Imaging from Space

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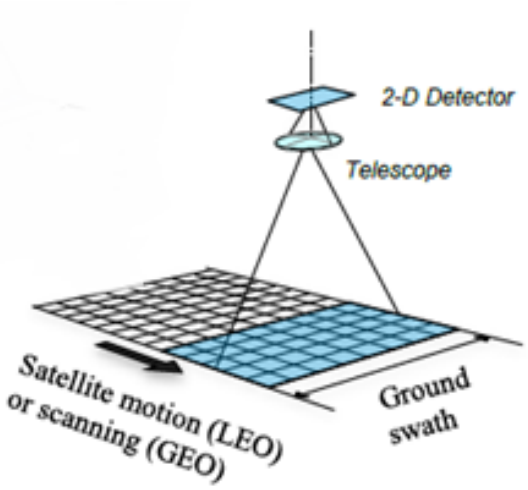
Imaging from Space

Alternative types of sensors and modes of operation – Snapshot imagers

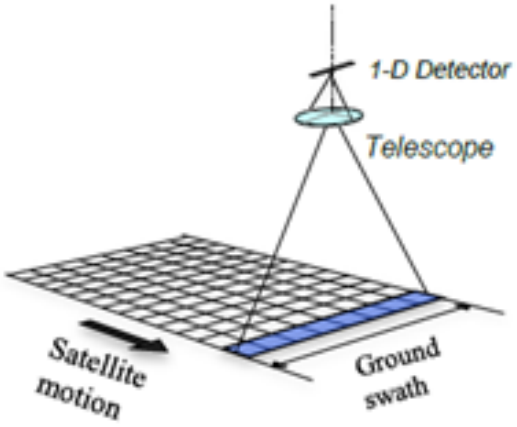
- Work like the detector in your camera
- Generally not good for Earth Observation– but used for astronomy
- Can either be colour or monochrome



Imaging from Space

Alternative types of sensors and modes of operation – Linear Imagers

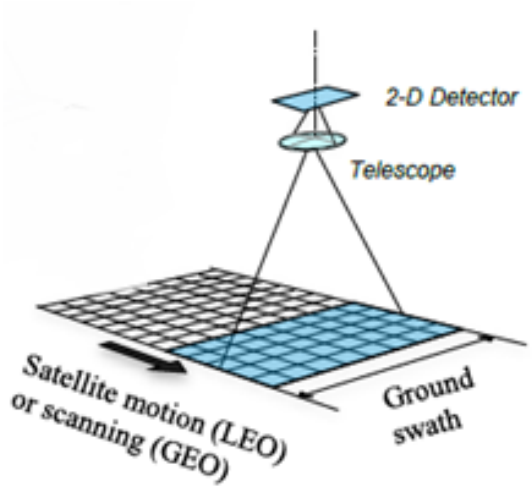
- The simplest type of detector is a linear (one row of pixels). This scans the ground like a sensor in a photocopier
- Several linear sensors are used together with filters to give a colour image
- Relatively easy application to switch to CMOS (eg Sentinel 2)



Imaging from Space

Alternative types of sensors and modes of operation – TDI imagers

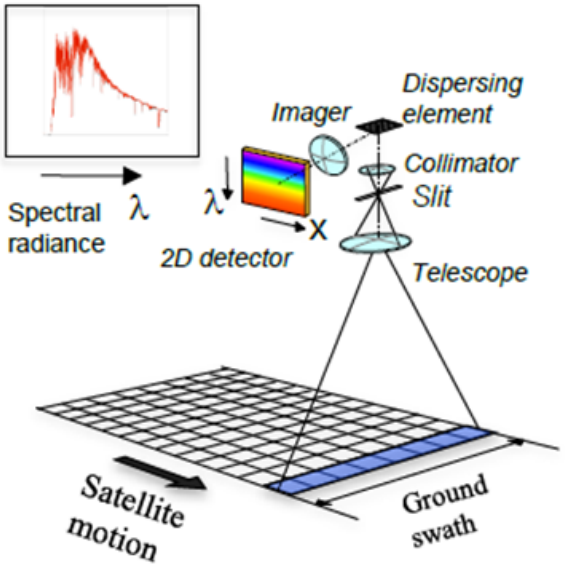
- The operating principle of TDI imagers is similar to linear detector
- Push-broom (scanning) operation
- Several lines are added together on chip to increase sensitivity
- Used for high resolution high sensitivity imaging (eg Pleiades, New Horizons)

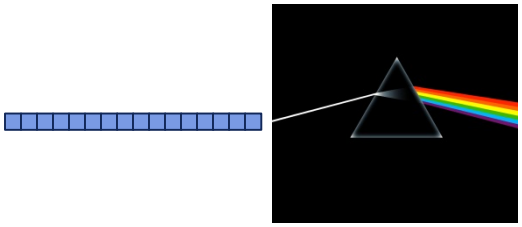


Imaging from Space

Alternative types of sensors and modes of operation – Hyperspectral imagers

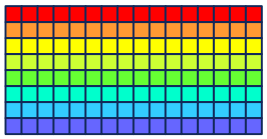
- Spectrum is dispersed across a 2D array
- Still scans the ground but with high quality spectral information
- Normally low spatial resolution but high spectral resolution





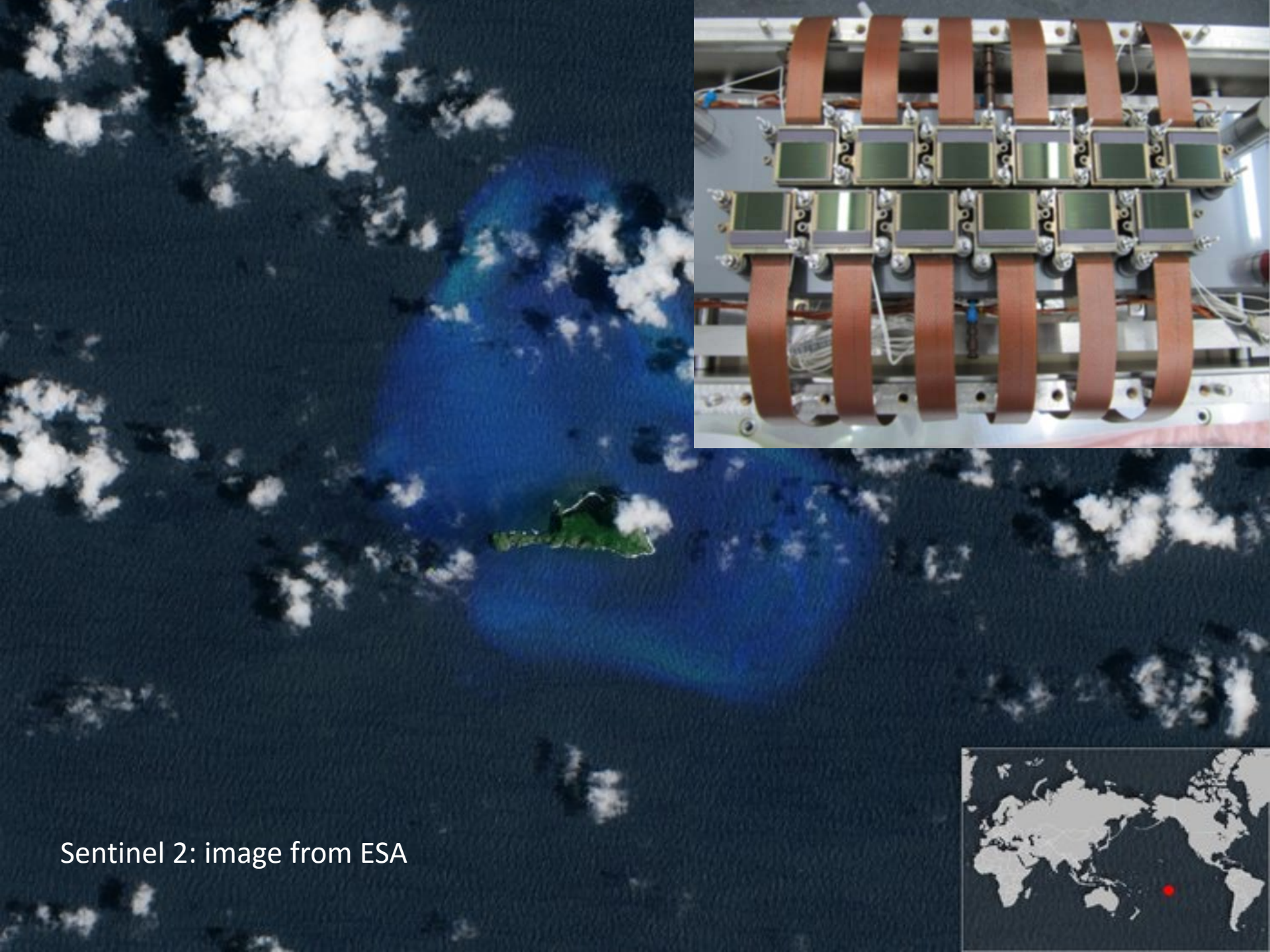
One line from the ground

Is split into spectral lines



And imaged as many lines on a detector

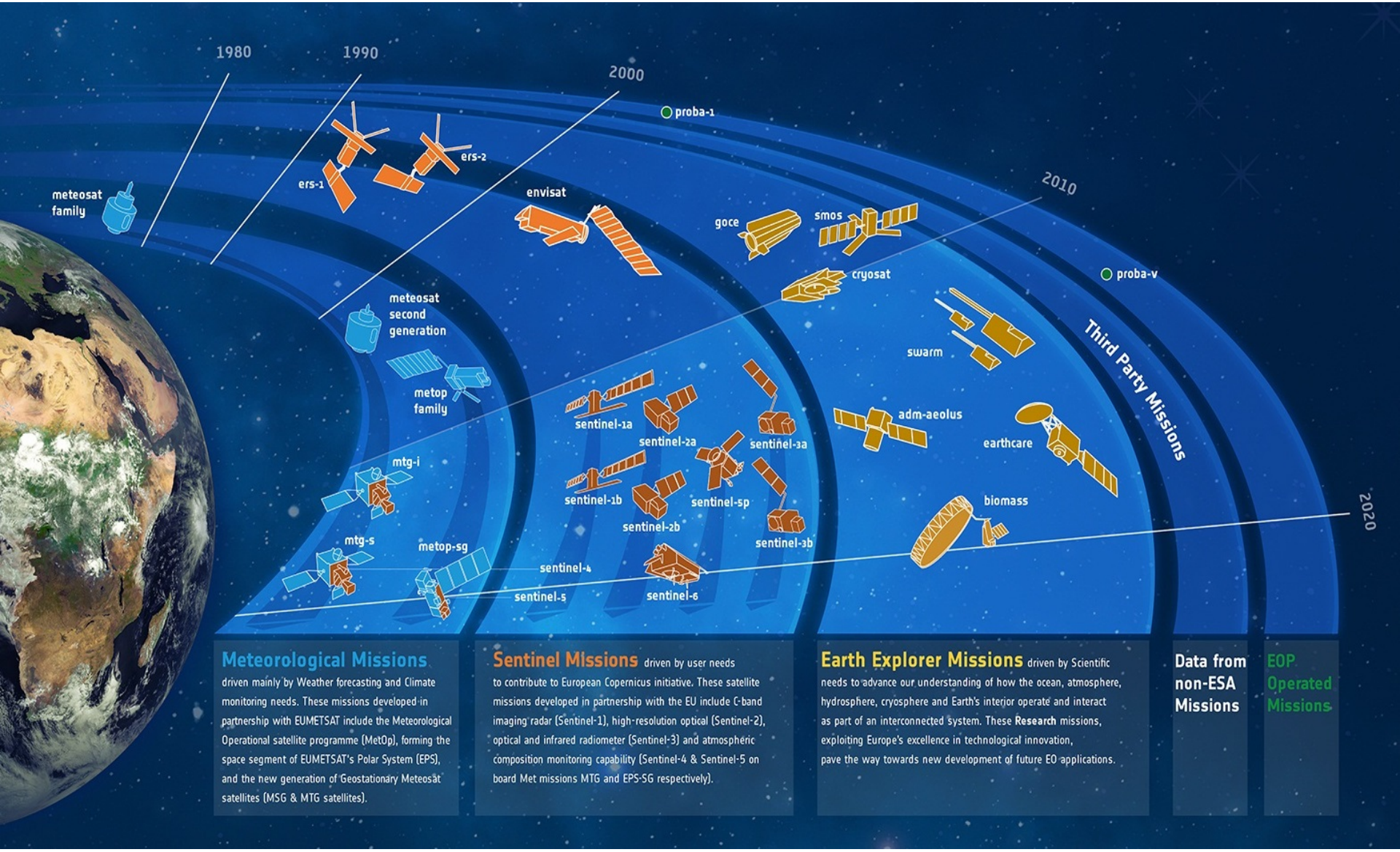
e2v inside ESA Sentinel 3A



Sentinel 2: image from ESA

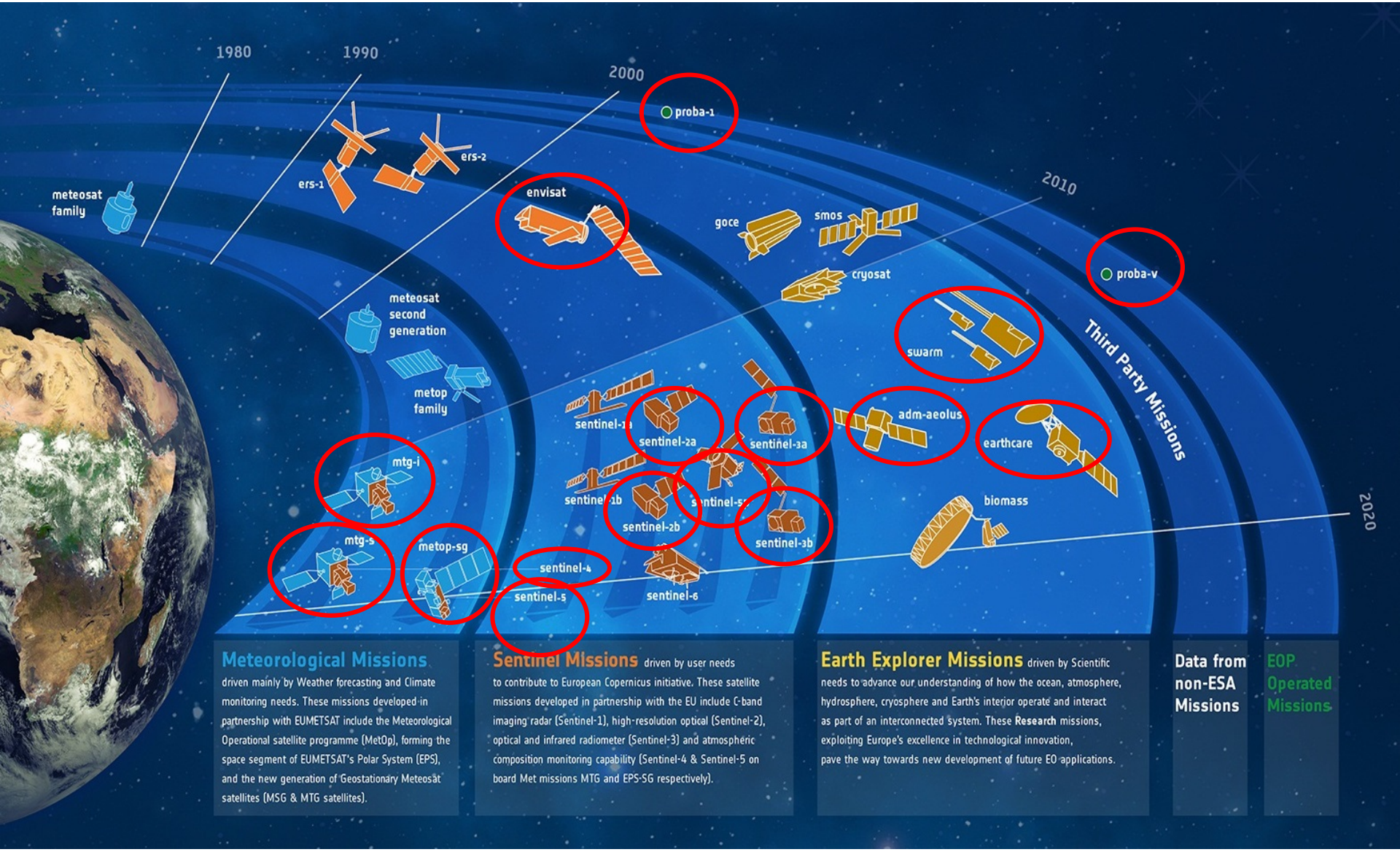
ESA's Earth Observation Fleet

e2v Bringing life to technology

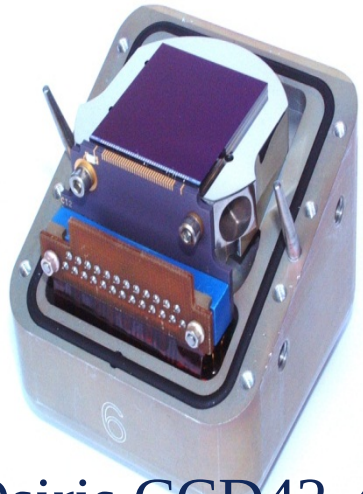


ESA's Earth Observation Fleet

e2v Bringing life to technology



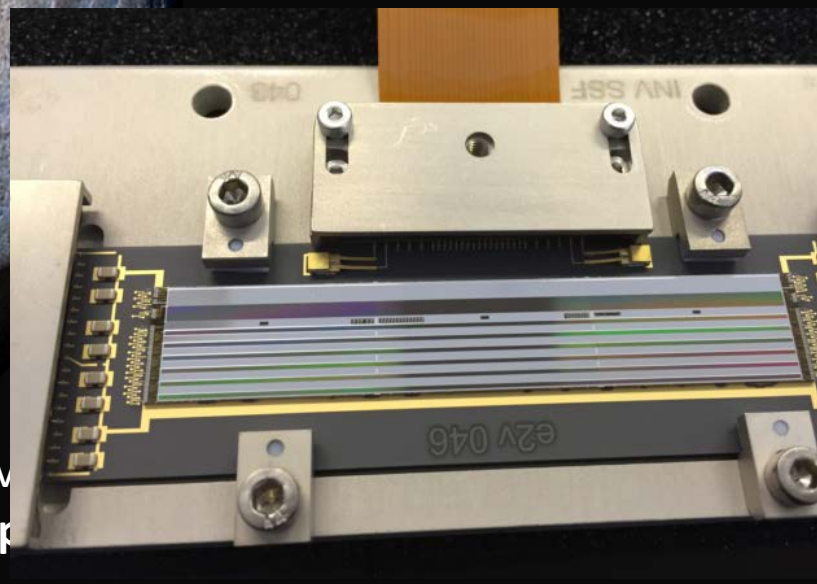
Who would have thought that cor



Osiris CCD42-40

e2v inside ESA Rosetta

Or that Pluto would be such a strange world?

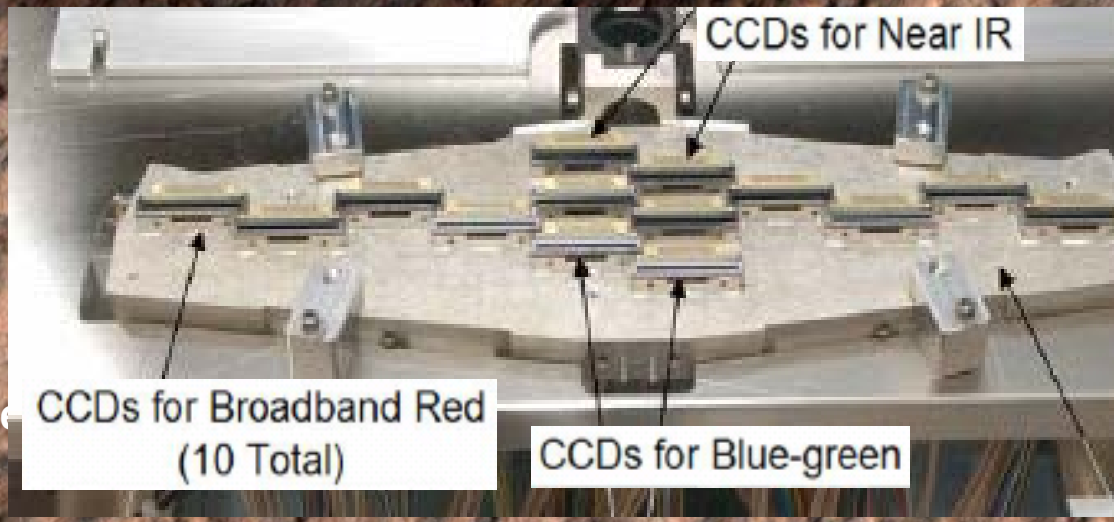


e2v

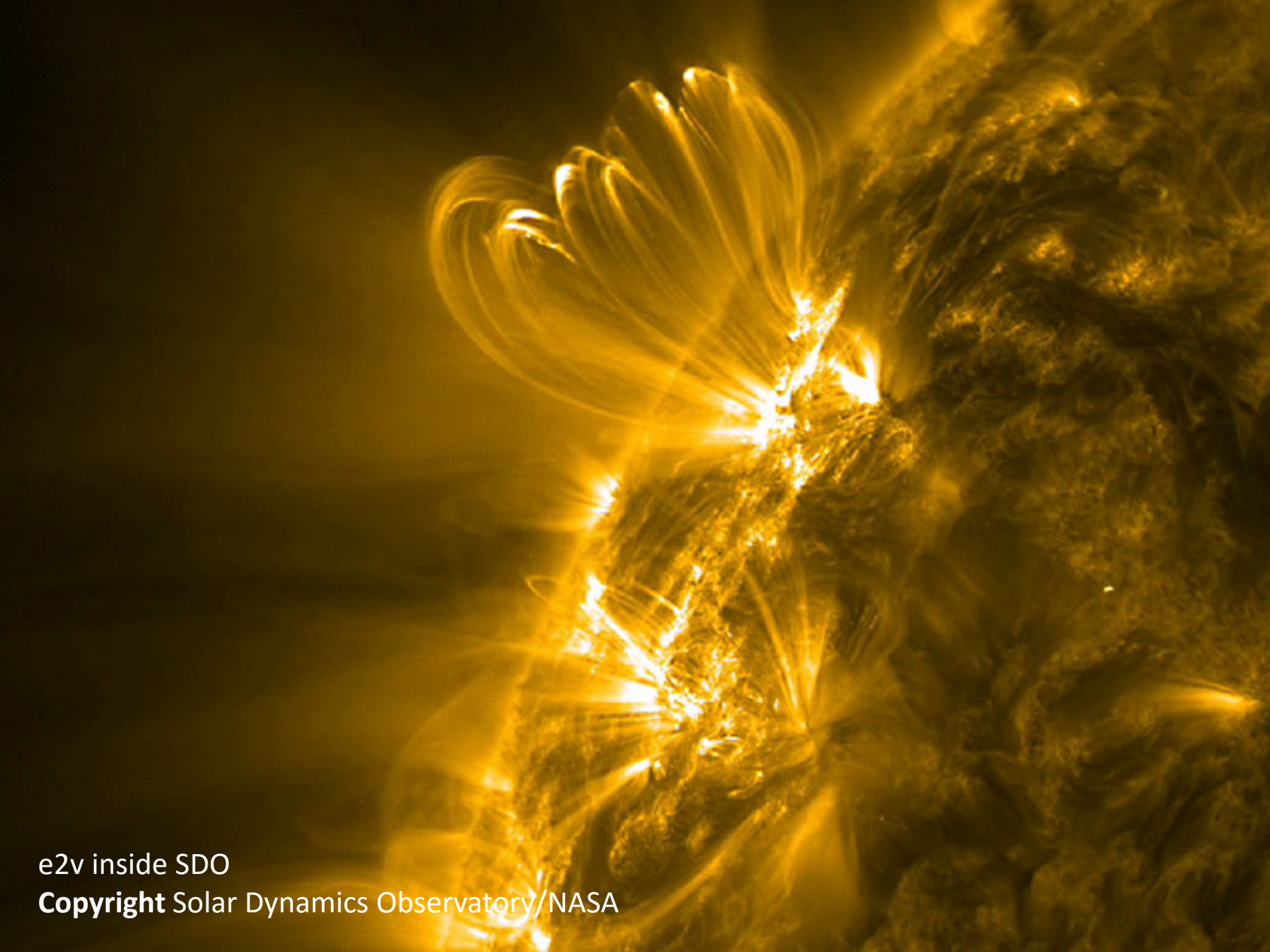
Cop

Charon

Just one of the surprises from Mars

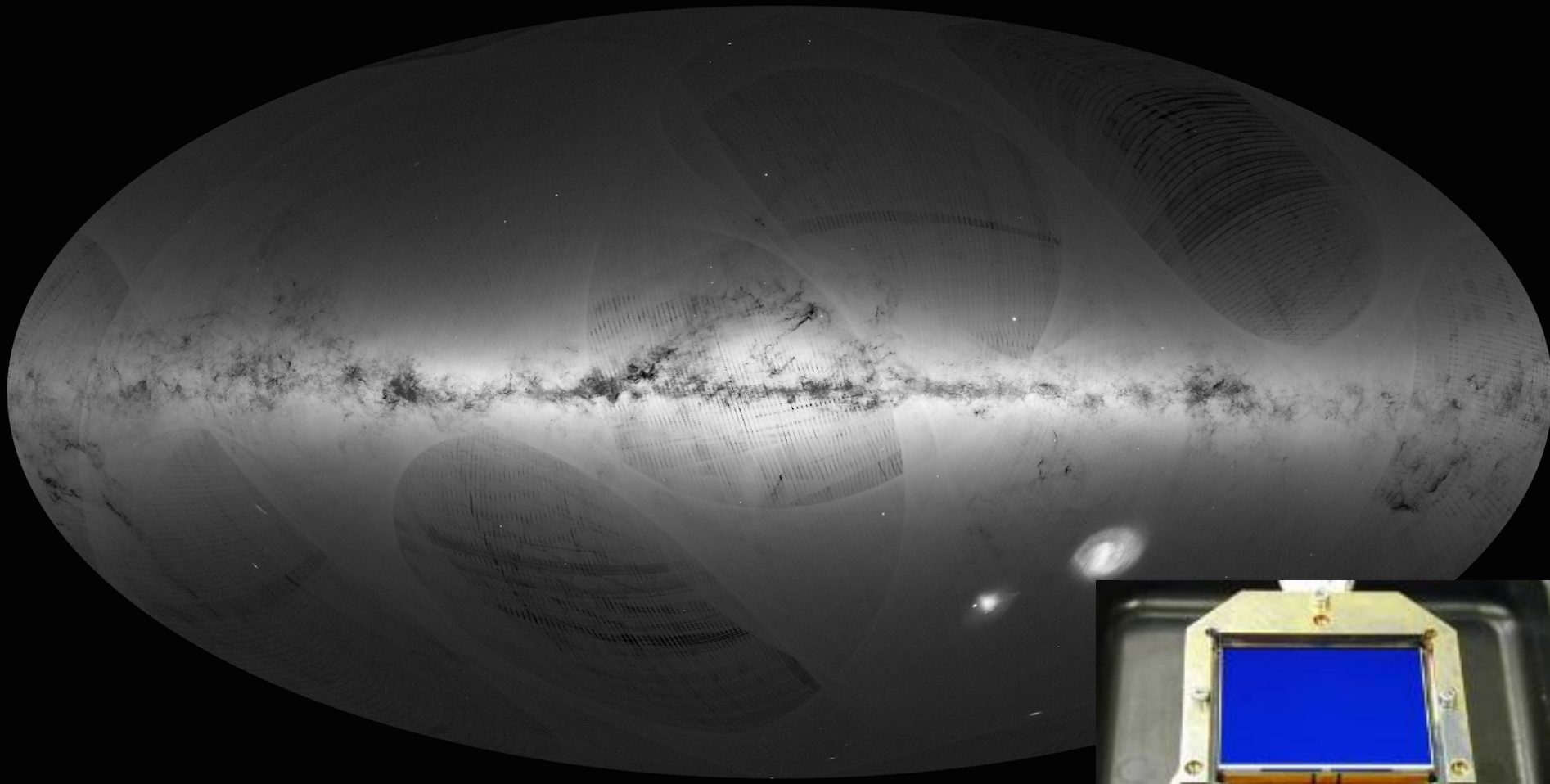


e2v inside NASA Mars reconnaissanc



e2v inside SDO

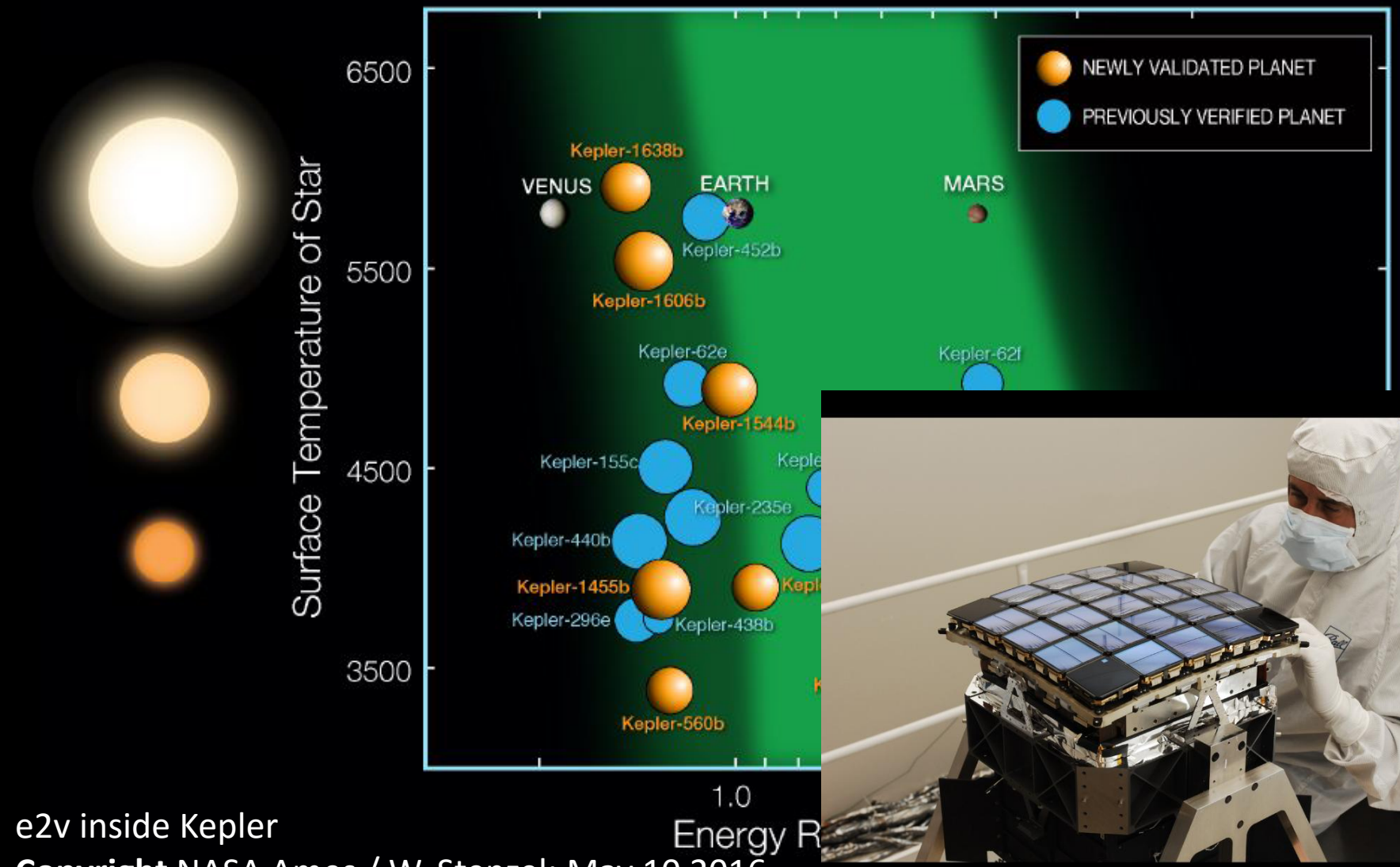
GAIA: Mapping our galaxy with unprecedented precision



Finding “Earth like “ planets

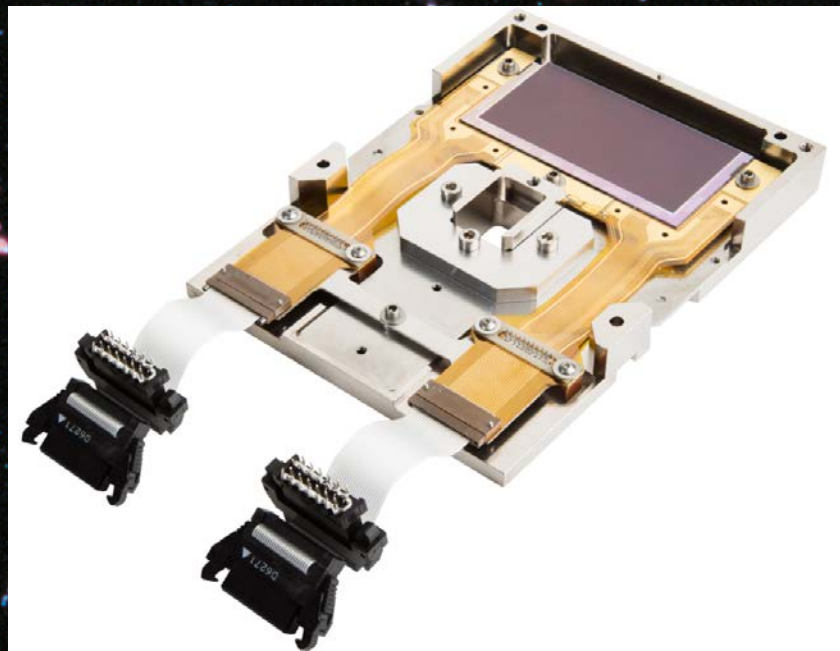
Kepler's Small Habitable Zone Planets

As of May 10, 2016

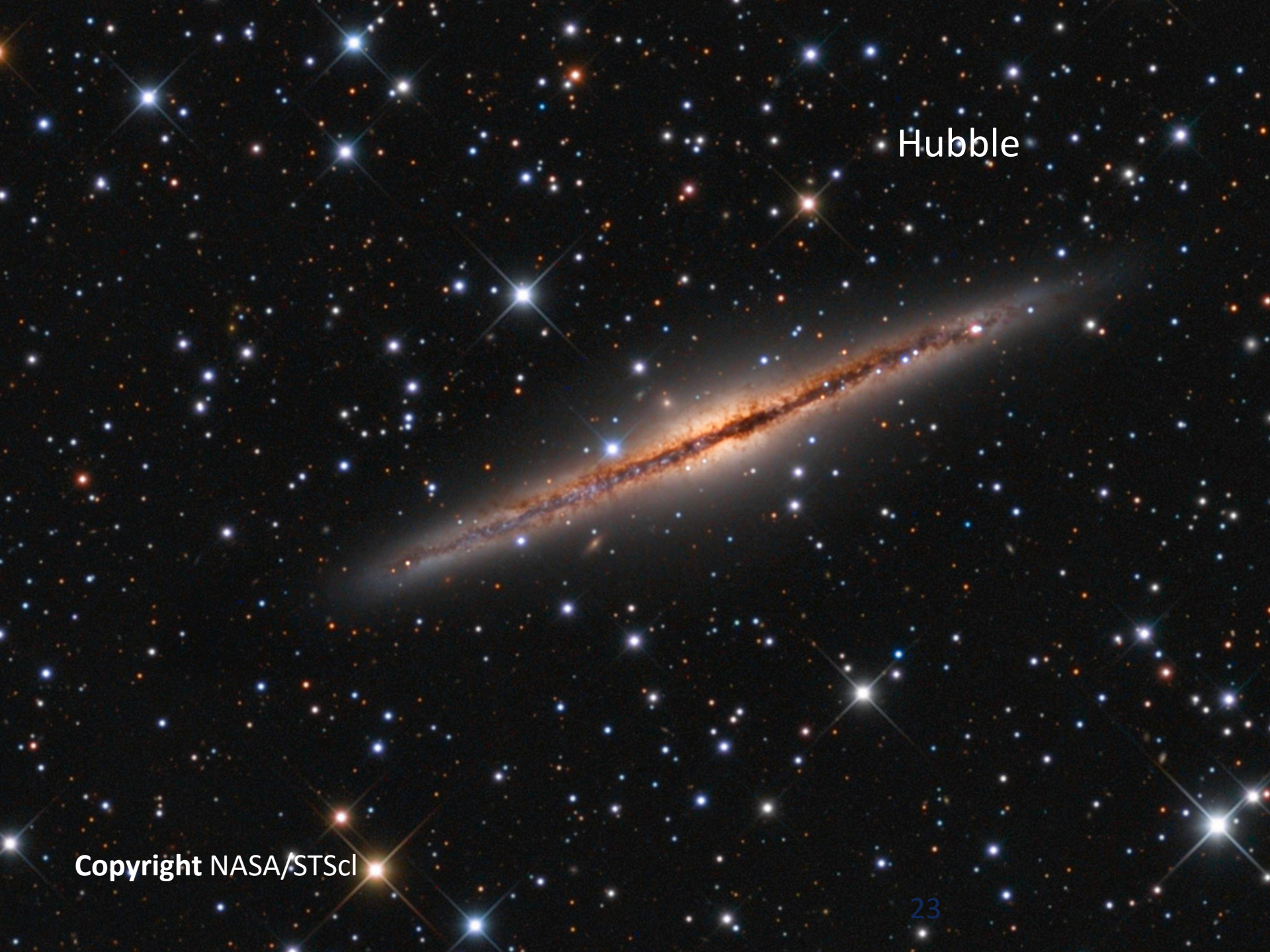


e2v inside Kepler

Seeing back to nearly the origins of the Universe
13.2 billion light year



e2v inside Hubble
Copyright *NASA/STScI*



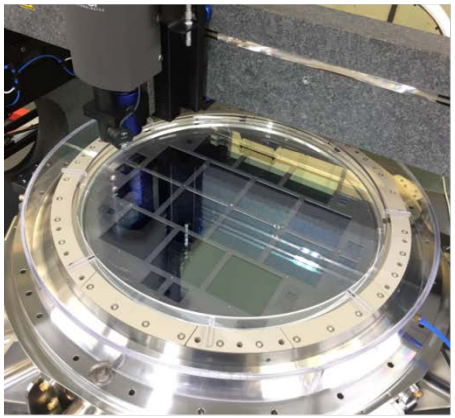
..and the future

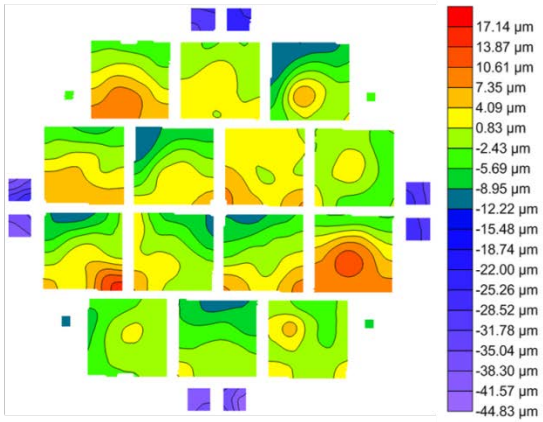
- PLATO
- EUCLID
- Many earth observation missions
- LSST
- + many more

The e2v 1.2 Giga-pixel camera

Bringing life to technology

Javalambre
Physics of the Accelerating Universe
Astrophysical
Survey





Opto-mechanical subsystem verification

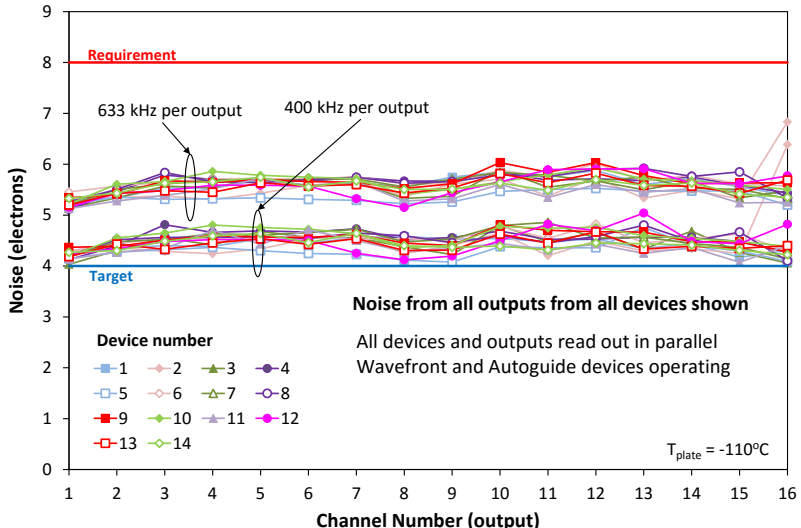
The focal plane inside the cryostat plane and flatness measurements made at -110 °C showing the 14 science devices, 8 wavefront and 4 autoguide CCDs.

Flatness achieved - **27 µm peak to valley** for (spec 40µm target 30µm)

Metrology has been developed to make this measurement at operating temperature

The measured system noise for all devices operating in parallel

Inter channel and inter device cross talk better than 106 dB



e2v is developing a focal plane to study the universe in Ultraviolet

e2v Bringing life to technology

WSO-UV space mission is to study the Universe in the 120 - 310 nm ultraviolet (UV) wavelengths range, which is beyond the reach of ground-based instruments.

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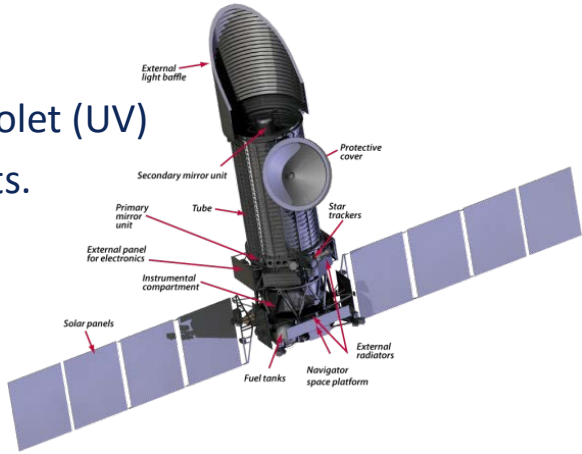
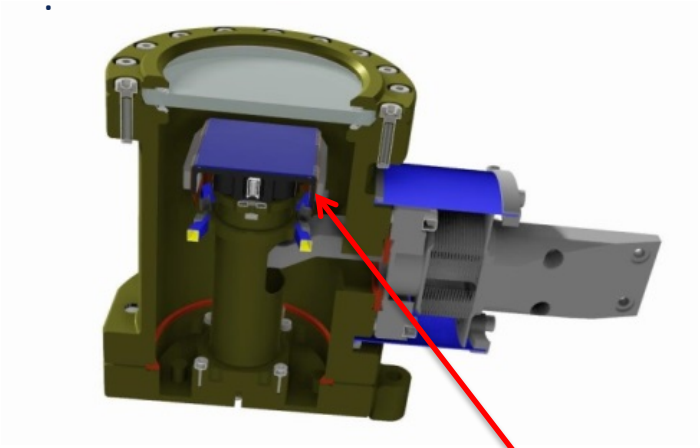
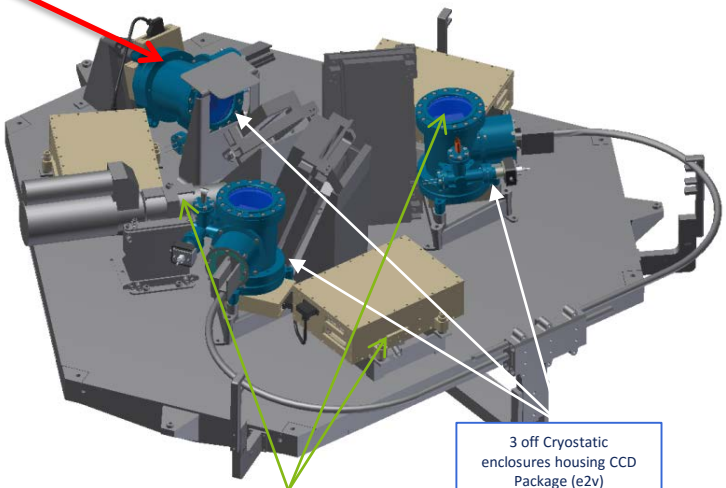
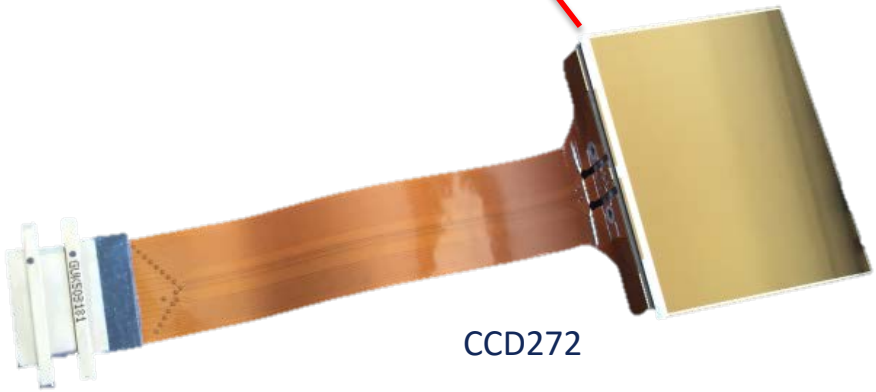
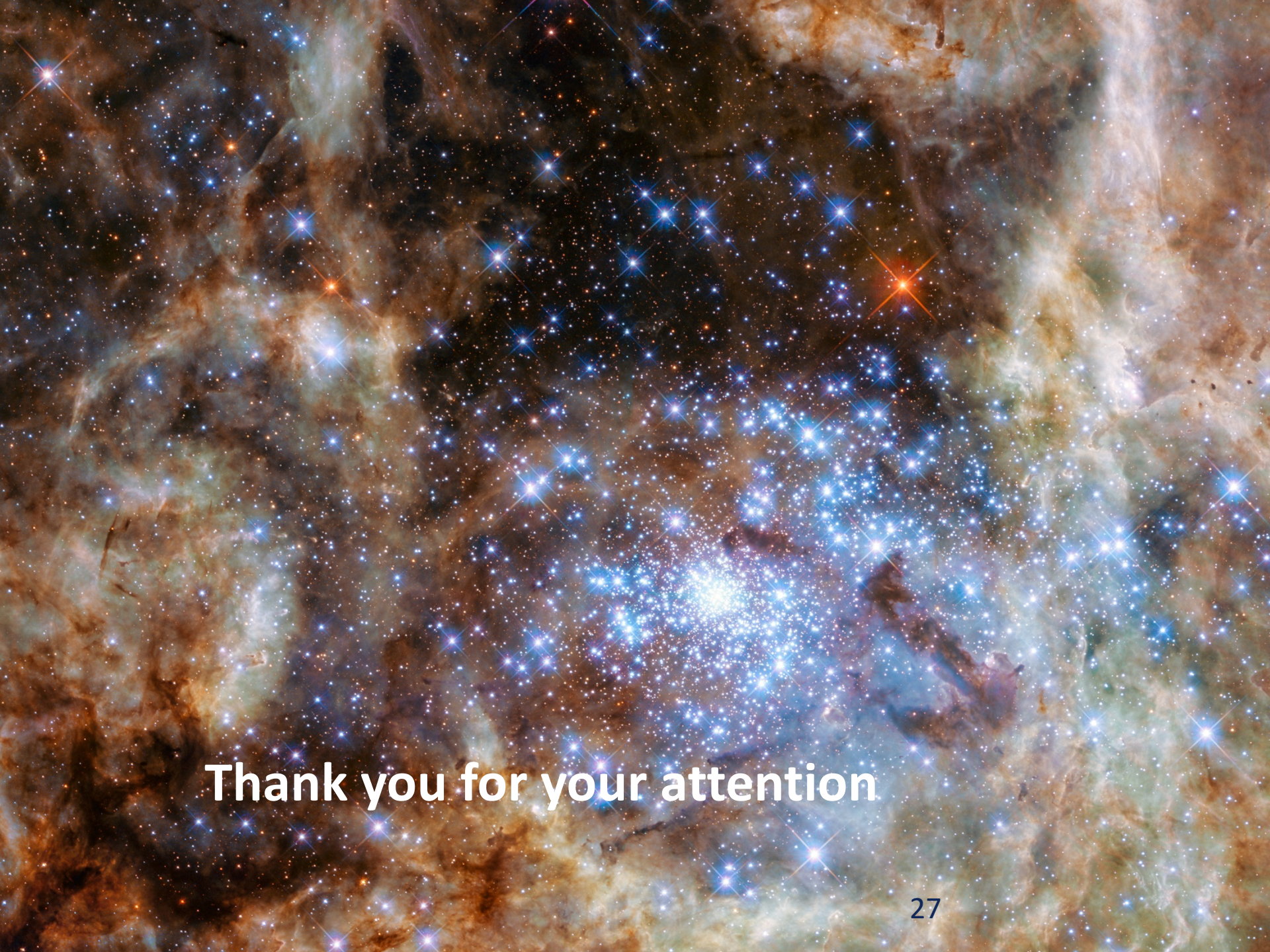








CCD272


Thank you for your attention