Software system for astrometric calibration of Euclid's ground-based imaging data

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MSc Astronomy research project

ESA's Euclid mission will construct a 3D map of the distribution of over a **billion galaxies**. Multiband ground-based imaging data is essential to obtain high precision photometric redshifts. This requires highly accurate colors. Six ground-based surveys need to be combined into a **homogeneous data set** that is **perfectly aligned** with the astrometry of Euclid's space-based imaging.

Two staged processing [see diagram below]

STAGE 1

Goal: Instrument and survey specific calibration

- **Input:** survey raw images & calibration data
- fixed reference system [survey specific]
- # software systems : 6 [one per survey]
- **Output:** calibrated single exposures

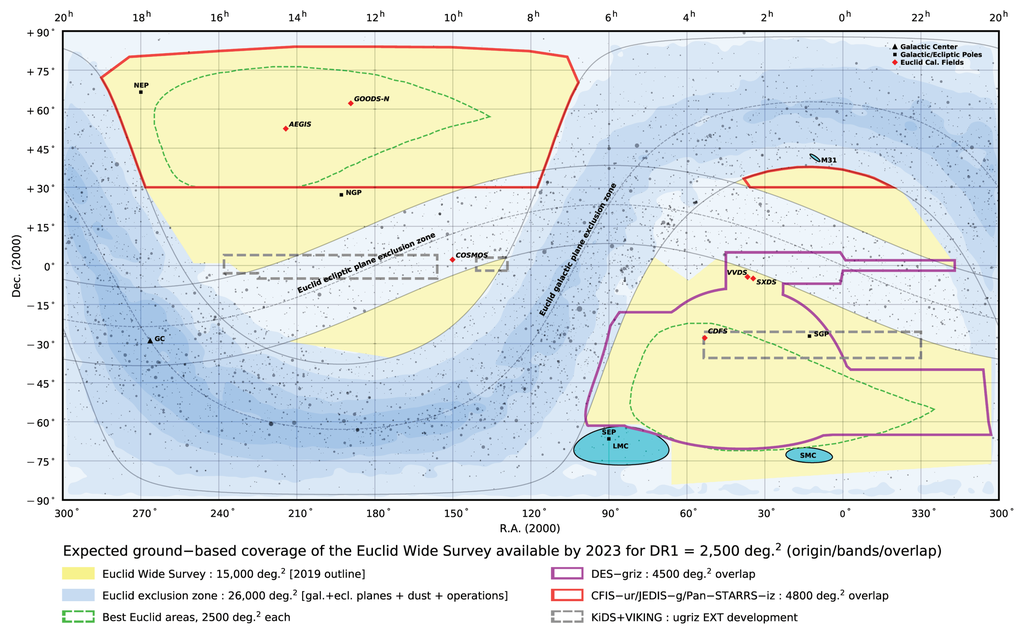
STAGE 2

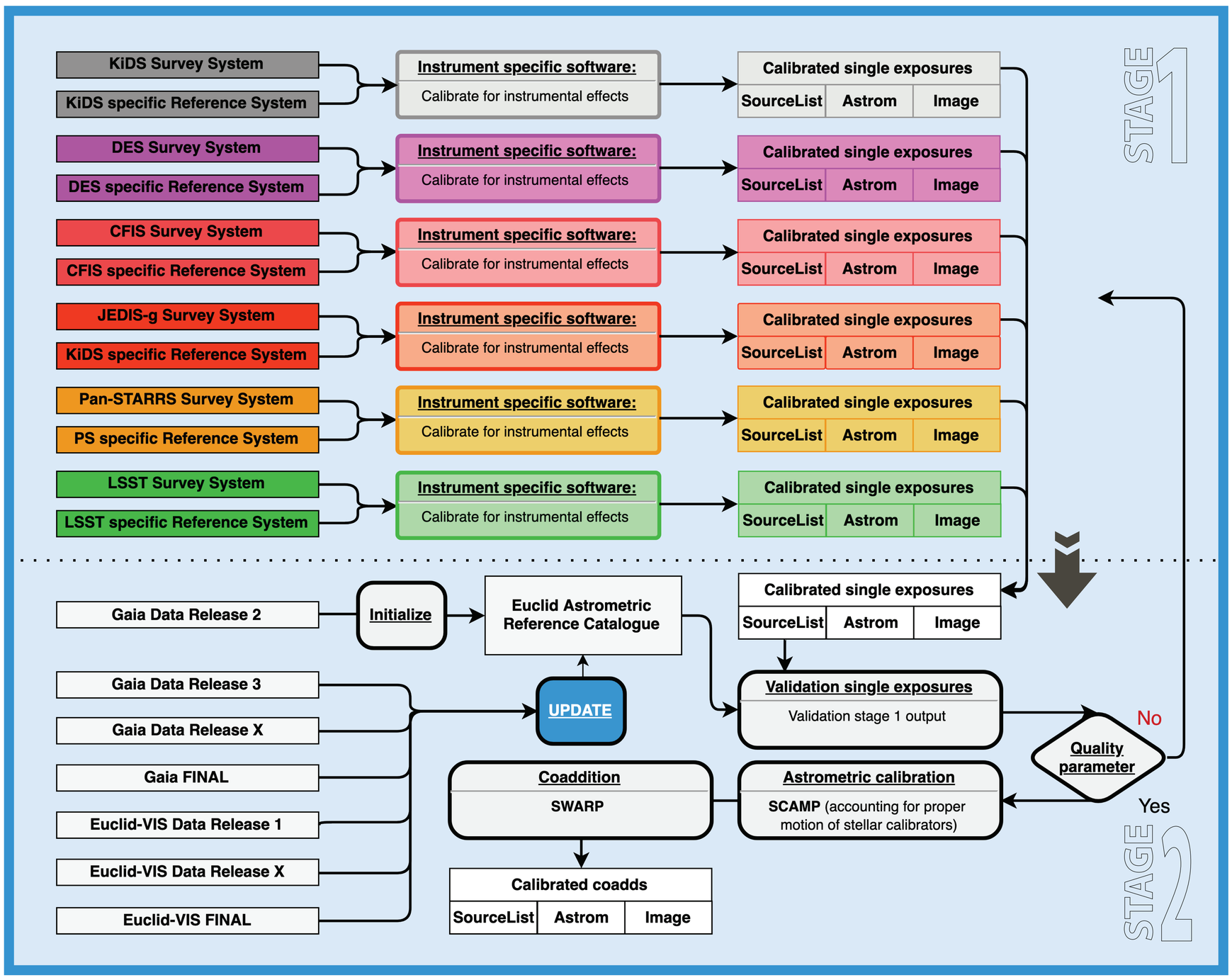
Goal: common processing
[validate data, align to Euclid reference, coadd]

- **Input**: stage 1 output
- one common reference system which evolves
- one common software system
- **Output**: calibrated co-added images

Survey	Start - Completion	Cover area (deg²)	FoV (deg²)	# Detectors	Filters	Raw Science Data Volume uncompressed (Tbyte)	# Astrometric solutions
EXT – CFI Survey	2017 – 2023	4800	1,10	40	u, r	17	2,2E+06
EXT – Dark Energy Survey	2012 – 2018	4500	3,00	62	g, r, i, z	76	8,3E+06
EXT – JEDIS-g	2019 – 2026	4800	4,06	14	g	17	2,1E+05
EXT – Kilo-Degree Survey	2011 – 2018	750	1,00	32	u, g, r, i, z	8	9,6E+05
EXT – LSST	2022 – 2026	11000	9,62	189	u, g, r, i, z	439	2,6E+07
EXT – Pan-STARRS	2018 – 2023	4800	7,00	60	i, z	1.183	5,1E+07

Ground based strategies for Euclid DR1
Credits: Jean-Charles Cuillandre, Konrad Kuijken, Peter Capak, ECSURV [UCM, 2019]



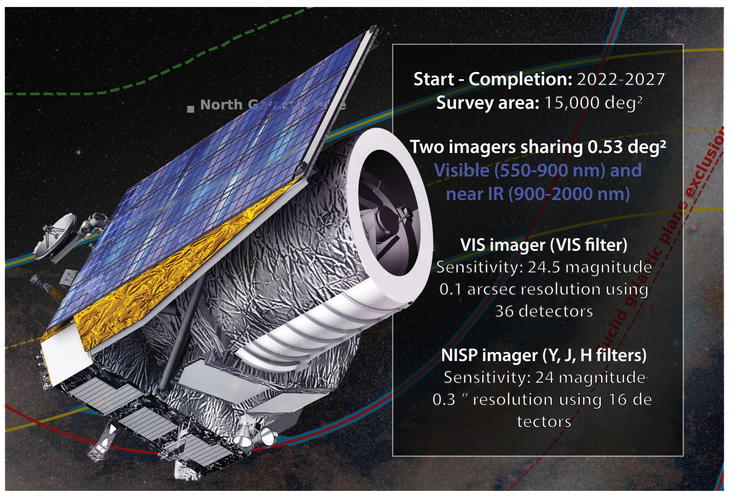


MSc Project

Detailed design and prototyping of software system* for UPDATE [see diagram on the left] of Euclid Astrometric Reference Catalog:

- update for improved reference values of existing calibrators from new Gaia & Euclid-VIS releases
- detect and flag bad calibrators
- expand with new calibrators

* Software system that allows calibration and validation procedures to account for stellar proper motion



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