

Euclid Data & Complementarity with the NSLS

M. Sauvage

Euclid Ground Segment Scientist

Euclid data? what about them?

Euclid data? what about them?

- * The three main (15000 sq. deg.) surveys of Euclid consist of:
 - * An imaging survey in a wide visible band, tailored to provide the best imaging quality for weak-lensing analysis.
 - * single “***riz***” filter, depth **24.5** ABmag **10sigma** “**extended**”.
 - * An imaging survey in three near-infrared bands, tailored to provide an extremely homogenous photometric database for photometric redshifts.
 - * “**Y,J,H**” filters, depth **24** ABmag **5sigma point source**.
 - * A spectroscopic survey, aimed at producing redshifts in the range **$z \sim 0.9-1.75$** that will mainly contain star forming galaxies.
 - * **1.25-1.80 mic** - $f_{\text{lim}}(\text{H}\alpha) = 2 \times 10^{-16} \text{ erg.s}^{-1} \text{cm}^{-2}$ (3.5 sigma, 1” source).

Euclid data? what about them?

- * The three main (15000 sq. deg.) surveys of Euclid consist of:
 - * An imaging survey in a wide visible band, tailored to provide the best imaging quality for weak-lensing analysis.
 - * single “***riz***” filter, depth **24.5** ABmag **10sigma** “**extended**”.
 - * An imaging survey in three near-infrared bands, tailored to provide an extremely homogenous photometric database for photometric redshifts.
 - * “**Y,J,H**” filters, depth **24** ABmag **5sigma** point source.
 - * A spectroscopic survey, aimed at producing redshifts in the range **$z \sim 0.9-1.75$** that will mainly contain star forming galaxies.
 - * **1.25-1.80 mic** - $f_{\text{lim}}(\text{H}\alpha) = 2 \times 10^{-16} \text{ erg.s}^{-1} \text{ cm}^{-2}$ (3.5 sigma, 1” source).

FWHM
0.19”@900nm

Euclid data? what about them?

- * The three main (15000 sq. deg.) surveys of Euclid consist of:
 - * An imaging survey in a wide visible band, tailored to provide the best imaging quality for weak-lensing analysis.
 - * single “*riz*” filter, depth **24.5 ABmag 10sigma “extended”**.
 - * An imaging survey in three near-infrared bands, tailored to provide an extremely homogenous photometric database for photometric redshifts.
 - * “**Y,J,H**” filters, depth **24 ABmag 5sigma point source**.
 - * A spectroscopic survey, aimed at producing redshifts in the range **$z \sim 0.9-1.75$** that will mainly contain star forming galaxies.
 - * **1.25-1.80 mic** - $f_{\text{lim}}(\text{H}\alpha) = 2 \times 10^{-16} \text{ erg.s}^{-1} \text{ cm}^{-2}$ (3.5 sigma, 1” source).
- * For calibration purposes, Euclid will also perform:
 - * Two deep observations of **20 sq. deg.**, at or close to the ecliptic poles.
 - * **2 magnitudes deeper in imaging, deeper and extended spectral range** ($>0.9 \text{ mic}$) for spectroscopic survey.
 - * Observations of well know fields (e.g. COSMOS).

FWHM
0.19”@900nm

Euclid data? what about them?

- * The three main (15000 sq. deg.) surveys of Euclid consist of:
 - * An imaging survey in a wide visible band, tailored to provide the best imaging quality for weak-lensing analysis.
 - * single “*riz*” filter, depth **24.5 ABmag 10sigma “extended”**.
 - * An imaging survey in three near-infrared bands, tailored to provide an extremely homogenous photometric database for photometric redshifts.
 - * “**Y,J,H**” filters, depth **24 ABmag 5sigma point source**.
 - * A spectroscopic survey, aimed at producing redshifts in the range **$z \sim 0.9-1.75$** that will mainly contain star forming galaxies.
 - * **1.25-1.80 mic** - $f_{\text{lim}}(\text{H}\alpha) = 2 \times 10^{-16} \text{ erg.s}^{-1} \text{ cm}^{-2}$ (3.5 sigma, 1” source).
- * For calibration purposes, Euclid will also perform:
 - * Two deep observations of **20 sq. deg.**, at or close to the ecliptic poles.
 - * **2 magnitudes deeper in imaging, deeper and extended spectral range** ($>0.9 \text{ mic}$) for spectroscopic survey.
 - * Observations of well know fields (e.g. COSMOS).
- * While these surveys are geared toward the equation of state for Dark Energy, all data will go through the DP pipeline and a vast array of products will be accessible.

FWHM
0.19”@900nm

Data products - “low” level or “space-only”

- * All images will be reduced to a common astrometry, based on GAIA.
- * Background/foreground will be modeled/corrected to provide mosaics of the whole sky.
 - * down to $<1\%$ of the flux of a 24 AB mag point source.
- * The whole Euclid photometric survey will be tied to a common photometric reference, with strict control over spatial drifts in zero points.
 - * relative photometric calibration error $<1\%$.
- * The Euclid spectroscopic survey will be flux-calibrated with a high emphasis on spatial homogeneity of the calibration.
 - * typ. 1% rms over scales of 0.8° \oslash .

**Performance/requirements figures have slightly evolved since the red book.
Latest figures are found in the requirements documents.**

Data products - “low” level or “space-only”

- * All images will be reduced to a common astrometry, based on GAIA.
- * Background/foreground will be modeled/corrected to provide mosaics of the whole sky.
 - * down to $<1\%$ of the flux of a 24 AB mag point source.
- * The whole Euclid photometric survey will be tied to a common photometric reference, with strict control over spatial drifts in zero points.
 - * relative photometric calibration error $<1\%$.
- * The Euclid spectroscopic survey will be flux-calibrated with a high emphasis on spatial homogeneity of the calibration.
 - * typ. 1% rms over scales of 0.8° \oslash .

**Astrometric, photometric
images in all bands
stacking all survey images
available per sky position.**

**Flux calibrated spectra,
mostly H α , stacking all
exposures and orientations
available per source.**

**Performance/requirements figures have slightly evolved since the red book.
Latest figures are found in the requirements documents.**

Data products - “high” level

- ✱ The main product of Euclid will be the catalog.
 - ✱ Galaxies for weak-lensing are at S/N 10, which means that the catalog will contain billions of objects with good to excellent photometry.
 - ✱ High-quality PSF of the VIS instrument will allow de-blending of sources, which will benefit photometric measurements of all other bands.
 - ✱ Similarly shape measurements performed on all galaxies above and around the WL threshold will benefit derivation of more accurate photometry.
 - ✱ Each galaxy in the catalog will have a photometric redshift with associated physical parameters (i.e. describing the state of the galaxy, based on the photo-z code).

Data products - “high” level

- ✱ The main product of Euclid will be the catalog.
 - ✱ Galaxies for weak-lensing are at S/N 10, which means that the catalog will contain billions of objects with good to excellent photometry.
 - ✱ High-quality PSF of the VIS instrument will allow de-blending of sources, which will benefit photometric measurements of all other bands.
 - ✱ Similarly shape measurements performed on all galaxies above and around the WL threshold will benefit derivation of more accurate photometry.
 - ✱ Each galaxy in the catalog will have a photometric redshift with associated physical parameters (i.e. describing the state of the galaxy, based on the photo-z code).

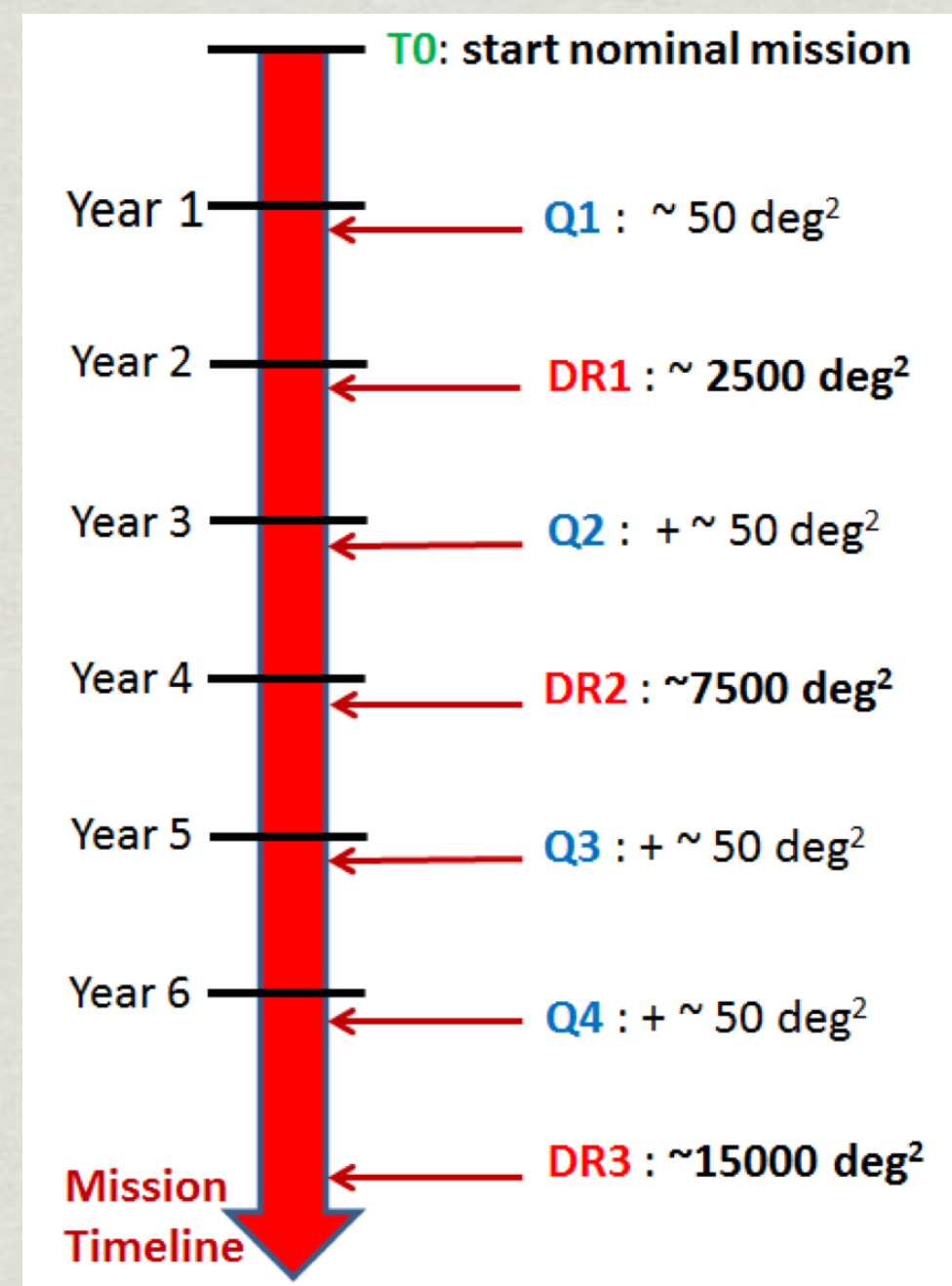
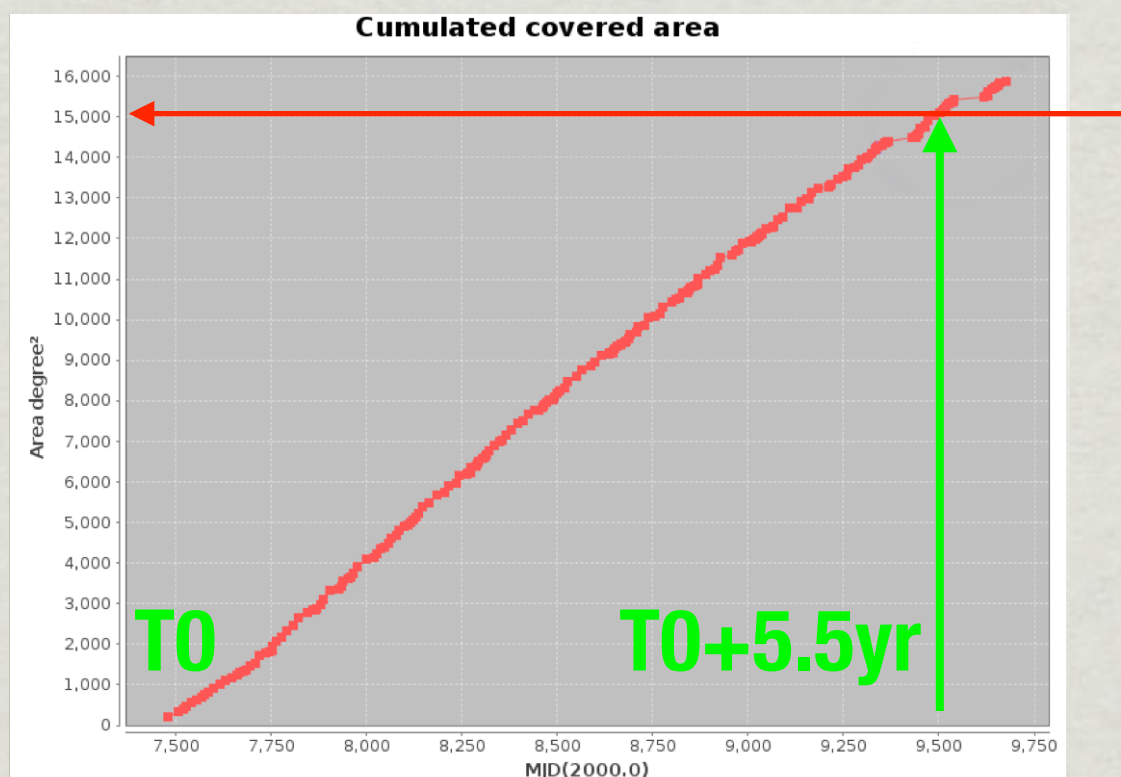
This is where the ground-based data is aggregated in the Euclid data products.

Integration of a ground-based visible survey in the Euclid context brings:

- **Tight control over calibration issues thanks to the stability of space environment.**
- **Improved detection/photometry thanks to high-resolution and shape priors that can be derived from the space images.**
- **Extension of the capacity to measure photo-z (up to $z \sim 2$) thanks to the near-infrared images.**

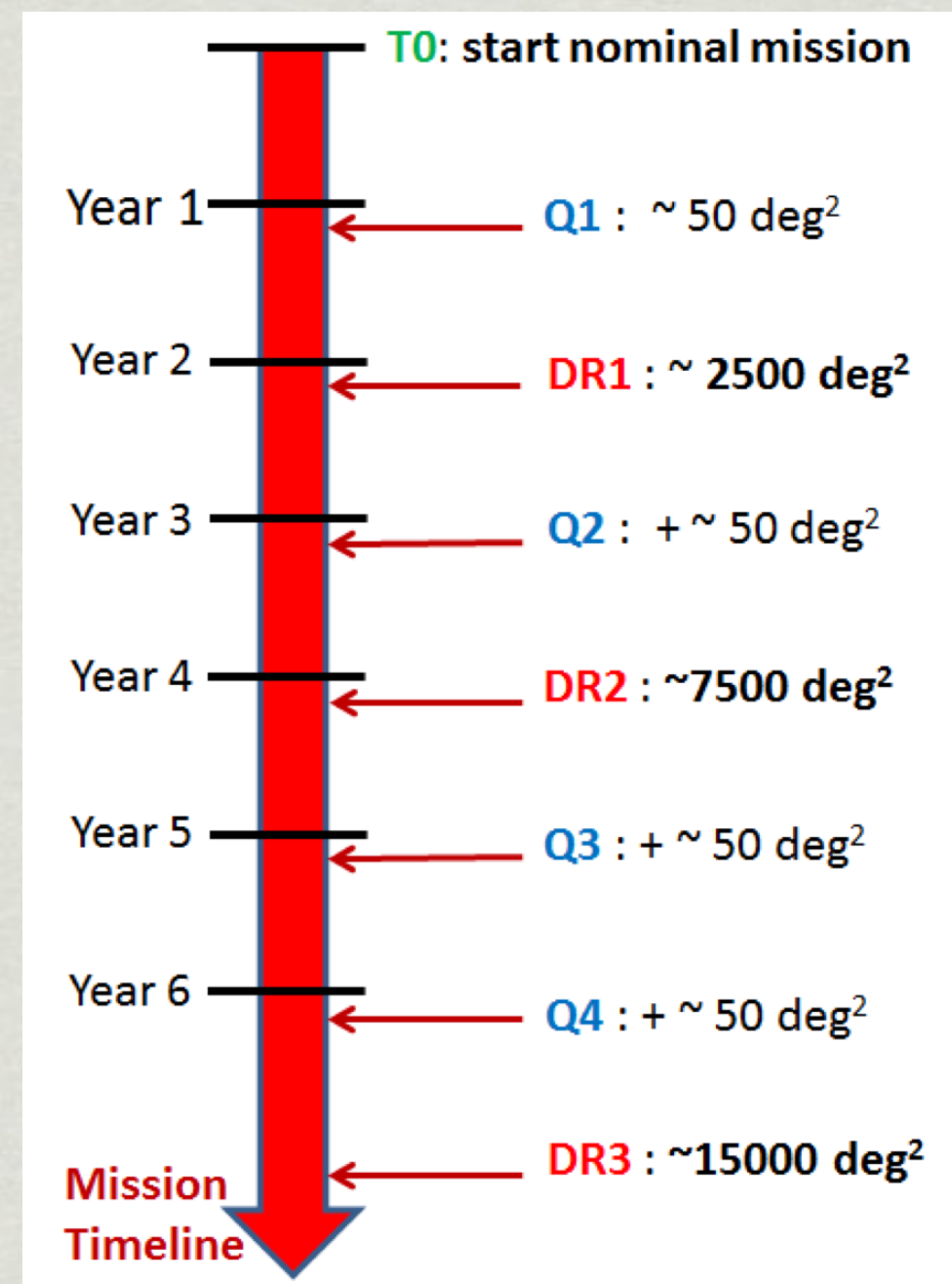
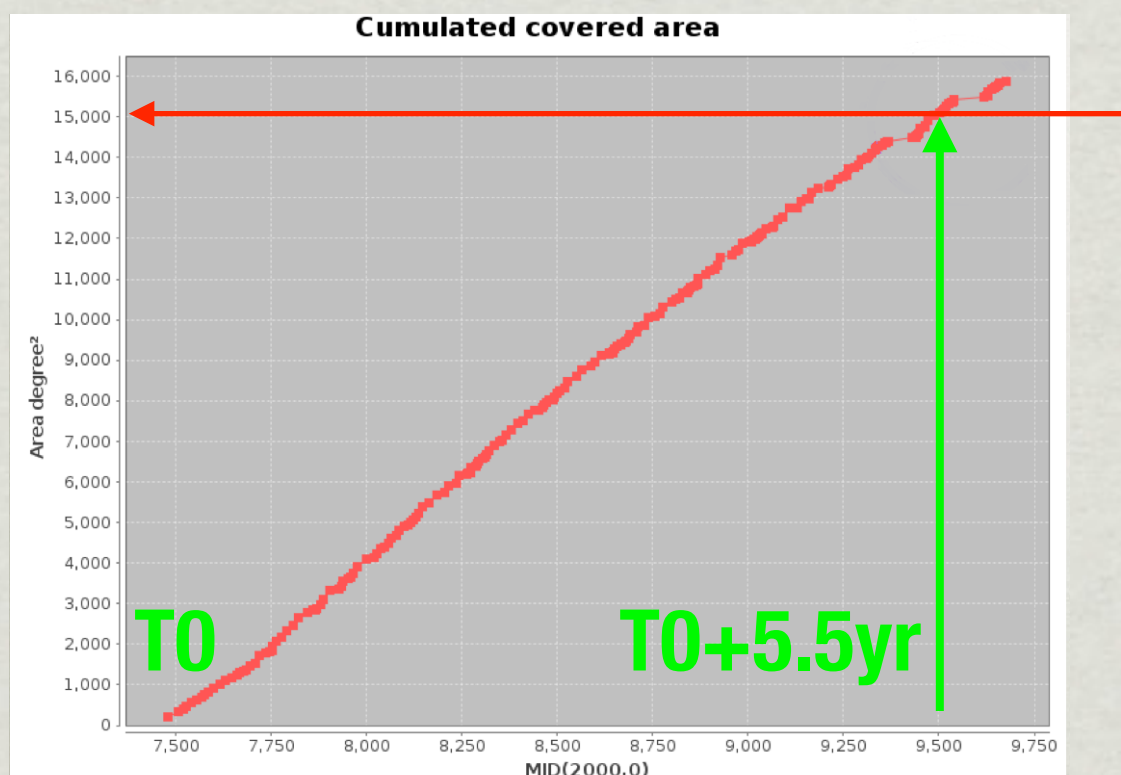
Survey strategy and associated releases

- * Euclid will perform its survey only once, it will take 5.5 years after commissioning and performance verification to complete it.
- * The survey will very likely proceed in patches of 50-100 sq. deg. (highly deterministic).
- * We have a staged release strategy, with 3 main data releases and intermediate Quick releases (e.g. one patch centered on a well-known part of the sky).



Survey strategy and associated releases

- * Euclid will perform its survey only once, it will take 5.5 years after commissioning and performance verification to complete it.
- * The survey will very likely proceed in patches of 50-100 sq. deg. (highly deterministic).
- * We have a staged release strategy, with 3 main data releases and intermediate Quick releases (e.g. one patch centered on a well-known part of the sky).



Consortium members have access to all data at anytime.
We plan an internal pre-release with 1yr lead time.