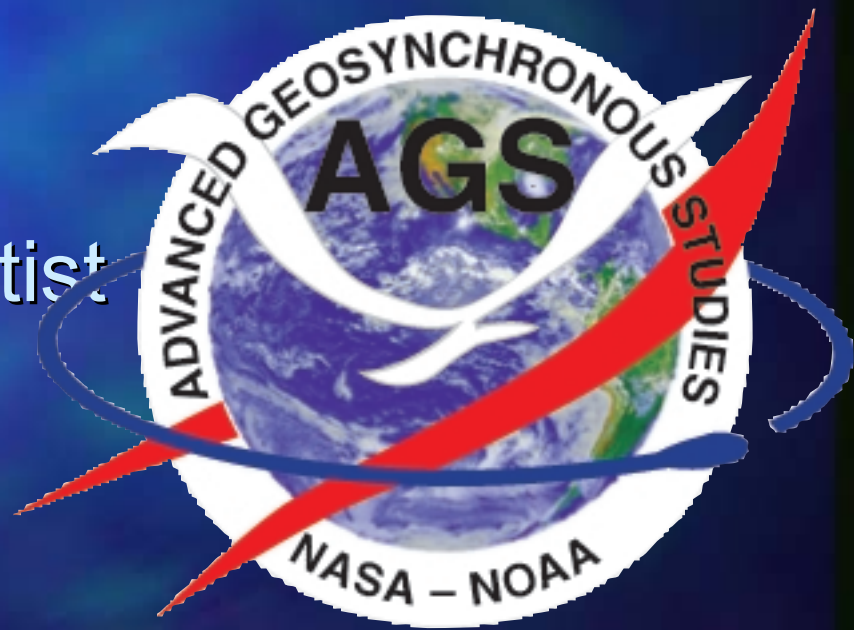# Advanced Geosynchronous Studies - **Imager (AGSI)**

Dennis Chesters

GOES project scientist
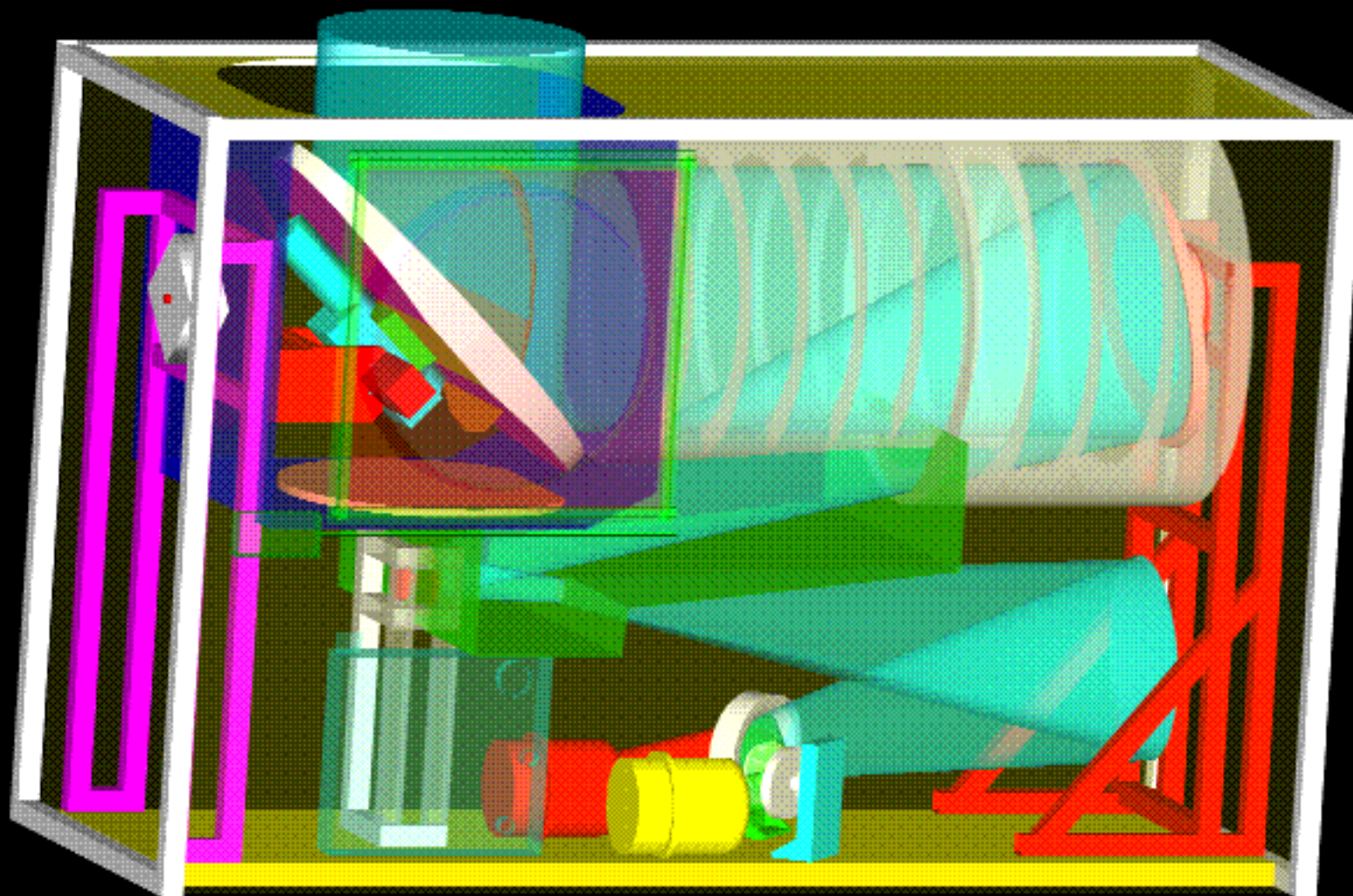
NASA-GSFC

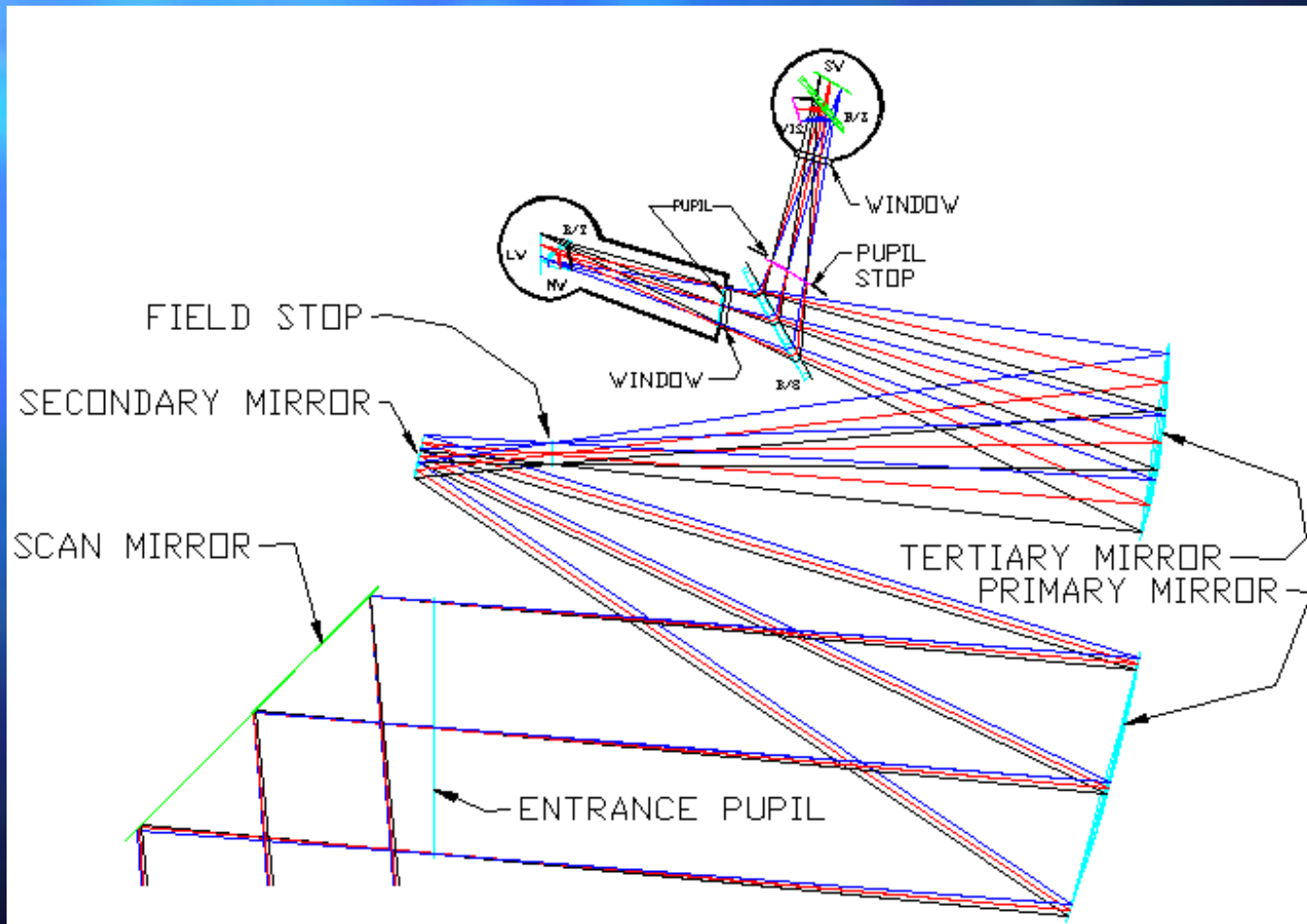January 1999

AGS Imager design in 1998

- Scan mirror design
- Fit on a satellite like GOES-N
- Fit in the 5-band Imager slot
- Trade-up from NOAA baseline (ABI 8-band imager, circa 2010)
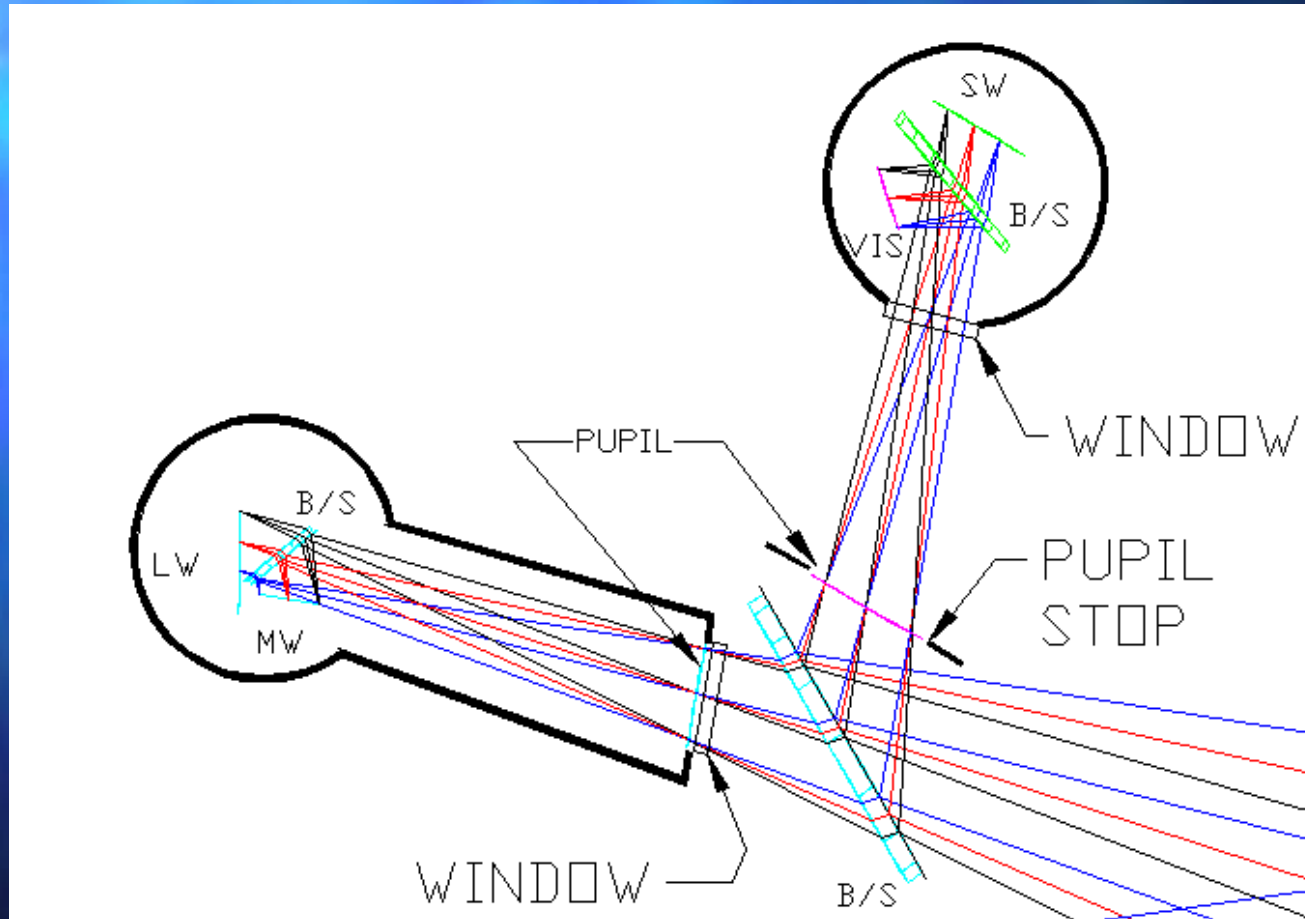- **Ready for flight circa 2005**
- **Next millenium science on GOES**

AGS Imager Structure

AGS Imager Schematic

Detectors & Beamsplitters inside Cooled Dewars

AGS Imager technical requirements

- **National Weather Service requirements (GOES-R, circa 2010)**
  - rates:
    - regional (1000x1000 km) @ 1 minute intervals for nowcasts
    - CONUS (3000x5000 km) @ 3.5-, 5-, 6-minute intervals for NEXRAD
    - full disk (16000x16000 km) @ 15 minute intervals for winds and storms
  - resolution: 0.5 km vis & 2 km infrared
  - navigation: ± 1 km earth-location
  - 8 spectral bands: 0.6, 1.6, 3.7, 6.7, 7.3, 11, 12, 13 microns
  - Signal/Noise 250/1 vis., NEDT 0.3 K infrared
  - operate through eclipse and local midnight
  - selectable sectors, data and products deliverable within 3 minutes

- **Science goals (earth science supplement, circa 2003-2005)**
  - **emulate MODIS and POES bands in all atmospheric windows**
  - diurnal cycle at full-disk; cloud phase, aerosols, winds, water vapor layers
  - shotwave and longwave calibration: internal, terrestrial, lunar, solar
  - cross-references with polar-orbiting satellites
  - long-term radiance data and products in standard servers on the network
  - **National observatory for unpredictable events**

Science and operational products from an **Advanced** Geosynchronous Imager

- Episodic & sporadic events
- Clouds
- Surface conditions
- Atmospheric moisture
- Winds
- **New and improved weather and climate data**
- **Cirrus and Aerosols, calibrated**
- **Colorimetry - ocean, land; smoke and haze**
- **Observe variations in the diurnal cycle**
- **Cross correlations with EOS**
- **Regional dynamic process studies**
- **Gap-filling in space-time, in statistics, and in physical budgets**
- **Long duration science archive for trends**

ITT-AB-AGS Imager Performance

PERFORMANCE	ITT	ABI	AGSI
Speed (full disk)	27 min	5 min	5 min
Resolution (IFOV)	1 & 4 km	0.5 & 2 km	**0.3 & 0.7& 1.3 km**
Channels	5	8	**18***
Signal/Noise	250-1000:1	500-2000:1	500-2000:1
Navigation	±4 km	TBD	**±1 km**
Registration	±25%	±15% FOV	±10% FOV
Calibration (IR)	1 K ± 0.1 K	1 K ± 0.1 K	1 K ± 0.1 K
(vis & NIR)	none	5% ± TBD	**1% ± 0.1%***

* more spectral bands and calibration enables science

AGSI-ABI Imager Channels

(µm)	FOV(km)	Noise	Heritage*	Purpose
0.47	0.5	1/500	M	smoke, dust and haze
0.60	0.5	1/500	ARMISm	cloud albedo, wind
0.80	0.5	1/400	AMm	vegetation
1.37	1	1/300	M	cirrus
1.65	1	1/500	MRm	cloud/snow, fires
2.22	1	1/400	M	cloud ice, ice, fires
3.60	2	0.1K	MS	sfc, total water vapor
3.95	2	0.1K	ARMISm	sfc. & cloud temp., fires, fog
4.15	2	0.2K	MS	sfc, low air temp.
6.55	2	0.1K	Sm	tropopause water vapor
6.85	2	0.1K	RMIS	high water vapor
7.15	2	0.1K	RSm	mid. water vapor
7.45	2	0.1K	MS	low water vapor
8.50	2	0.2K	Mm	total water vapor
9.70	2	1.0K	MSm	total ozone
11.0	2	0.1K	ARMISm	sfc. & cloud temp., fires, fog
12.4	2	0.3K	ARMISm	sfc, total water vapor, volcanic ash
13.3	2	0.5K	MRISm	high cloud cover

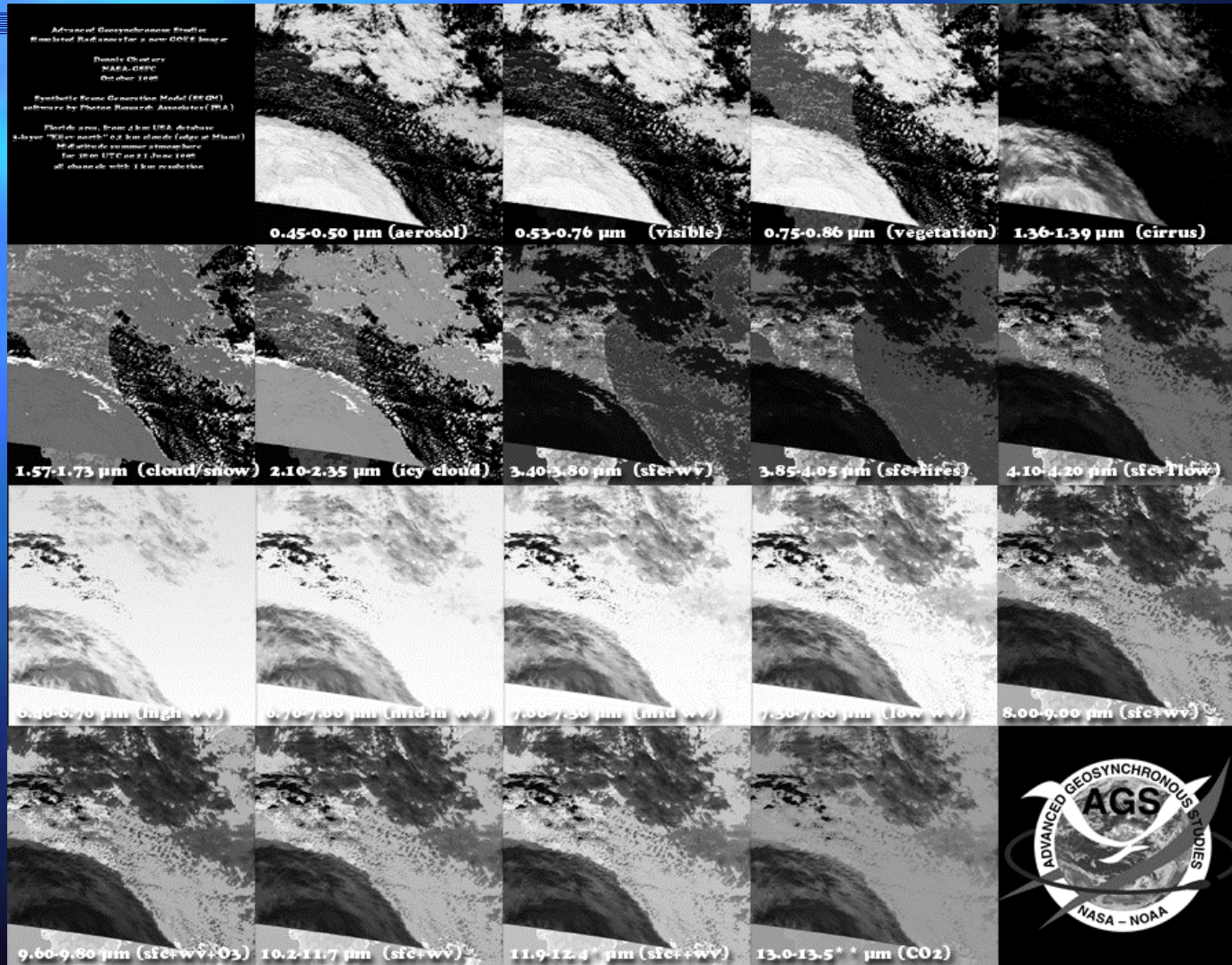*M=MODIS, A=AVHRR, R=GOES-R, I=GOES-8 Imager, S=GOES-8 Sounder, m=MSG

AGS Imager **Spectrum**

Current Imager GOES-N
5 band simulation
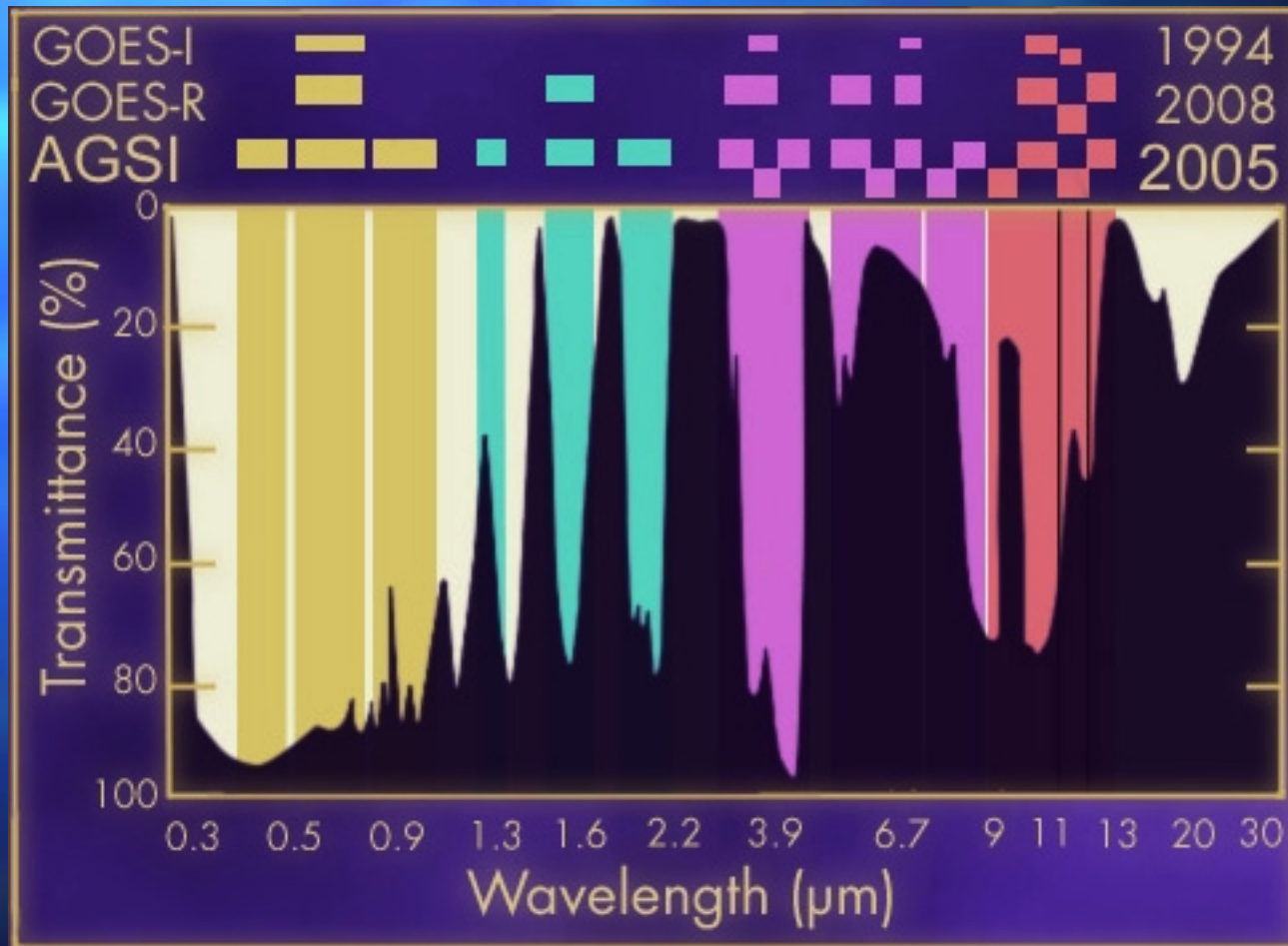
Baseline Imager GOES-R
8 band simulation
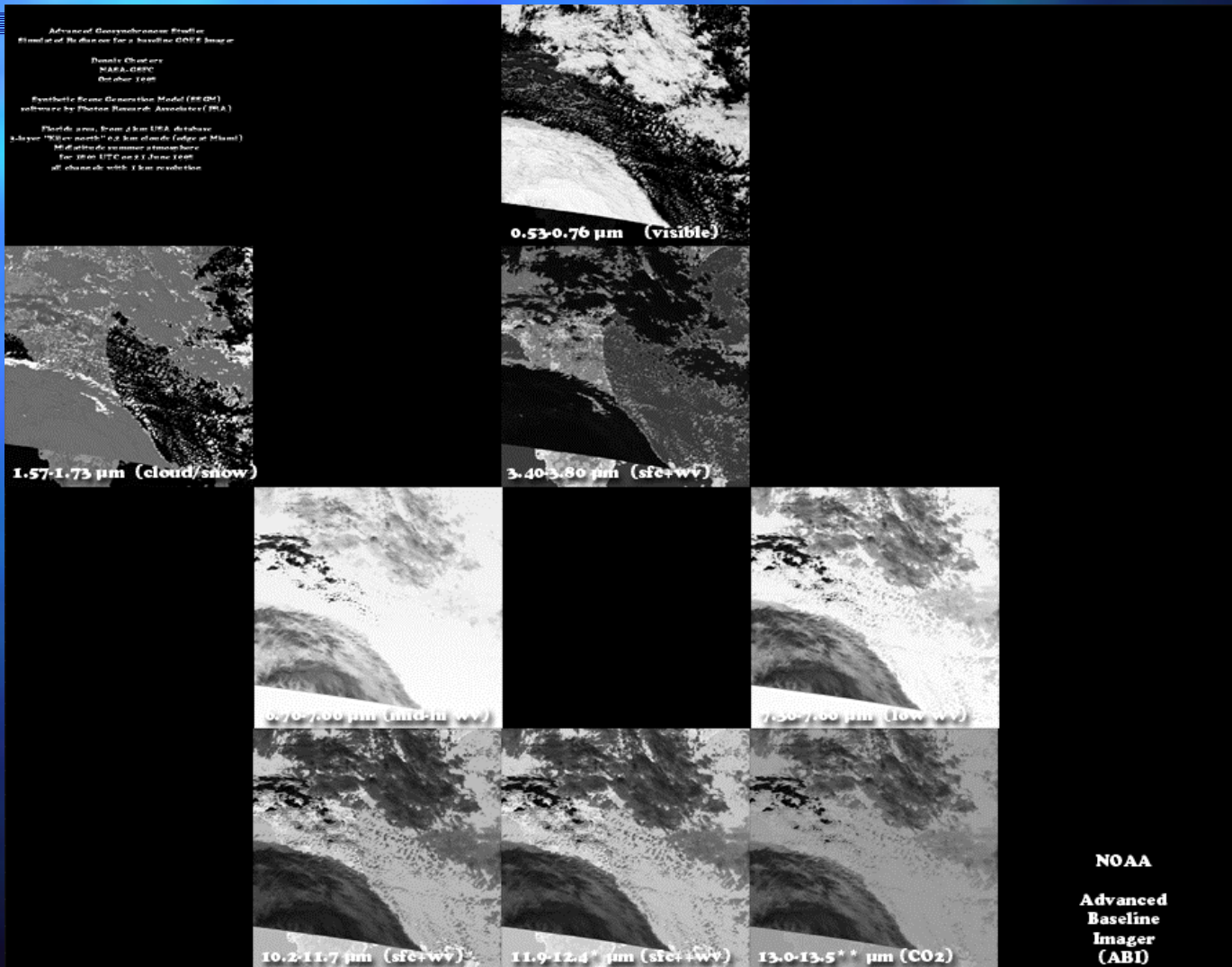
Advanced Imager GOES-P/Q
18 band simulation

Future of NASA-NOAA?

- **Dan Goldin at AGU, December 1998**
  - "We need to work out a larger architecture that encompasses more than 2-5 day weather & climate forecasts. It should consider Geostationary Earth Orbiters(GEO) as well as polar orbiters."

  - "NASA will step up to being the technology supplier, but there must be a commitment and a process to infuse new technologies into the operational systems. Otherwise, they will never be able to produce more than they are producing today."

Priority Interrupt Tests
GOES-10 -- May 1998

- **Full Disk every hour**
  CONUS every 6 minutes
  24 hours/day
  for integration with radar

- **Full disk every hour**
  Gulf coast every 1.2 minutes
  24 hours/day
  for local severe storms