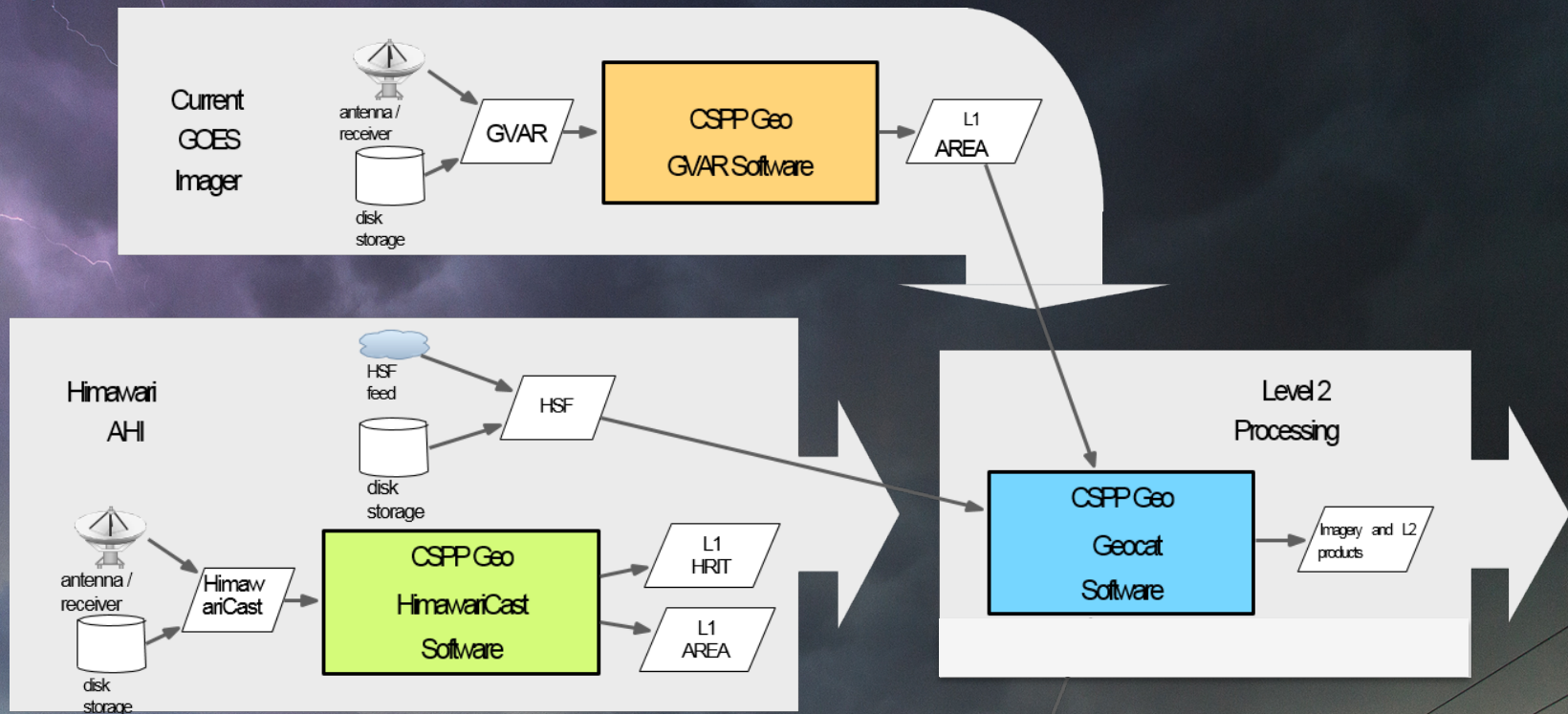
SATELLITE GROUND STATIONS

POWERED BY



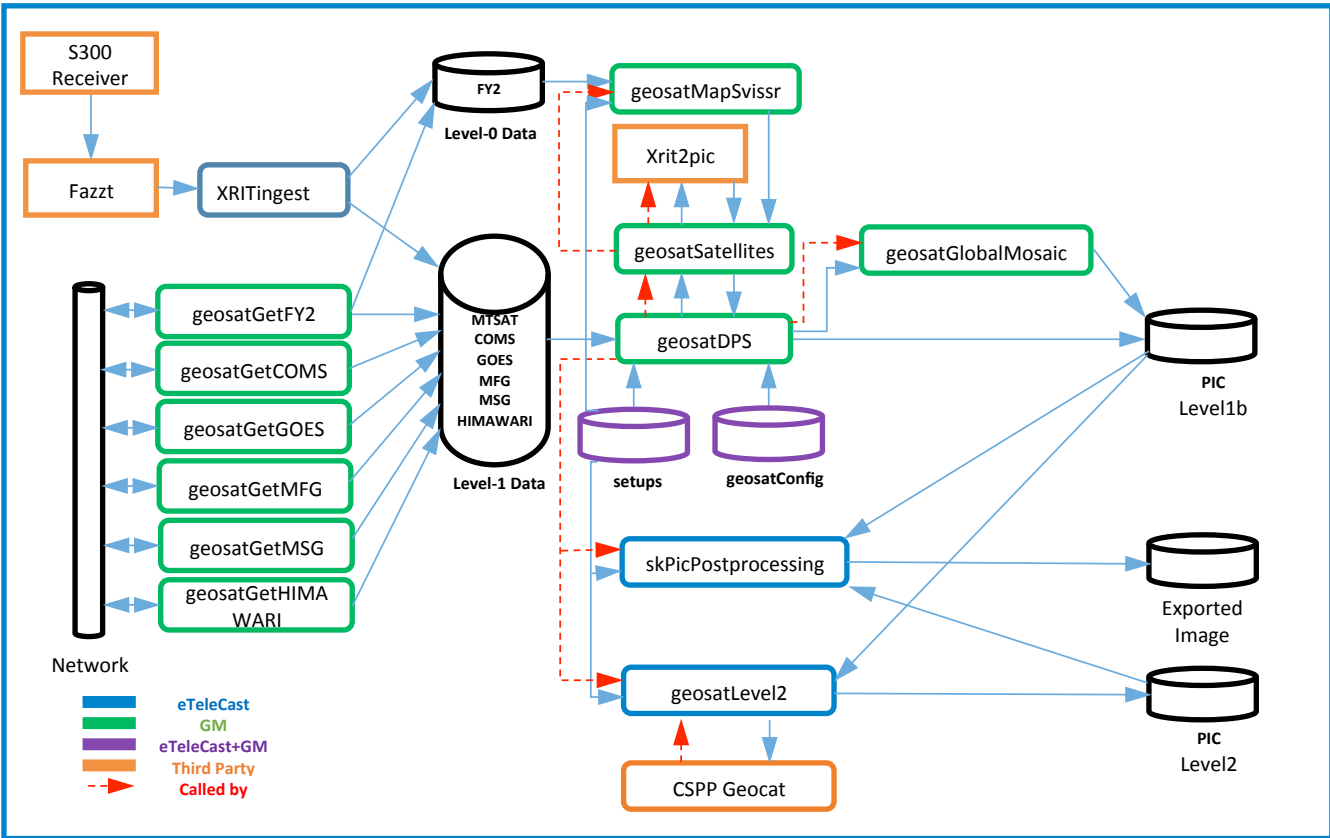


# AHI Level 2 Products from Geocat Software Package





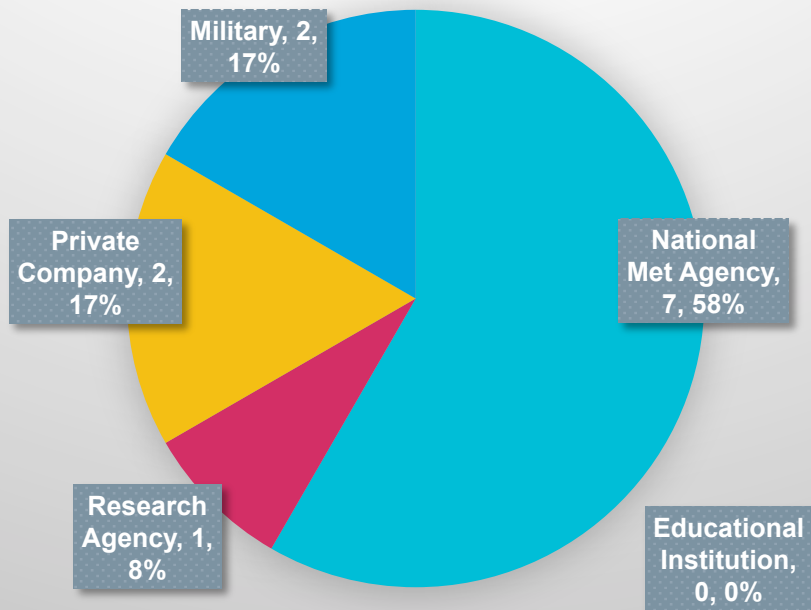
# Geosat & Satkit Software Flow Diagram



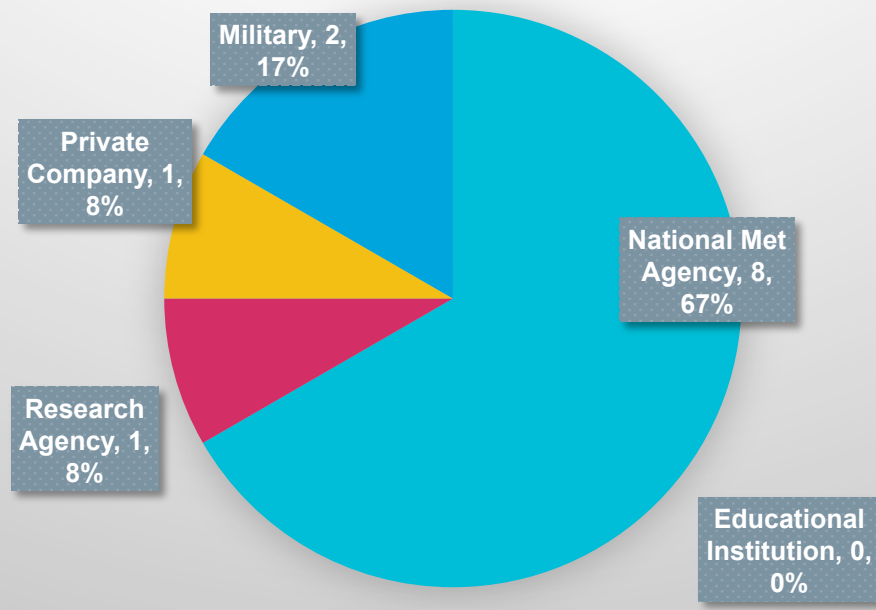




## GOES-R Customers



## HimawariCast Customers





**TELESPACE** PROVIDES COMPLETE TURNKEY  
SATELLITE GROUND SYSTEMS plus

**TRAINING:**

**OPERATIONS AND MAINTENANCE**  
**SATELLITE METEOROLOGY**  
**BASIC & ADVANCED REMOTE SENSING**  
**SATELLITE OCEANOGRAPHY**

**CLASSES CONDUCTED AT CUSTOMER SITE OR AT  
EEC FACILITIES IN ENTERPRISE, ALABAMA AND  
MELBOURNE, AUSTRALIA**

## QUESTIONS

### Contact Information

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[www.eecweathertech.com](http://www.eecweathertech.com)



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