



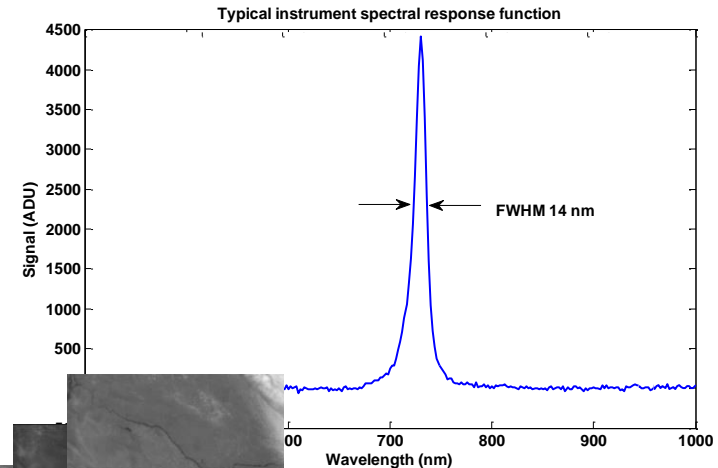
# Snapshot hyperspectral imaging for atmospheric measurements

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# Snapshot spectral imagers

- Traditional filter wheel

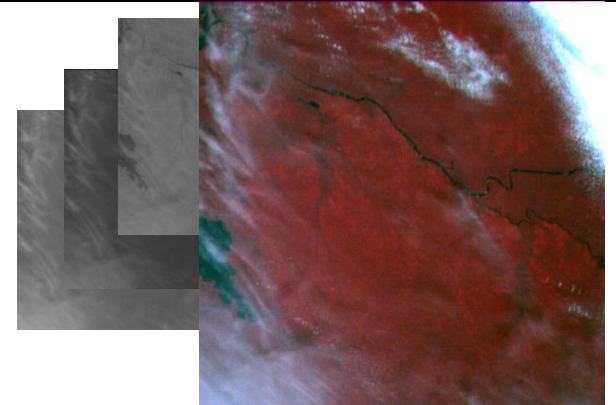
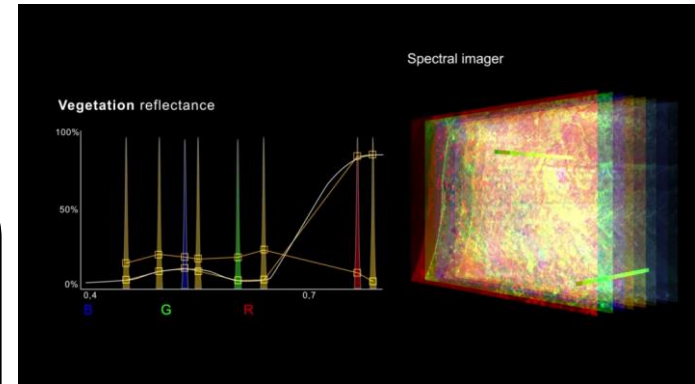
- Linear variable filter
- Tunable Fabry-Perot Interferometer (FPI)**
- Acousto-optical tunable filter (AOTF)
- Liquid crystal tunable filter (LCTF)



# Snapshot spectral imagers

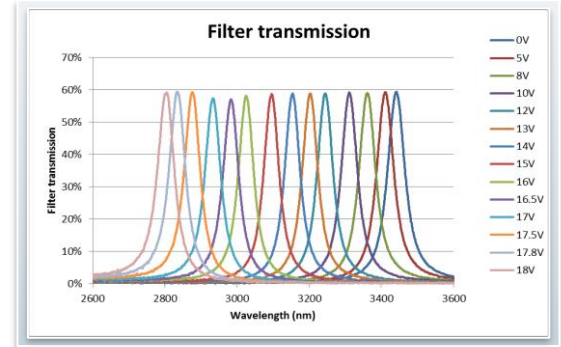
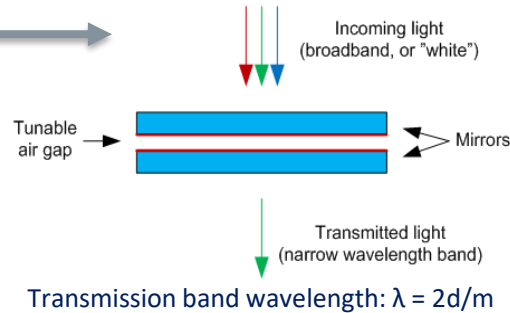
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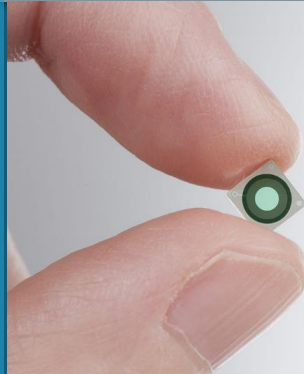
# Fabry-Pérot interferometer (FPI)

- Tunable optical bandpass filter
- VTT has two complementary solutions



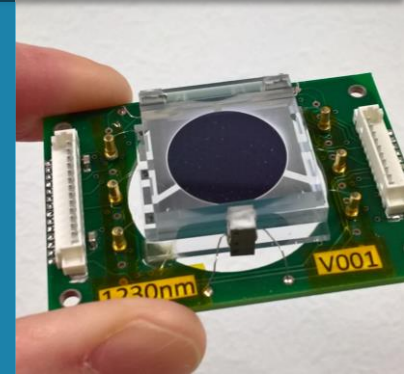
## MEMS FPI

- Mass producible
- 2–4 mm aperture
- Low unit cost
- Very compact structure

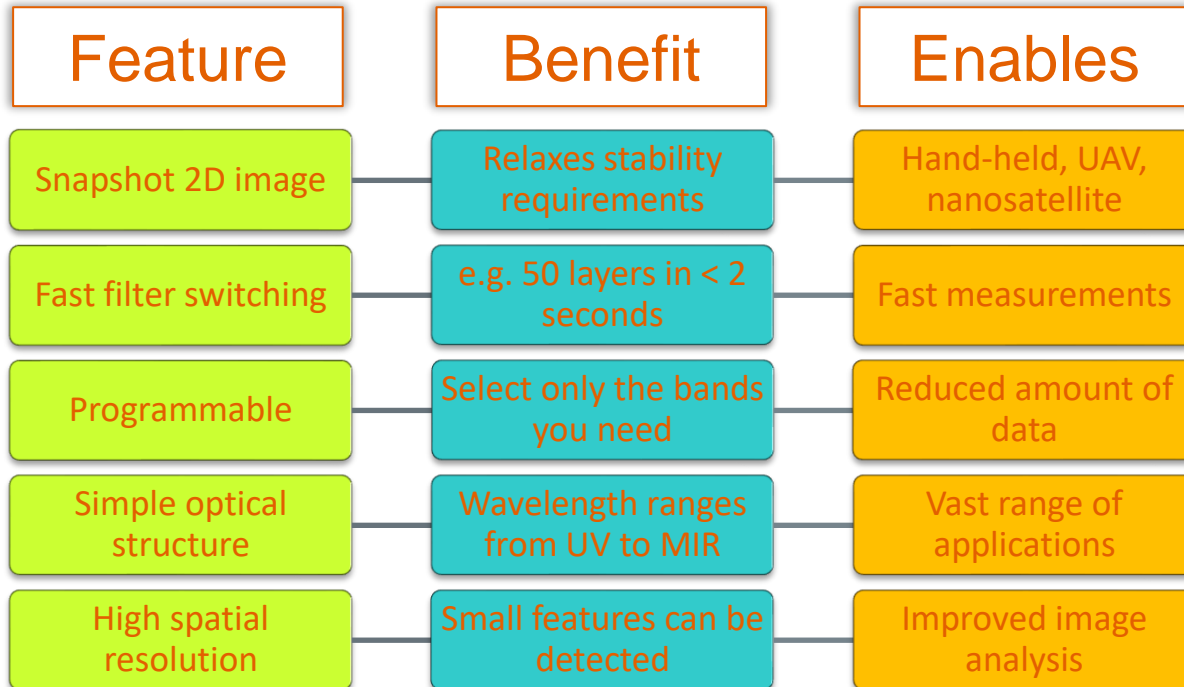


## Piezo FPI

- Small-to-medium volume applications
- Large aperture, up to 43 mm
- Broad tuning range

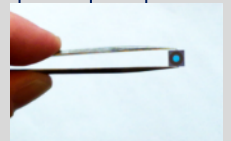
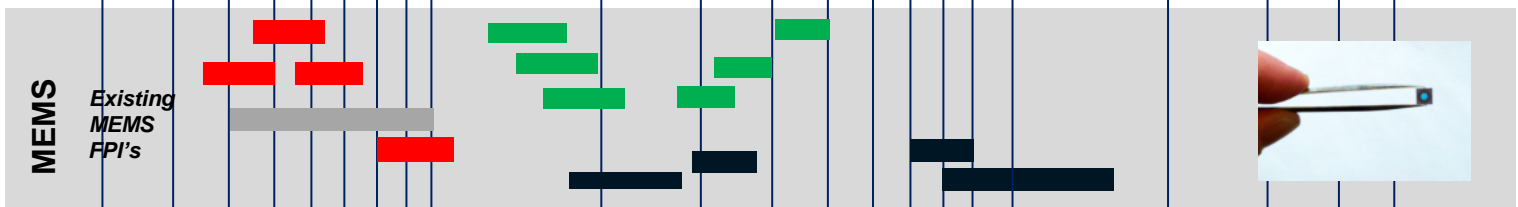
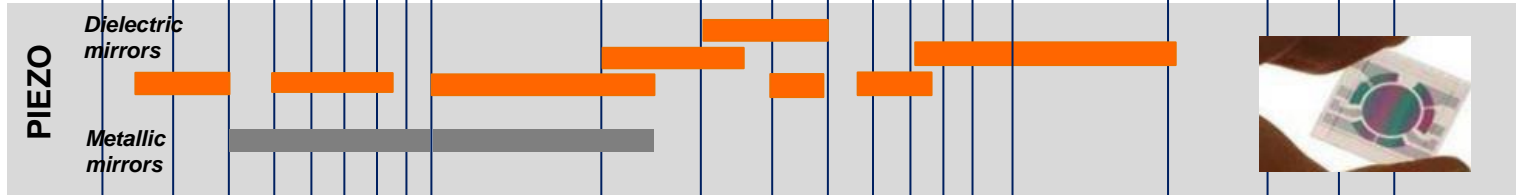


# FPI spectral imager characteristics



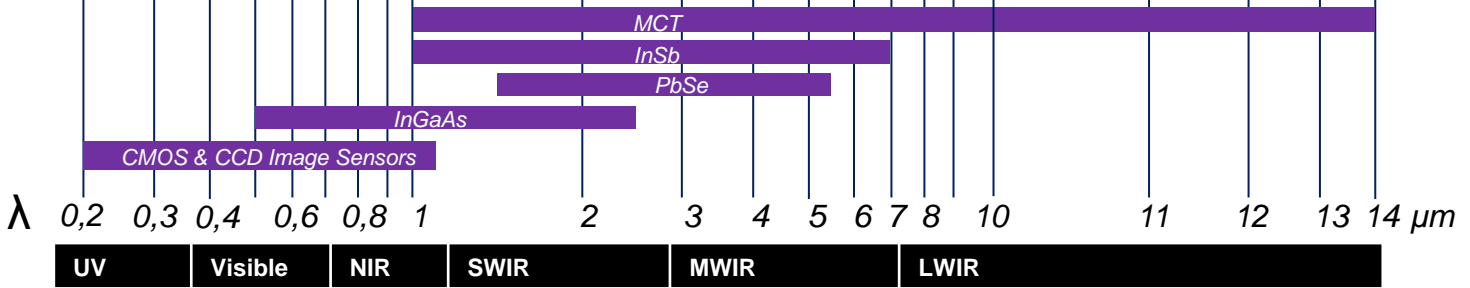
# FPI platforms

Material science, biology  
 Pharma, food, agriculture  
 Forestry  
 Gases, plastics  
 Minerals  
 Minerals



**MEMS process platforms:**

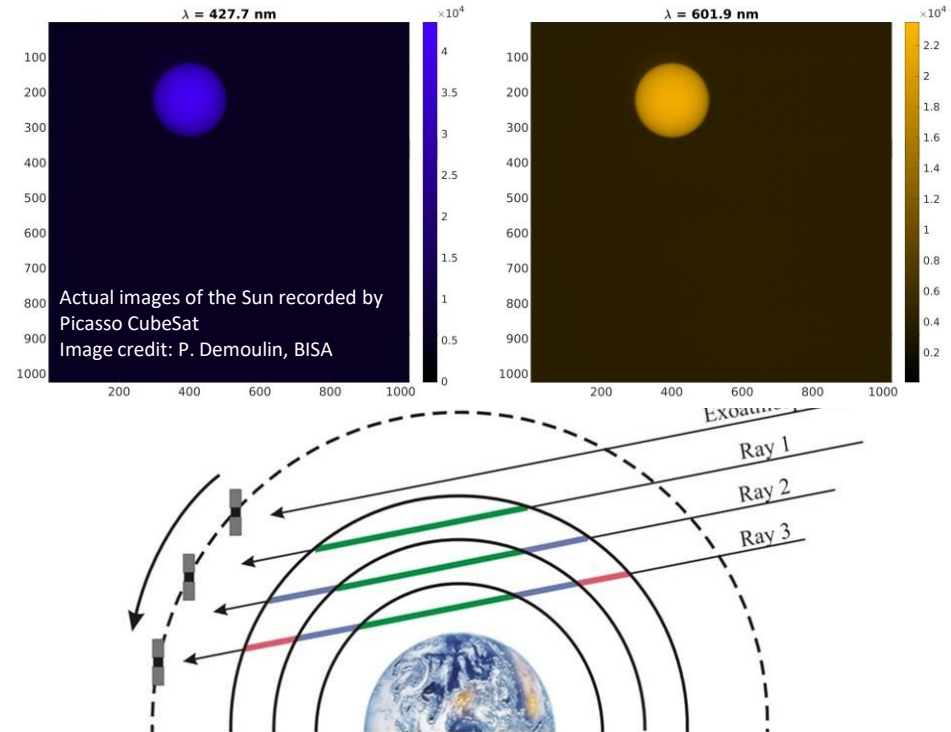
- ALD MFPI
- PolySi-SiN/SiO2 MFPI
- Si-air MFPI
- Metal MFPI



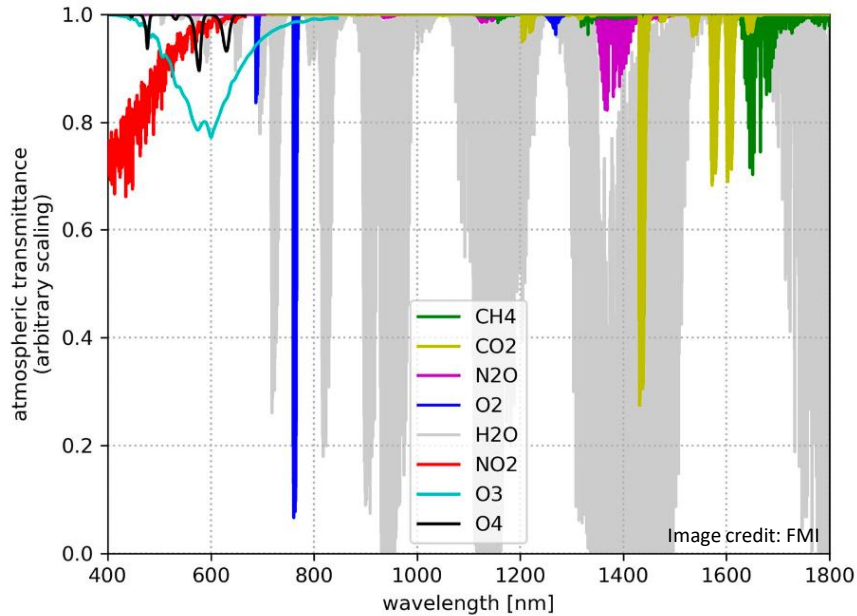
# Solar occultation

- ❑ Observation of **sunsets** and **sunrises** through the Earth's atmosphere
- ❑ Occultation technique is **self-calibrating** (dividing by out-of-atmosphere signal)
- ❑ Vertical distribution retrieved by **onion peeling** method

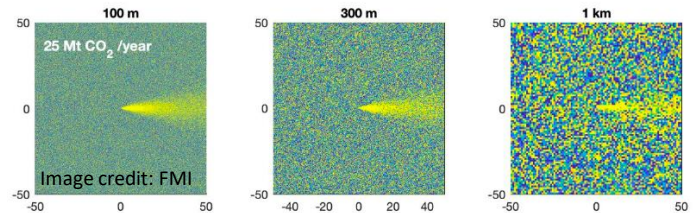
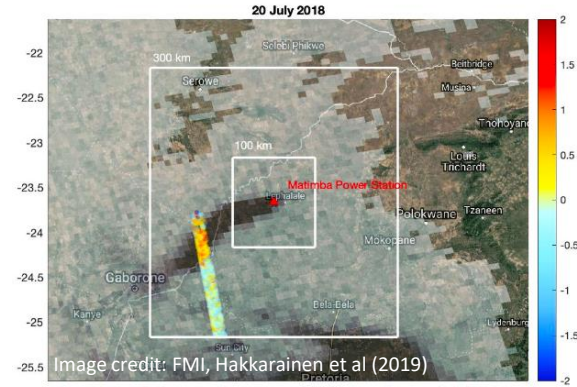
Very suitable for nanosatellites!



# Greenhouse gases



Atmospheric transmittance of different gases



Measured (top) and simulated (bottom) CO<sub>2</sub> plumes



# Conclusions

- Snapshot spectral imagers always provide the 2D spatial information at selected spectral band
- Adjustable in flight
- Solar occultation is self calibrating and enables high SNR
- Suitable for small and low cost platforms