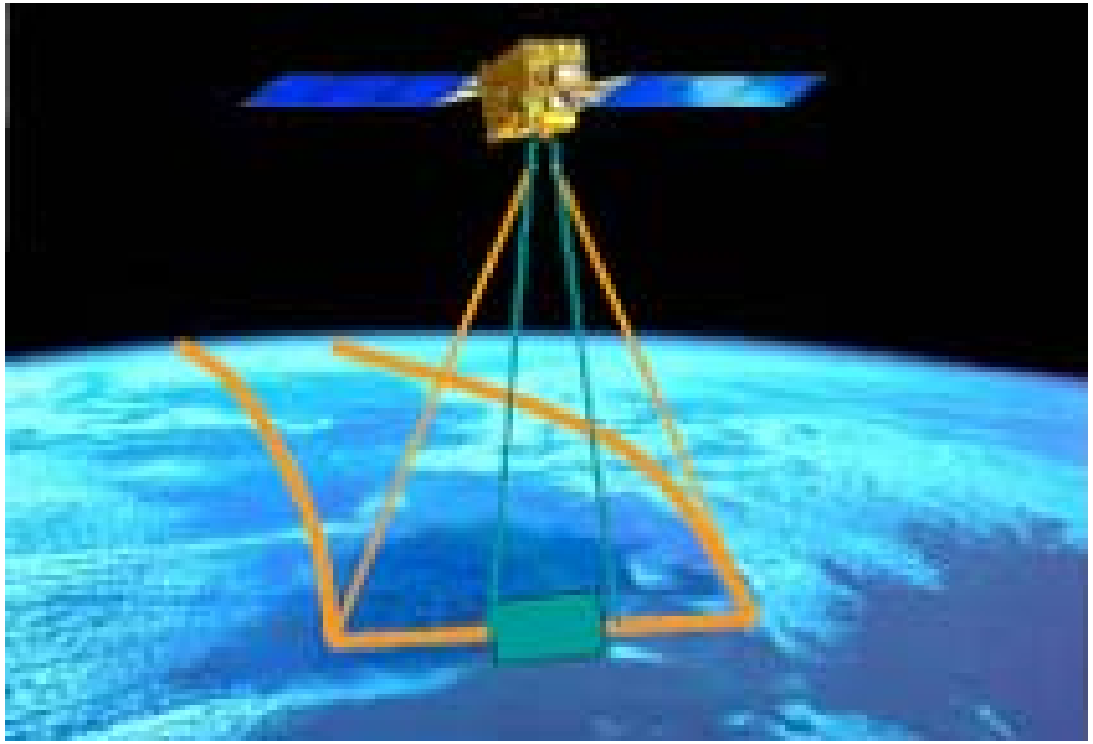
Japanese Hyper-spectral and Multi-spectral Sensor System Development Status



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Personal Information

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- *Member of Japanese ASTER Science Team*
  Co-chair of Ecosystem, Oceanography, and Limnology WG
  Member of Temperature/Emissivity Separation WG

- *Member of Committee for METI*'s new instrument development*
  **Ministry of Economy, Trade, and Industry of Japan*

- *Other satellite projects*
  *- PI of Spectral Profiler** onboard Japanese "Kaguya" lunar explorer*
  ***Nadir-looking "non-imaging" spectrometer with 296 bands in 0.5 – 2.6 μm region.*
  *- Member of NIES GOSAT***Project*
  ****Japaense satellite for measurement of atmospheric CO2 and CH4 using a Fourier transform spectrometer in NIR and TIR regions*
  - Former member of EO-1 Science Validation Team

Summary

- *Japanese Ministry of Economy, Trade, and Industry (METI) has developed several earth observation instruments for various satellites since 1980s including ASTER onboard NASA's Terra satellite.*

- *In 2007, METI started the development of a new instrument which consists of hyperspectral subsystem and multispectral subsystem.*
  - *"Hyper" : 30 m resolution, 30 km swath, 185 bands in 0.4-2.5 μm*
  - *"Multi" : 5 m resolution, 90 km swath, 4 bands in 0.4-0.9 μm*
  - *Simultaneous operation of two subsystems is possible*

- *The completion of the new instrument will be 2011.*
  JAXA's ALOS-3 satellite, to be launched in 2013/14, is a candidate satellite to host METI's new instrument.

- *Following issues are being discussed:*
  - *Establishment of Science Team*
  - *Development of the ground data system*
  - *Domestic and international collaboration*

Earth Obervation Instruments by METI

JERS-1

OPS & SAR

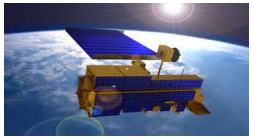
Satellite : JERS-1
Operation : NASDA

IMG

Sounder

Satellite : ADEOS
Operation : NASDA

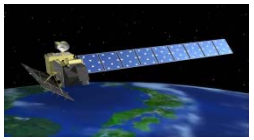
ASTER



OPS

Satellite : **Terra**
Operation: NASA

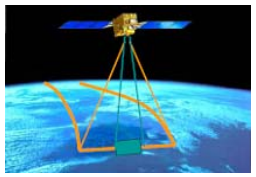
PALSAR



SAR

Satellite : **ALOS**
Operation: JAXA

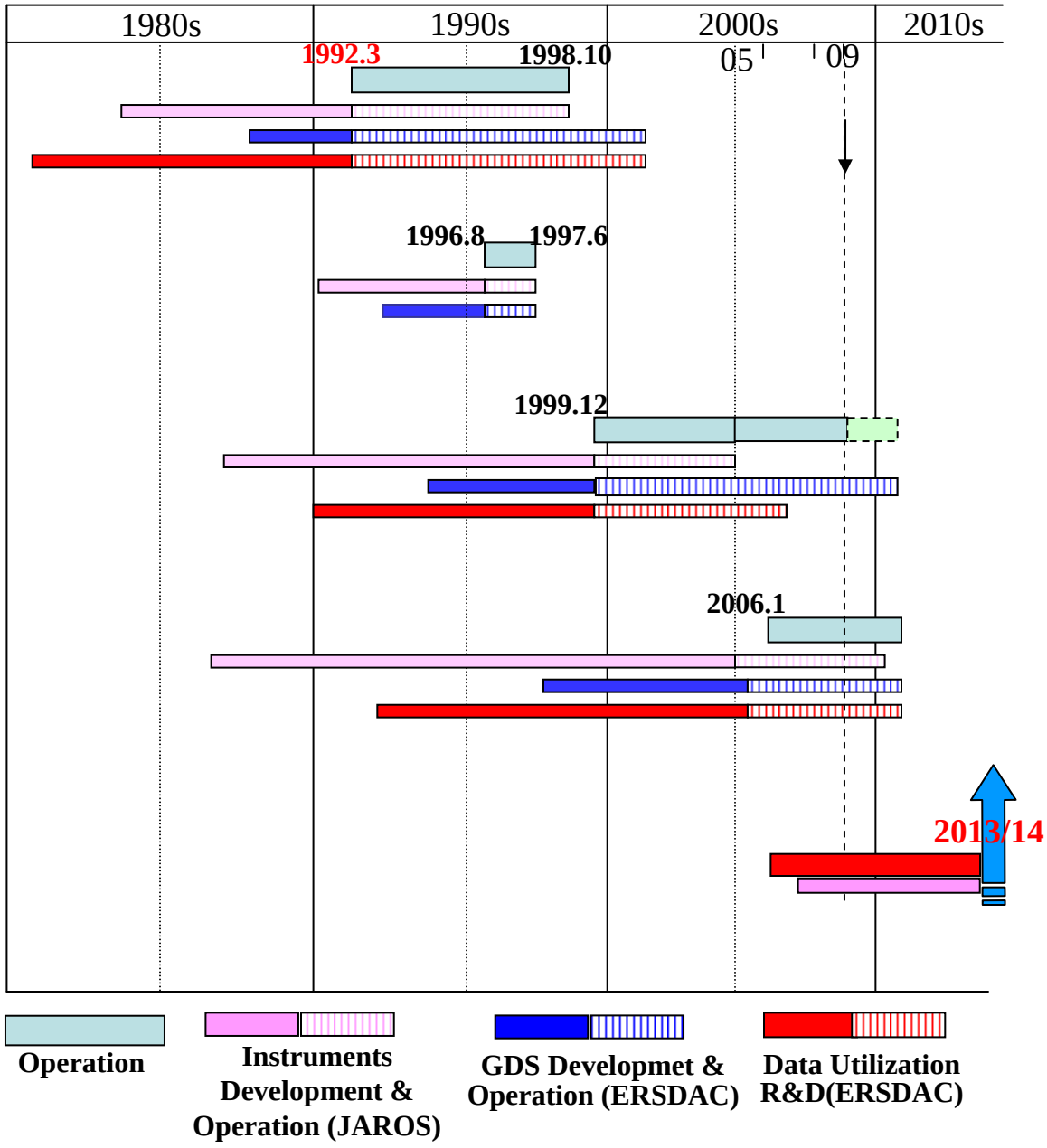
New Instrument



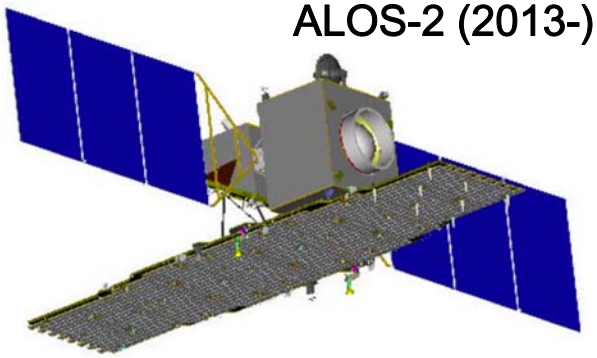
OPS

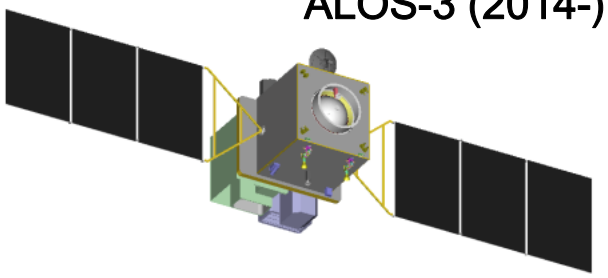
Satellite : ALOS-3
(not yet decided)
Operation: JAXA
(not yet decided)

OPS : Optical Imager



Candidate Satellite : JAXA's Advanced Land Observing Satellite - 3

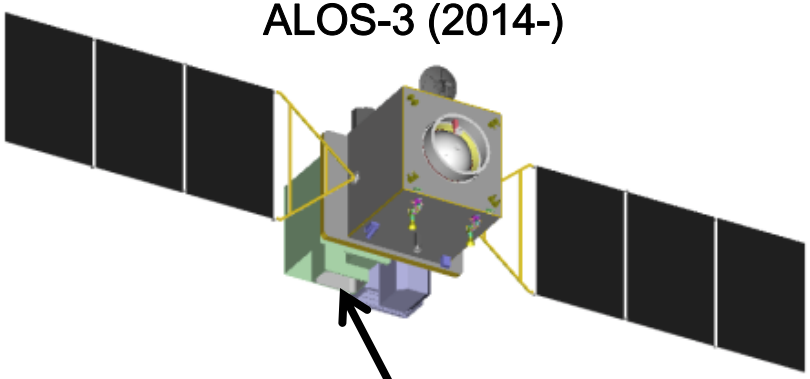




Orbit	Type	Sun-synchronous subrecurrent orbit
	Altitude	Approx. 618km
	Local Sun Time	13:30 +/- 15min (Descending node)
Life time		5 years
Launch	Target Year	2014
	Rocket	H-2A
Satellite	Mass	≦2000kg
	Solar Arrays	2 paddles
Mission data transmission		Data Relay (Ka-band) Direct Transimission (X-band)
Optical Instruments		Panchromatic Hyper-/Multi-specral
Optical Observation	Panchromatic	Res.: 0.8m Swath: 50km
	Multi-spectral	Res.: 5m Swath: 90km
	Hyper-spectral	Res.: 30m Swath: 30km

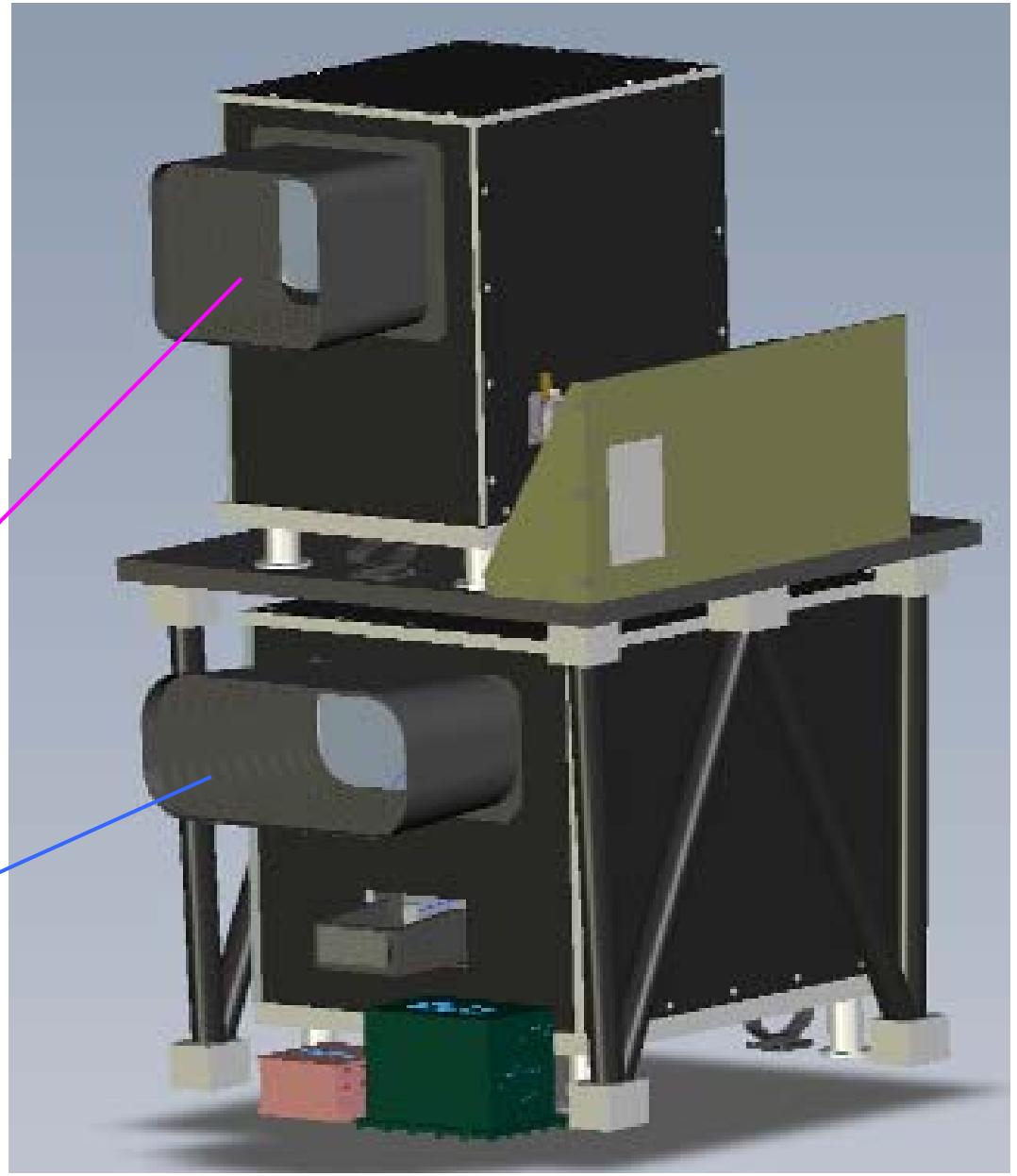
As of July, 2009 (http://www.alos.jp/pdf/ALOS-3_0900702.pdf)

ALOS-3 (2014-)



Hyper-spectral Sensor

Multi-specrtal Sensor



	Hyper-spectral Sensor		Multi-spectral Sensor
	VNIR	SWIR	
Spatial Resolution	30 m		5 m
Swath Width	30 km		90 km
Telescope	Off-axis Three Mirror		Off-axis Three Mirror
Spectrometer	Offner Type	Offner Type	
Detector Type	Si CMOS	MCT	Si CCD
Radiometric Quantization	12 bit		12 bit

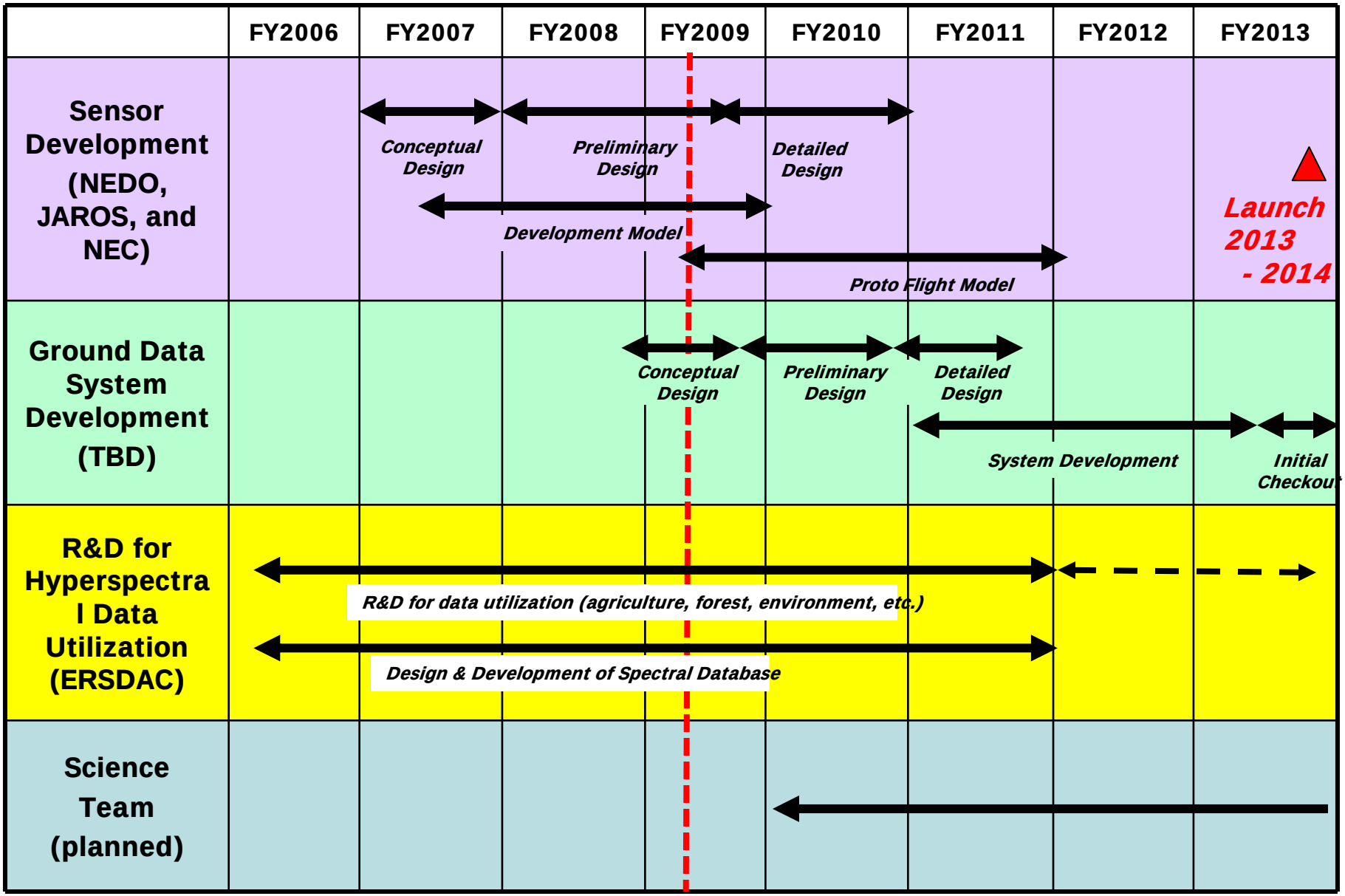
Requirements for Hyperspectral Subsystem

Parameter		Requirement
Spatial	Resolution	30 m
	Swath Width	30 km
Spectral	Number of Bands	185 VNIR:57 SWIR:128
	Range	0.4 - 2.5 µm VNIR:0.4-0.97 µm SWIR:0.9-2.5 µm
	Resolution	10 nm (VNIR) 12.5 nm (SWIR)
Signal to Noise Ratio (S/N)		≥ 450 @ 620 nm ≥ 300 @ 2100 nm
MTF		≥ 0.2
Dynamic Range / Digitization		≥ 10 bits

Requirements for Multispectral Subsystem

Parameter		Requirement
Spatial	Resolution	**5 m**
	Swath Width	**90 km**
Spectral	Number of Bands	**4**
	Range	**0.42 - 0.90 μm**
Signal to Noise Ratio (S/N)		**≥ 200**
MTF		**≥ 0.3**
Dynamic Range / Digitization		**≥ 8 bits**

Schedule for Hyper- and Multi-spectral Sensor System Development



Thank you for your attention.