# Preparatory data needed for the determination of the non-seismic parameters

# Impact of classical parameters on seismic analysis

| | Goal | Impact error in classical parameter | |
|---|---|---|---|
| | | $\Delta T_{eff}$ = 100 K | $\Delta$[Fe/H] = 0.1 dex |
| $\Delta R/R$ | 2% | ~1% | ~1% |
| $\Delta M/M$ | 10% | ~3% | ~3% |
| $\Delta\tau/\tau$ | 10% | ~10% | ~4% |

*Based on studies from Serenelli+17, Valle+18, and Bellinger+19*

# PSM WP122

More than 70 scientists with expertise in model atmospheres (both 1D and 3D), spectral modelling, techniques for stellar parameter determination from spectroscopy, (spectro)photometry, interferometry, …

This includes people with spectroscopic expertise involved in FU WPs.

WP122100 – 1D Model atmospheres

Bertrand Plez

WP122200 – 3D Model atmospheres

Hans Ludwig

WP122300 – Fundamental stellar parameters

Maria Bergemann

WP122400 – Limb darkening

Antonio Claret

WP122500 – Interstellar extinction

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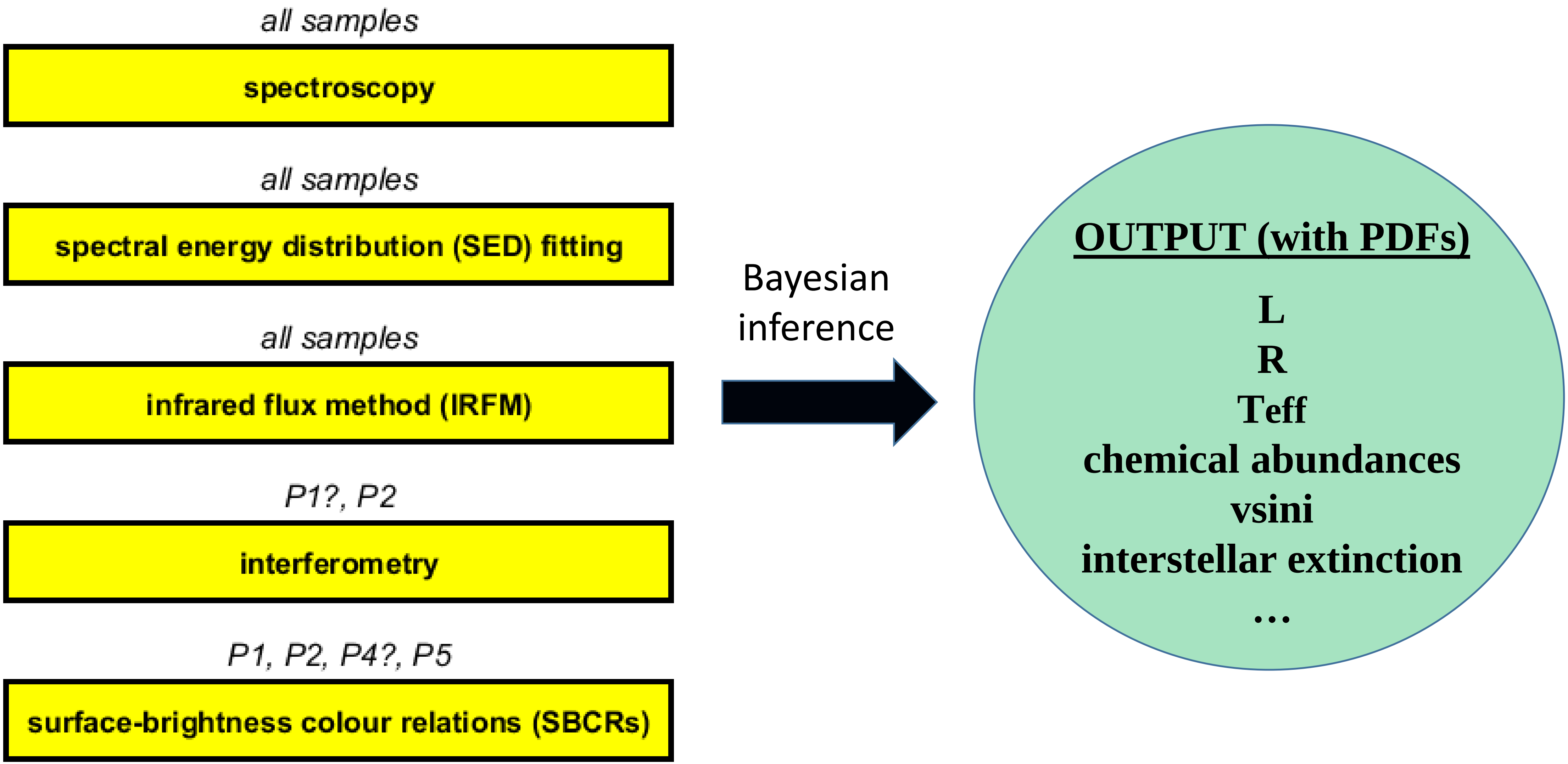
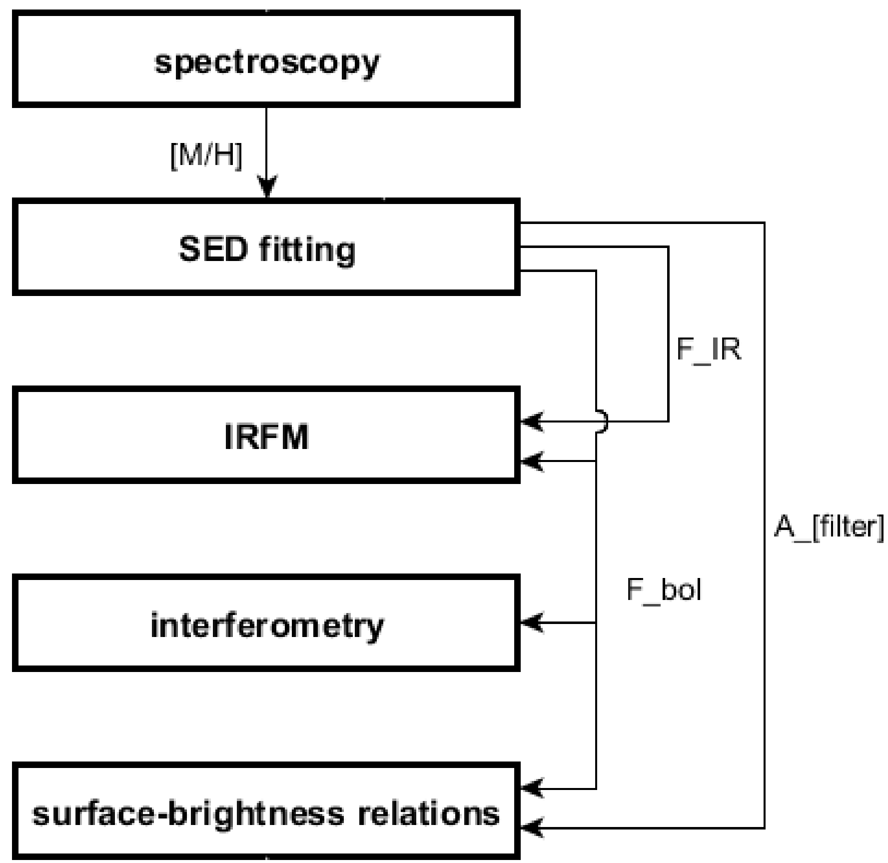
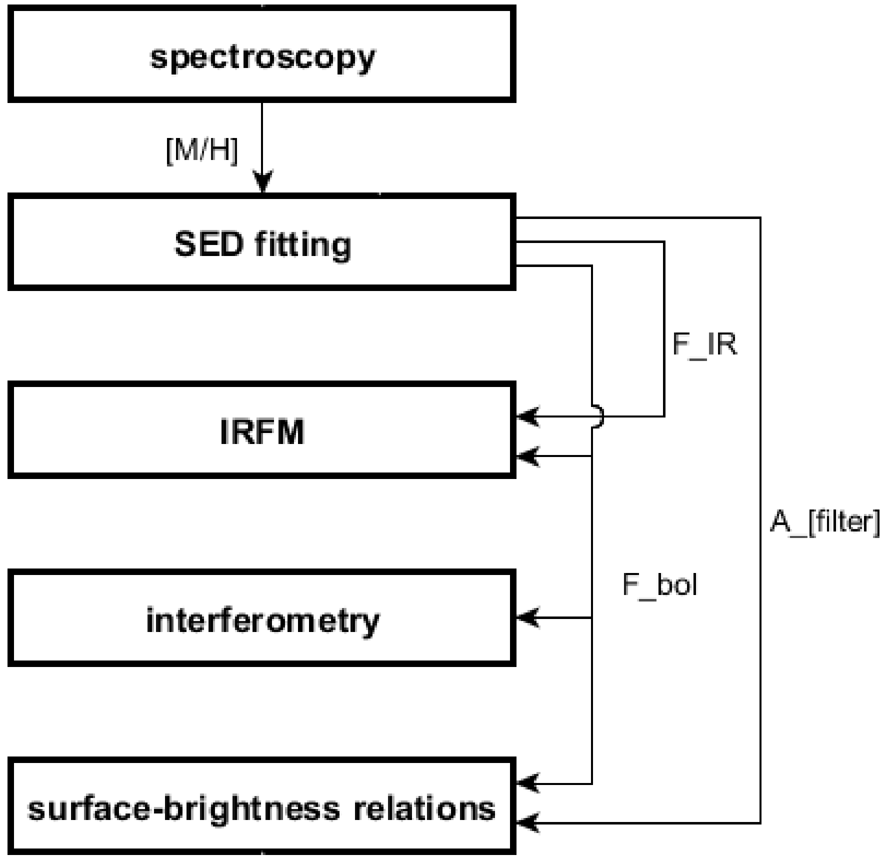
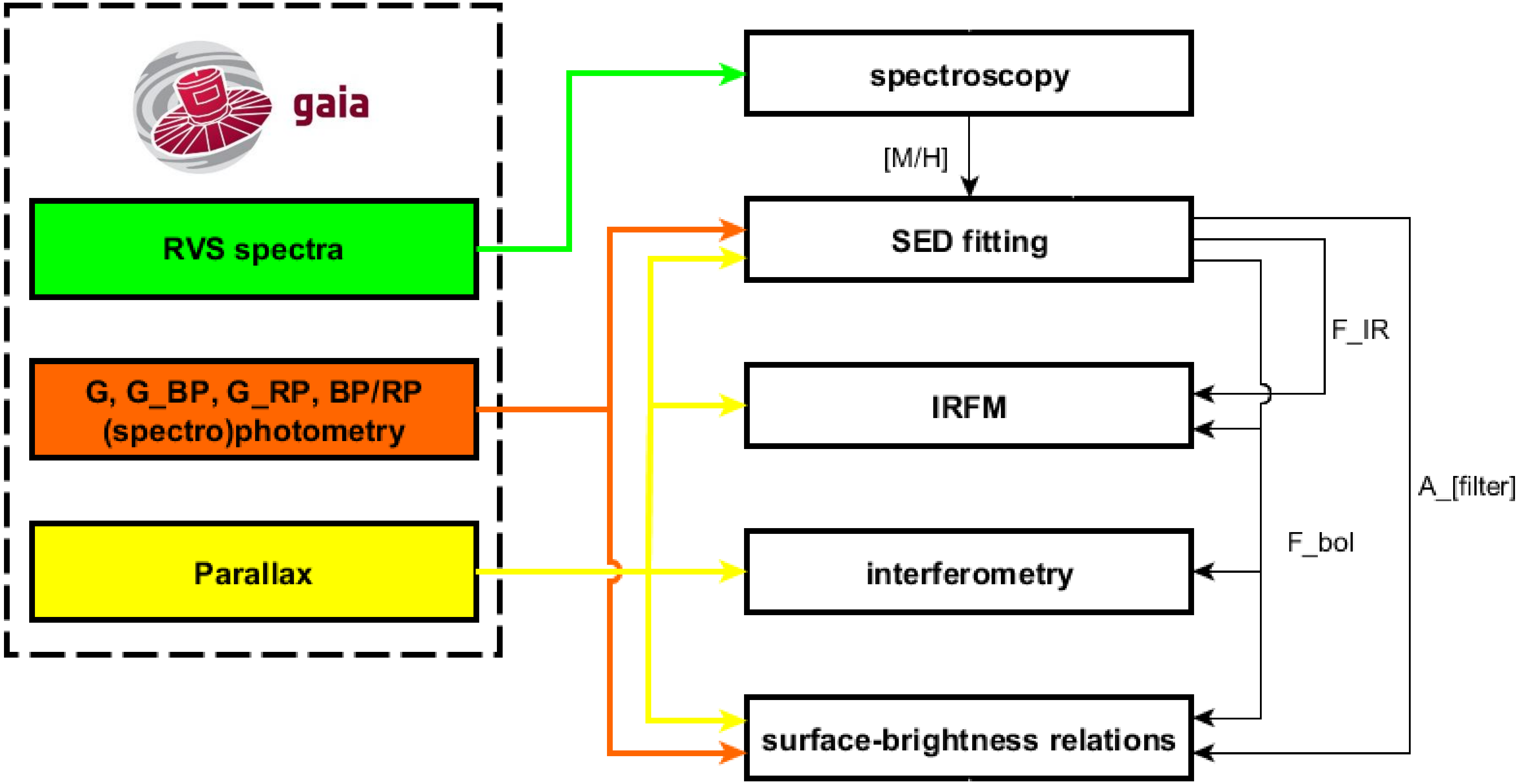

all samples
spectroscopy
all samples
spectral energy distribution (SED) fitting
all samples
infrared flux method (IRFM)
P1?, P2
interferometry
P1, P2, P4?, P5
surface-brightness colour relations (SBCRs)
Bayesian inference
OUTPUT (with PDFs)
L
R
Teff
chemical abundances
vsini
interstellar extinction
...


spectroscopy
[M/H]
SED fitting
F_IR
IRFM
A_[filter]
F_bol
interferometry
surface-brightness relations

## Caution

Oversimplified: the parameters may eventually be determined through a global optimisation of all observables




gaia
RVS spectra
G, G_BP, G_RP, BP/RP
(spectro)photometry
Parallax
spectroscopy
[M/H]
SED fitting
F_IR
IRFM
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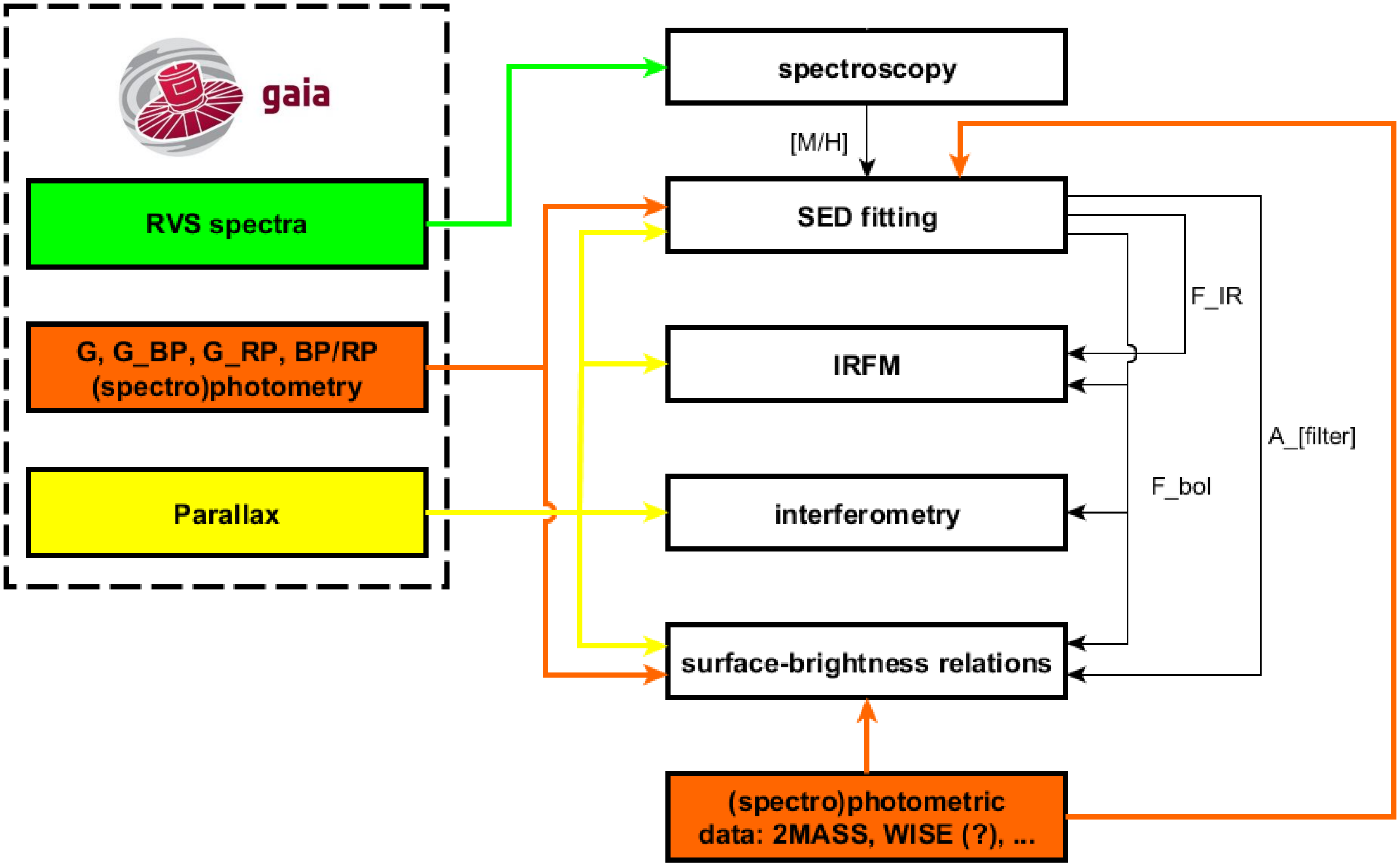
**Gaia RVS data will still be useful, but…**

Spectral resolution (R~11,200) and wavelength coverage (847-871 nm) not optimal:

- ✓ $T_{eff}$ and [Fe/H] of limited quality (cf WP122 H&H)
- ✓ A full chemical characterisation of POIs with volatile/refractory species (Li, CNO, α+iron-peak+neutron-capture elements) impossible

No formal access to the RVS spectra before Gaia DR3 (~2022): no possibility to test the pipeline with real data until then


gaia
RVS spectra
G, G_BP, G_RP, BP/RP (spectro)photometry
Parallax
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SED fitting
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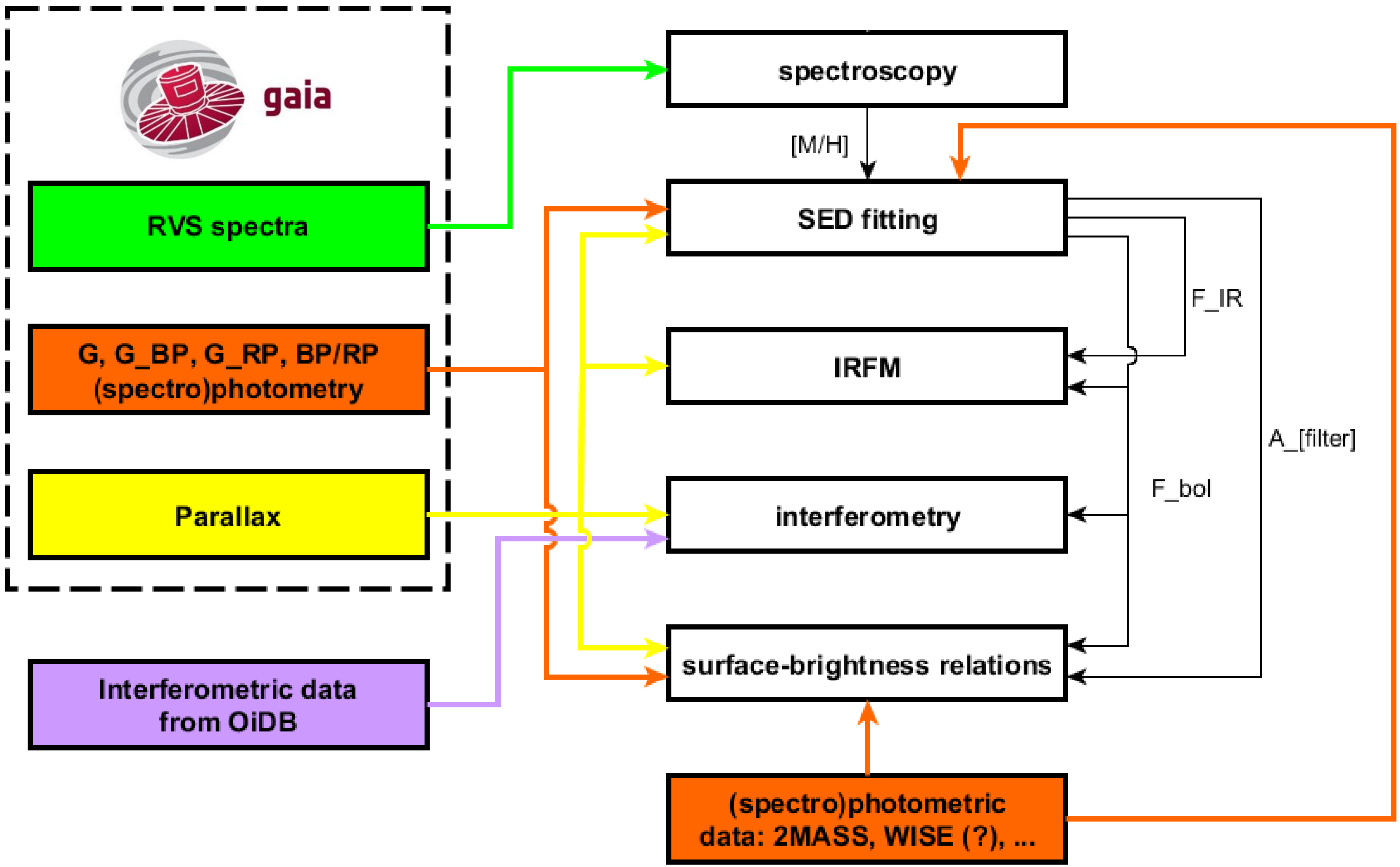
interferometry
surface-brightness relations
(spectro)photometric data: 2MASS, WISE (?), ...
F_IR
F_bol
A_[filter]



gaia
RVS spectra
G, G_BP, G_RP, BP/RP (spectro)photometry
Parallax
Interferometric data from OiDB
spectroscopy
[M/H]
SED fitting
F_IR
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A_[filter]
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interferometry
surface-brightness relations
(spectro)photometric data: 2MASS, WISE (?), ...

Who are we ?
- Who was JMM ?
- Partners
- Structure
- Working Groups

Training

Proposal Preparation
- ASPRO
- GetStar
- SearchCal
- VLTI Proposals

Data Processing
- AMBER
- PIONIER
- OIFits Explorer
- Oifits Validator

Data Analysis
- LITpro
- OImaging

Databases
- BadCal
- CalEx
- OiDB
- JMDC
- JSDC

## OiDB: A global database for optical interferometry

The Optical interferometry Database (OiDb) is a service developed by the JMMC OiDB Working Group to provide astronomers with a convenient solution to query calibrated optical interferometry data (OIFITS format) as well as regularly-updated observation logs obtained with a wide range of interferometric instruments. It relies on Virtual Observatory standards and tools to increase diffusion and operability.

Scientific and technical background of OiDb are described in the paper "Haubois et al., 2014, A global database for optical interferometry, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series , 9146, 91460O".

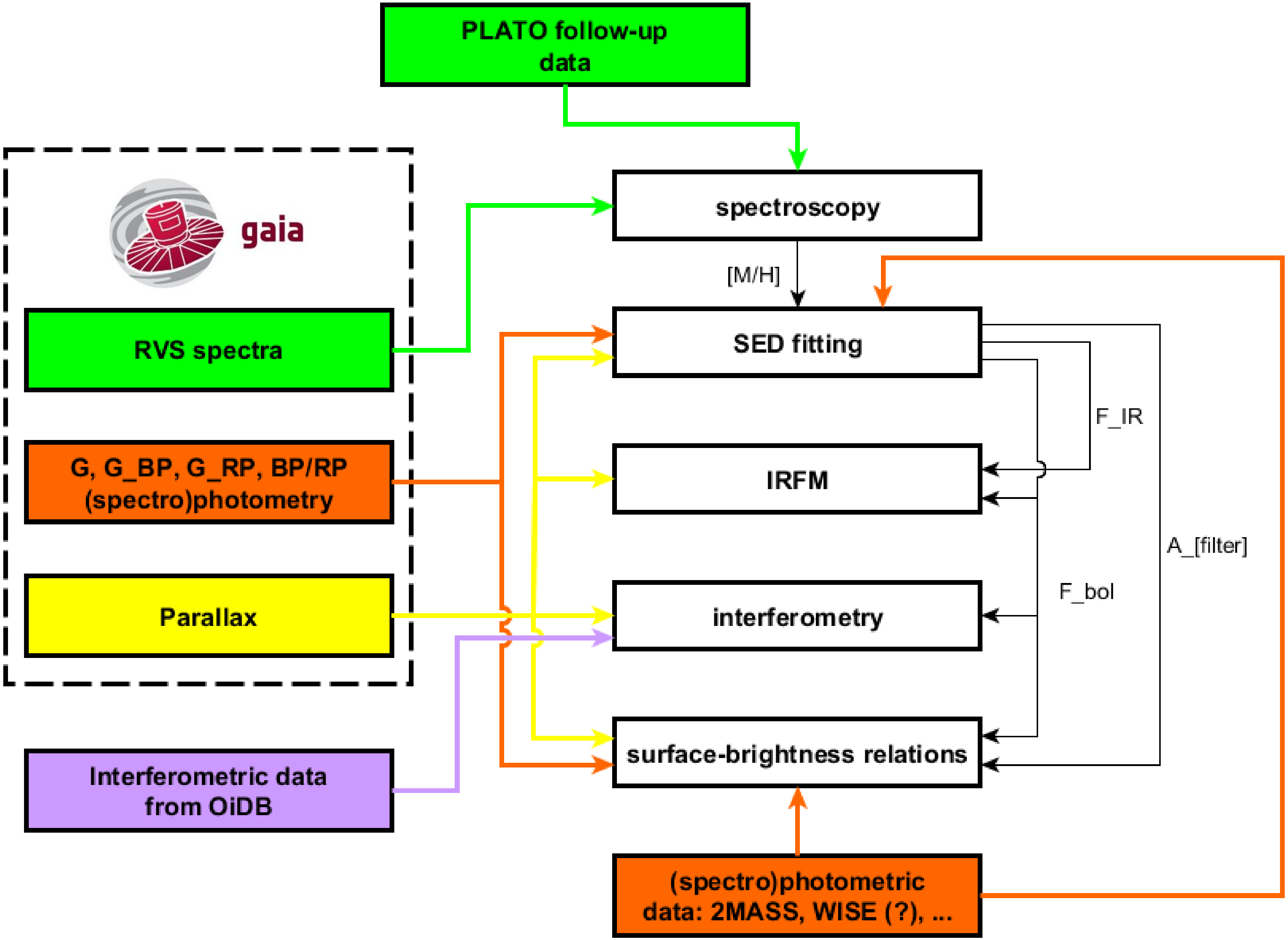
### Visit OiDB

OiDB

*User's feedback is very welcome.*

**Documentation**

User manual, terms of use and citation policy can be found on the OiDB documentation page


PLATO follow-up data
gaia
RVS spectra
G, G_BP, G_RP, BP/RP (spectro)photometry
Parallax
Interferometric data from OiDB
spectroscopy
[M/H]
SED fitting
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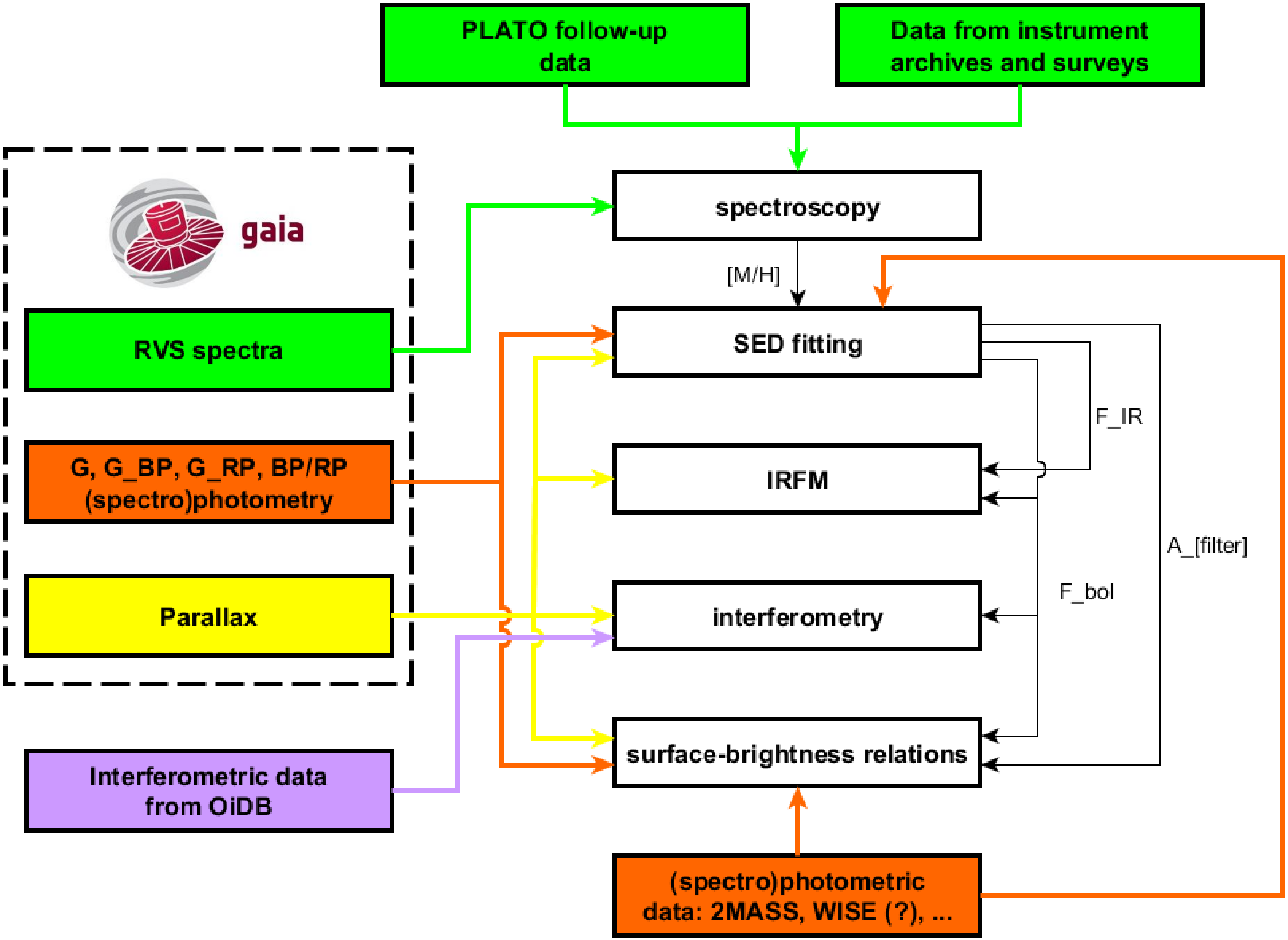
F_IR
F_bol
A_[filter]
(spectro)photometric data: 2MASS, WISE (?), ...


PLATO follow-up data
Data from instrument archives and surveys
gaia
RVS spectra
G, G_BP, G_RP, BP/RP (spectro)photometry
Parallax
Interferometric data from OiDB
spectroscopy
[M/H]
SED fitting
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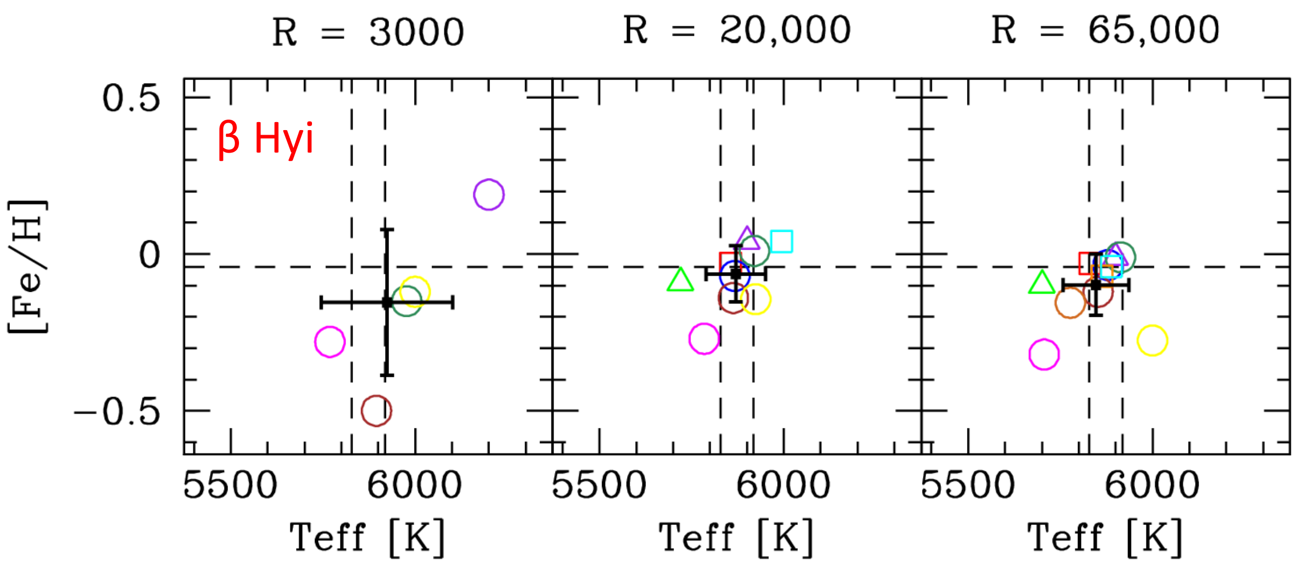
A_[filter]
F_bol
interferometry
surface-brightness relations
(spectro)photometric data: 2MASS, WISE (?), ...

# Requirements on spectroscopic data

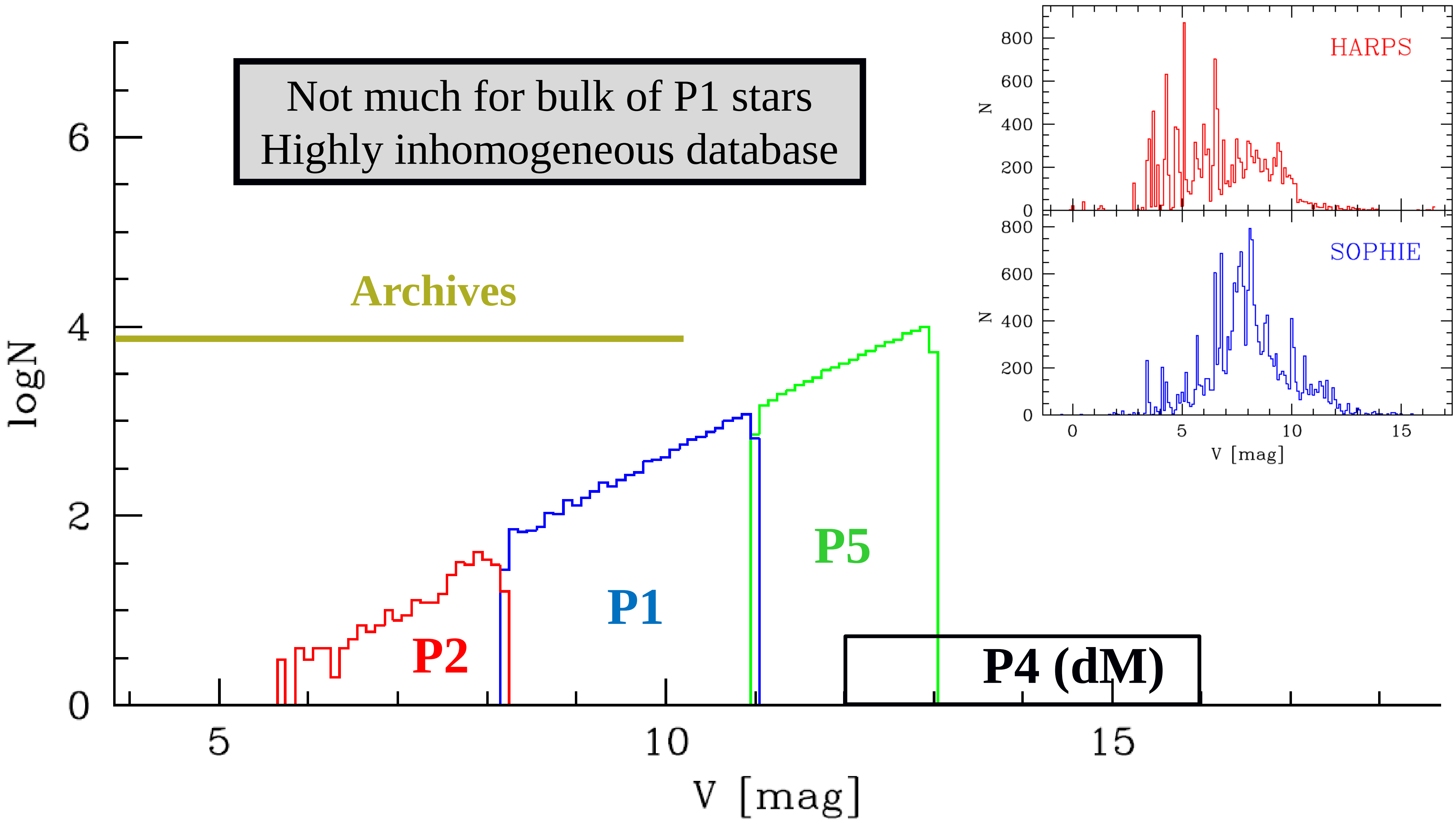
✓ Previous H&H tests indicate that spectra with at least *R*~20,000 and with a relatively wide wavelength coverage are needed to reach the appropriate accuracy levels on $T_{eff}$, [Fe/H], …



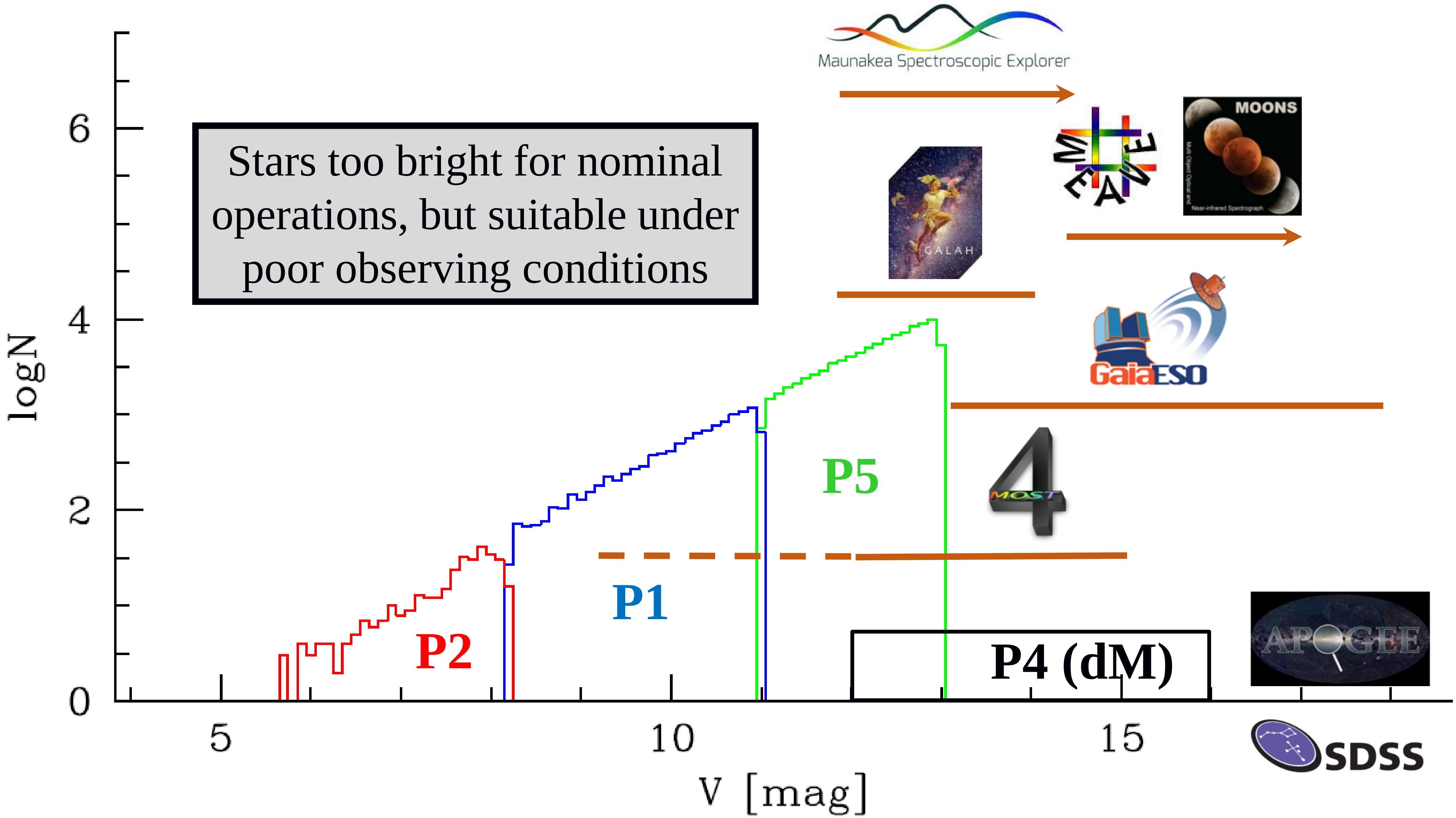

✓ As far as possible, need for a homogeneous dataset.

**But low-resolution data (LAMOST, DESI, …) should not be ignored…**

# How to get the data: from public archives?



# How to get the data: from massive surveys?



| Observation mode | Source of data |
|---|---|
| **Astrometry** | **Gaia parallax** |
| **(Spectro)photometry** | **Gaia G, G_BP, G_RP, BP/RP**<br>**2MASS**<br>**Others in the IR (WISE, SPHEREx, …)?** |
| **Interferometry** | **Reduced data from OiDB** |
| **Spectroscopy** | **Gaia RVS**<br>Surely useful, but limited in terms of quality, especially wrt R and Δλ.<br>**FU data: average spectrum**<br>Exquisite data, but only for a limited number of targets.<br>**Observatory public archives**<br>Somewhat limited in number and highly inhomogeneous.<br>But important to collect as much as possible.<br>**Surveys: WEAVE, 4MOST, MSE, SDSS-V, …**<br>Low-resolution data valuable if nothing else is available.<br>Stars too bright to be included as part of nominal operations, but suitable targets under poor observing conditions. |

# What we would like to have in the PIC catalogue at start of processing of preparatory data (~2 years prior to launch)

**Estimates for:**

- ✓ Teff
- ✓ logg
- ✓ [Fe/H]
- ✓ [α/Fe] (TBC)
- ✓ L
- ✓ R
- ✓ vsini
- ✓ binarity information
- ✓ activity proxy

**With uncertainties + source of data**