

# *A Brief History of CRISM Observing Modes*

***3RD PLANETARY DATA WORKSHOP***

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# Primary Factors Affecting CRISM Data Characteristics

## ▪ Changes to instrument hardware

- **Gimbal** → experienced reduced range of motion through time
- **Cryosystem** → experienced reduced operation, higher IR detector temperatures through time = increased spectral noise

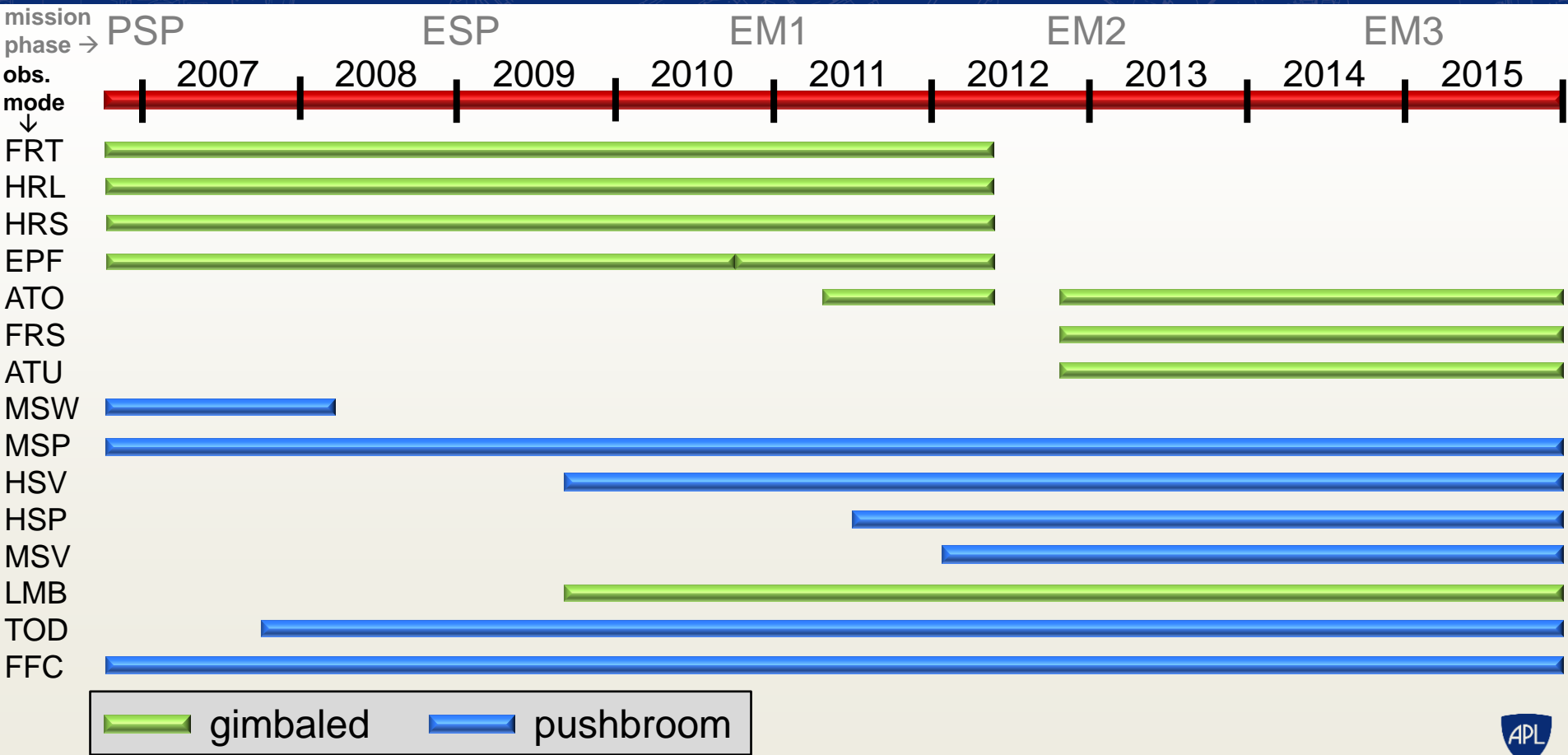
## ▪ Environmental conditions

- **Atmospheric opacity** → variable over mission; less surface signal when more dust and ice in the atmosphere
- **Illumination** → variable along orbit, with season; less signal at higher incidence angles

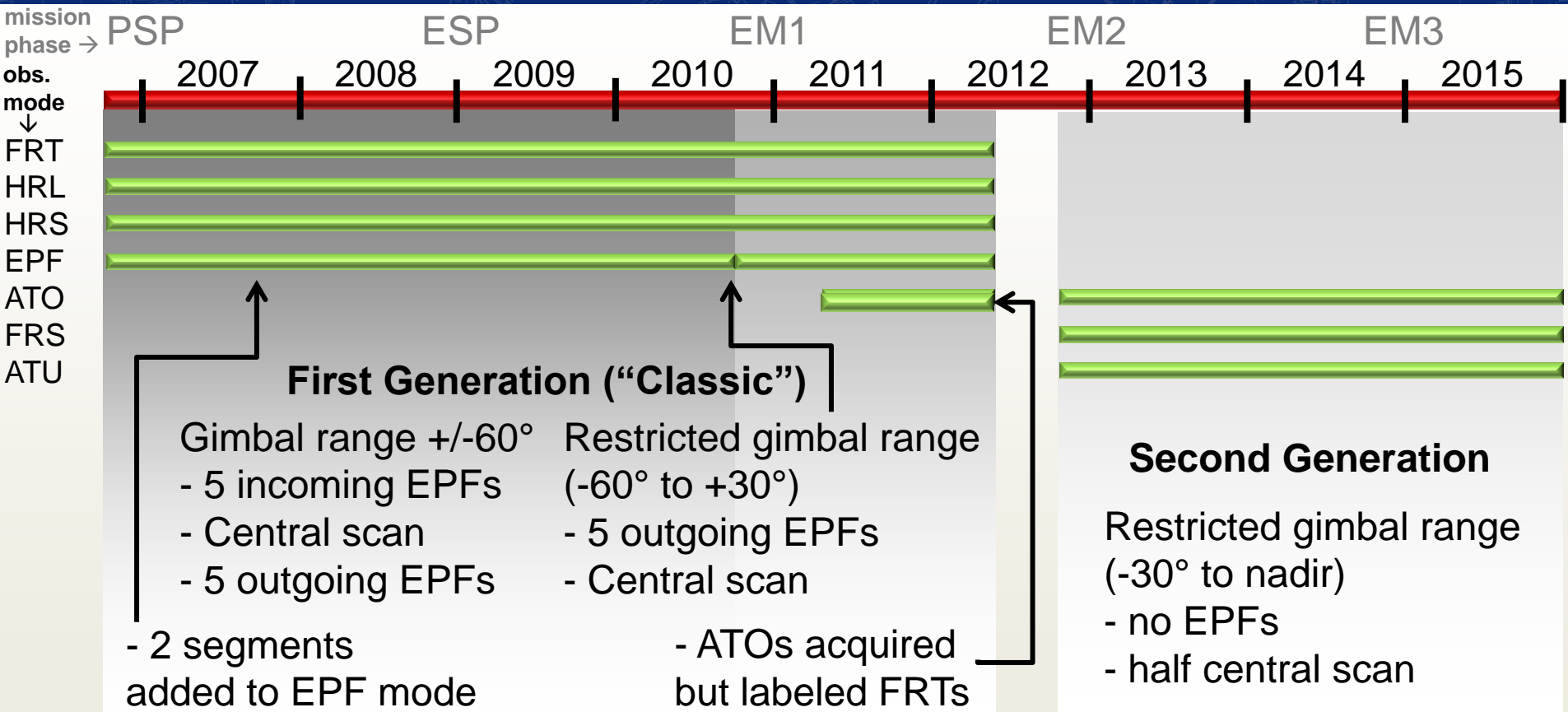
**Focus of this presentation!**



# Timeline of Observing Modes

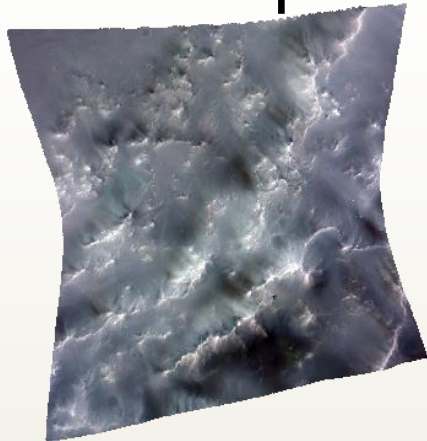


# Timeline of Observing Modes: **Gimbaled** (Surface Science)



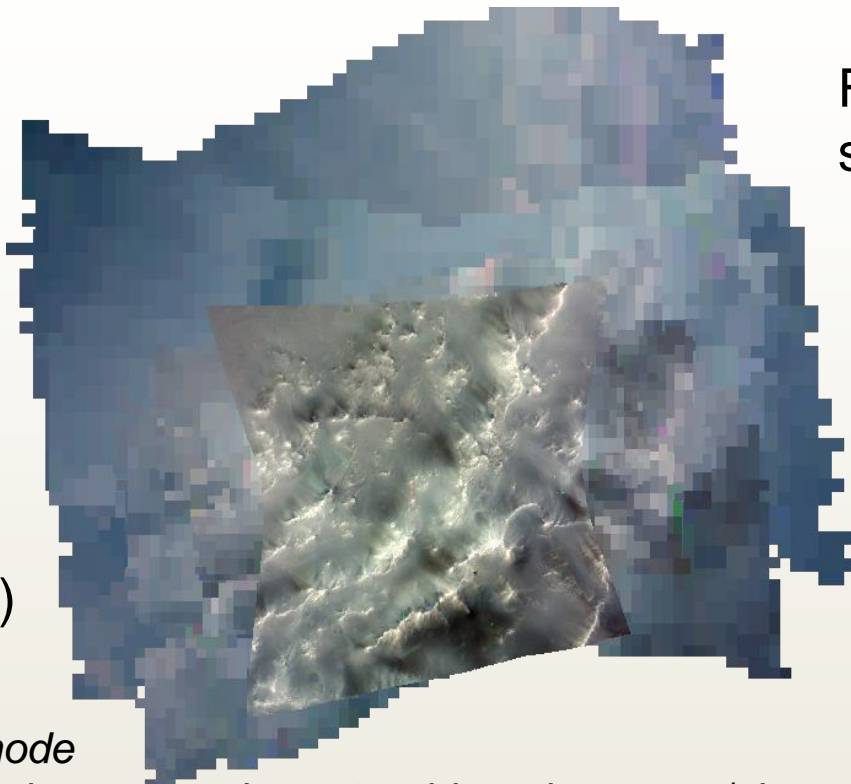
# Classic Targeted Observing Modes: FRT, EPF

~20 m/pix



Full Resolution Targeted (FRT)  
central scan only

- Emission Phase Function (EPF) *mode* consists of 5 (or 6) incoming and outgoing scans plus a 10x-binned, ~200 m/pix central scan
- Each FRT/HRL/HRS also has 5 EPF segments but the central scan is ~20 or ~40 m/pix.



FRT central  
scan + EPF  
sequence

# Classic Targeted Observing Modes: HRL, HRS

40 m/pix



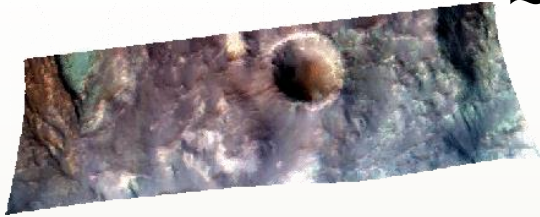
**Half Resolution Long (HRL)**



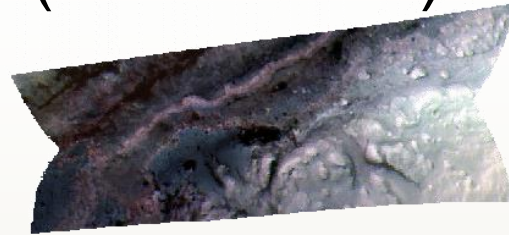
**Half Resolution Short (HRS)**

# Second Generation Targeted Observing Modes

~20 m/pix (cross-track)



**Full Resolution Short (FRS)**  
(~20 m/pix)



**Along Track Oversampled (ATO)**  
(variant of FRT before 2012\_142)  
(highest spatial resolution in center)



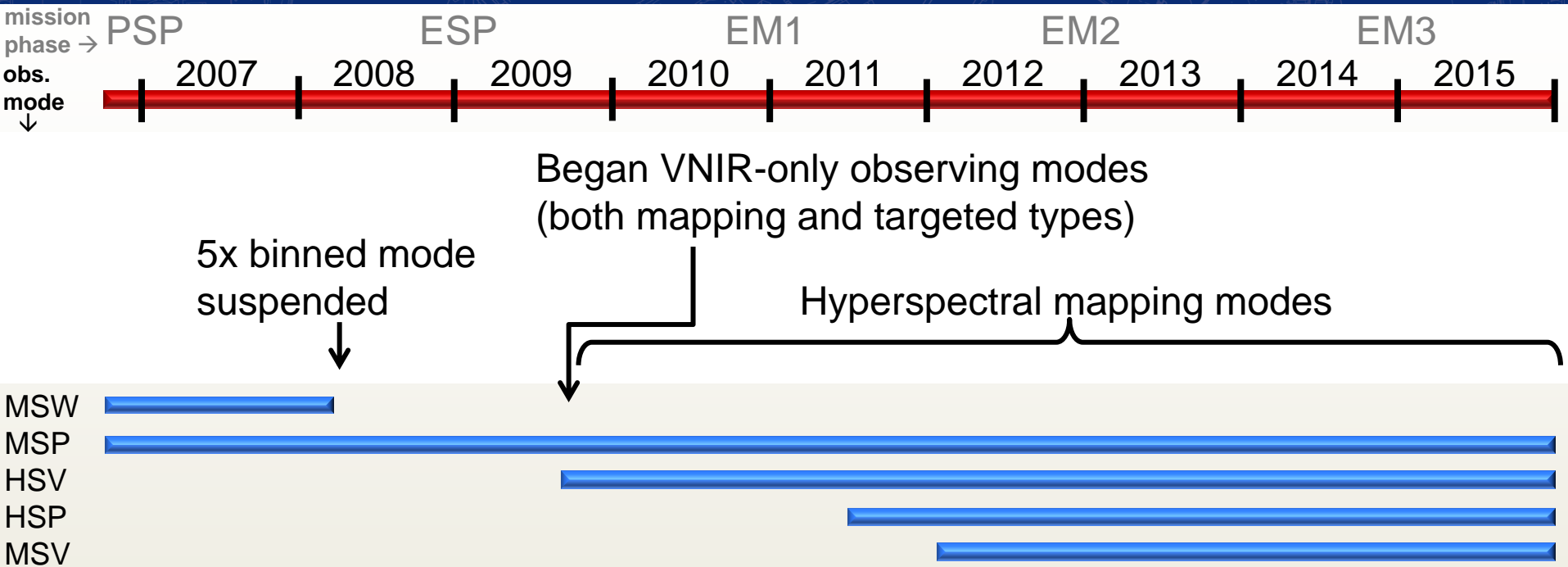
**Along Track Undersampled (ATU)**  
(~40 m/pix downtrack)



**ATO** (after 2012\_142)  
(up to ~8 m/pix downtrack, but  
requires special processing for  
increased resolution)



# Timeline of Observing Modes: *Mapping*



**MSW, MSV** = 5x binned = 100 m/pix

**MSP, HSV, HSP** = 10x binned = 200 m/pix

# Mapping Modes

100 m/pix

**MultiSpectral Window**  
(MSW)

**MultiSpectral VNIR**  
(MSV)



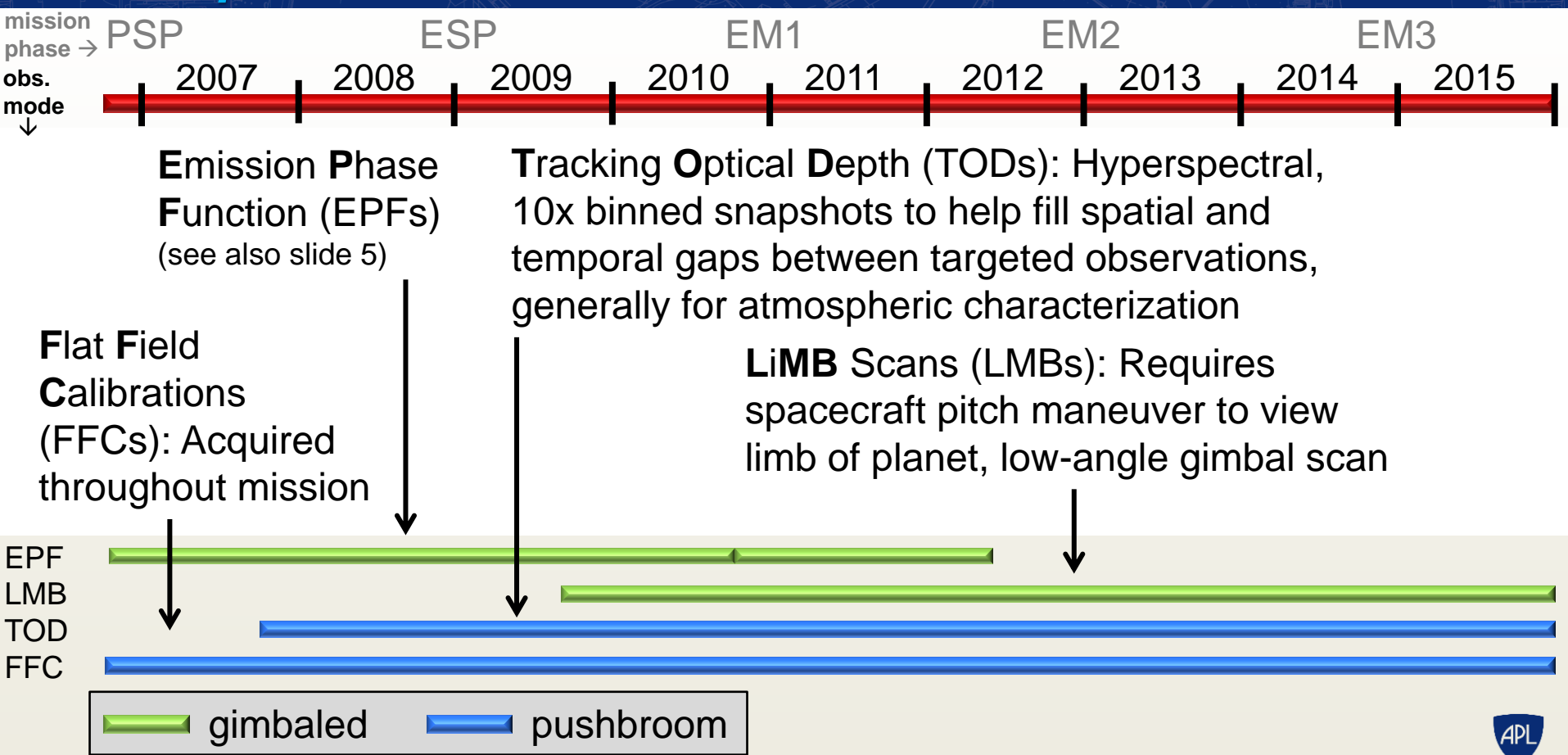
200 m/pix

**MultiSPectral Mapping (MSP)**  
**HyperSPectral Mapping (HSP)**  
**HyperSPectral VNIR (HSV)**

All mapping mode  
observations can  
vary in length:  
~45, 180, or 540 km



# Timeline of Observing Modes: Atmospheric Modes and Calibrations



# Atmospheric Observations

**LMB**

space

atmosphere

surface



**TOD**

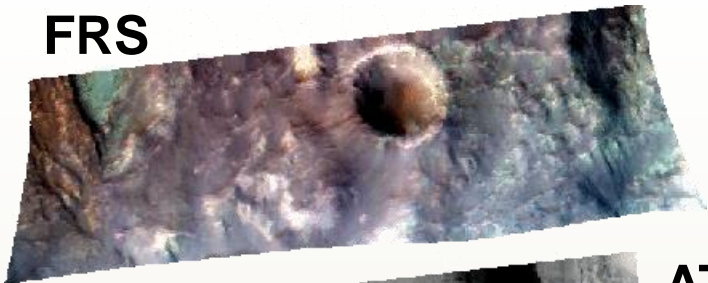


- 4 hyperspectral snapshots of surface
- Pixels are non-square and elongated downtrack – similar to flat fields

**EPF** not shown  
(see slide 5)

# Summary: Current Suite of Observing Modes

FRS



ATU



ATO



MSV



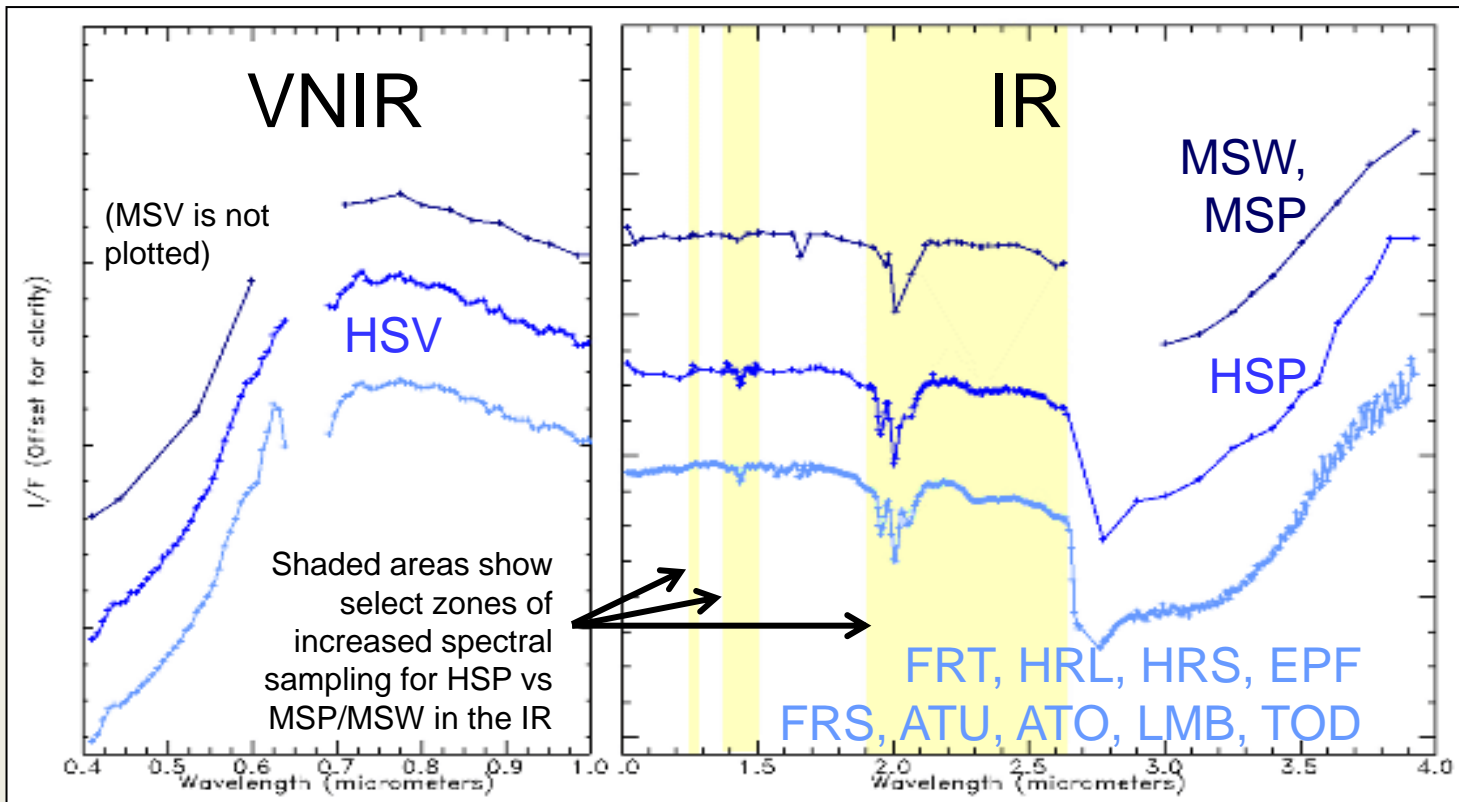
MSP,  
HSP,  
HSV



LMB

TOD

# Summary: Current Observing Mode Spectral Sampling



number of bands:

VNIR IR

19 55

107 154

107 436

VNIR-only modes:

HSV/FRS/ATO/ATU

107 0

MSV

90 0