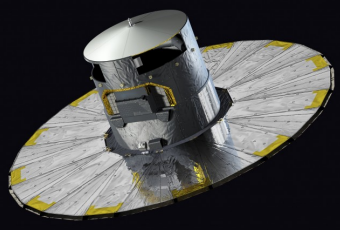# The SPSS survey for the flux calibration of Gaia

at the TNG Workshop, Padova, March 2017
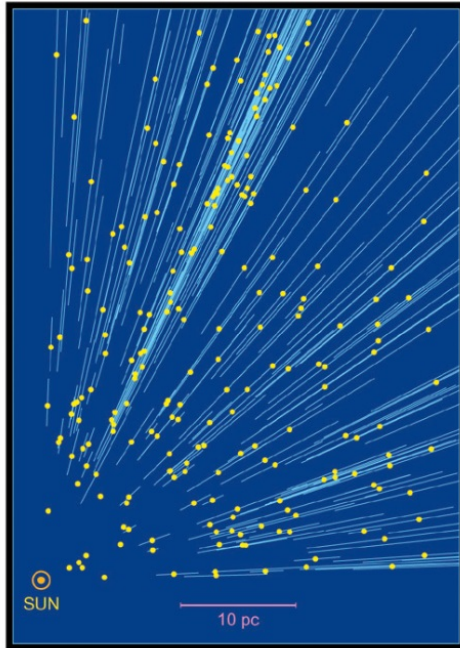
Elena Pancino – INAF OAA – ASDC
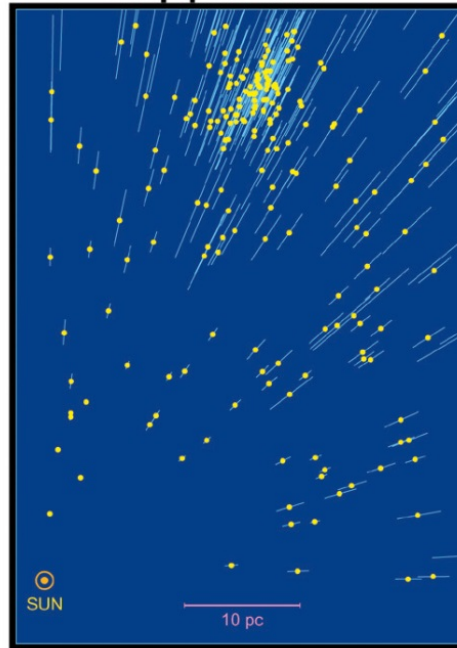
ESA - Gaia astrometry
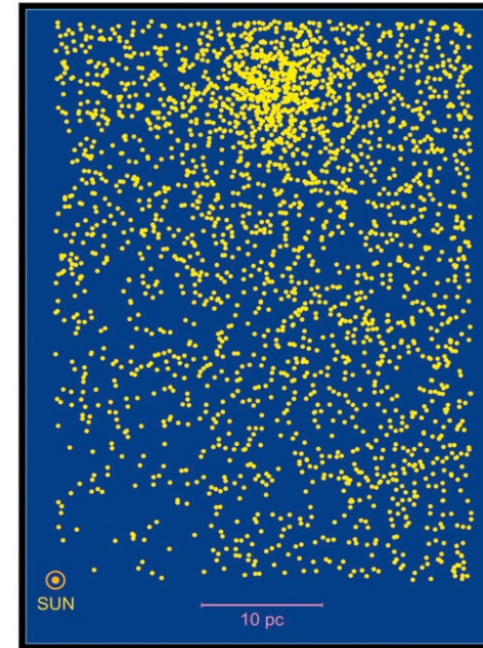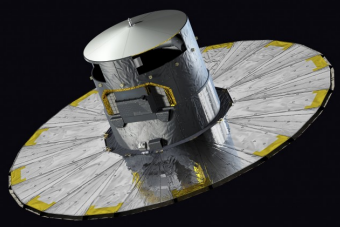

Ground | Hipparcos | Gaia

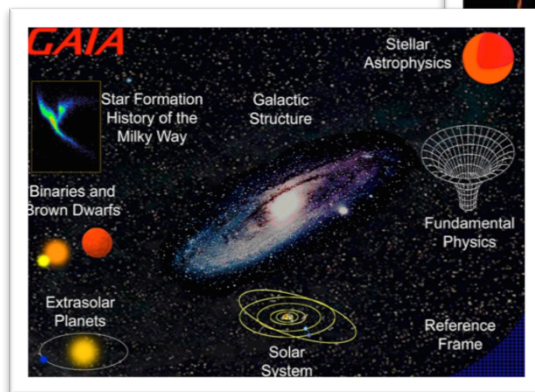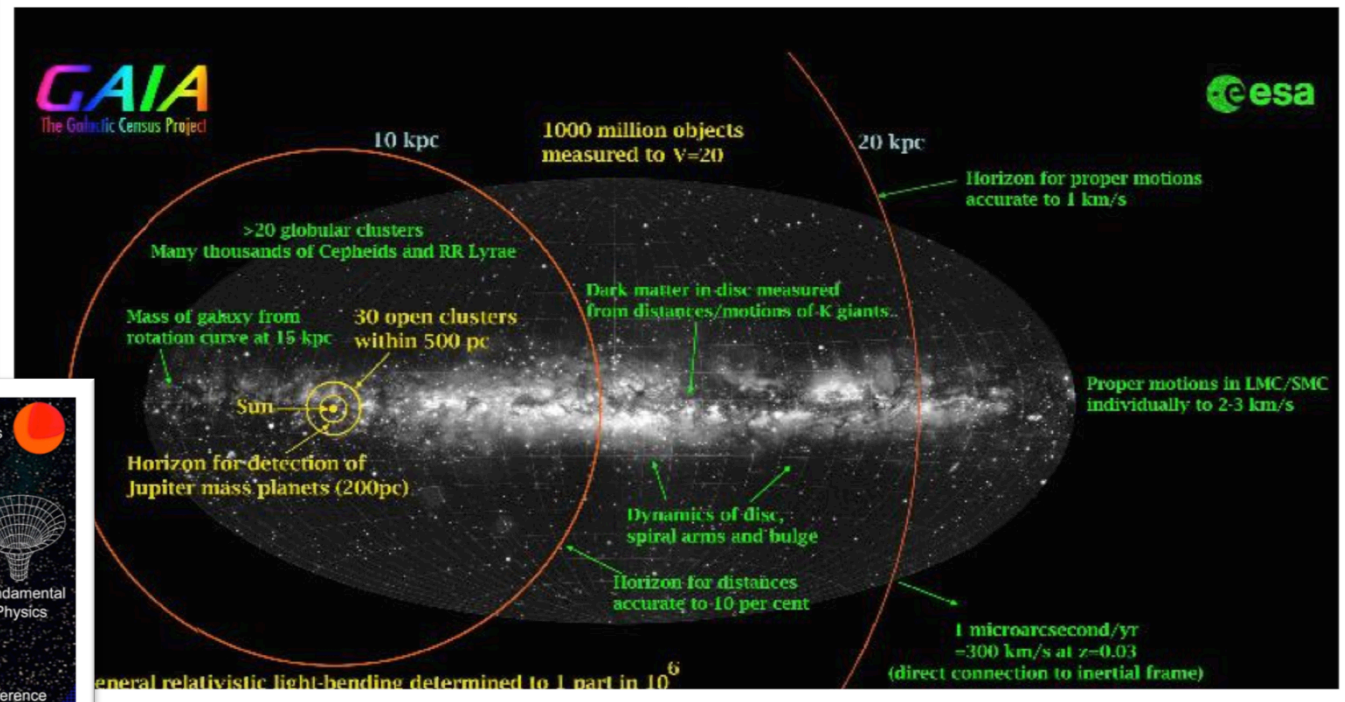*The Hyades and the solar neighborhood*

All-sky astrometry, 2 10^9 point-like sources, V<20.5 mag, μas uncertainties
Complemented by photometry (G, G$_{BP}$, G$_{RP}$) and spectroscopy (V<17 mag)

Gaia science goals

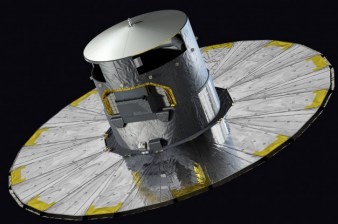*6D phase space and physical parameters (T_{eff}, logg, [Fe/H]) of Milky Way stars*

*on average ~70 observations in 5 yr*

- Solar system, exoplanets, transients, variability
- The Milky Way, mass, dark matter, stellar content
- Local group, distant galaxies, QSOs
- Distance scale, reference frame, relativity

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Flux calibration of Gaia

- Complex instrument
- Large focal plane
- 106 different CCDs
- Three instruments
- mmag photometry

- A grid of ~200 SPSS
- From WD to M stars
- ~1% calibration (Vega)
- Covering 330-1050 nm
- R = λ/δλ ~ 2000
- No existing literature grid matches all constraints
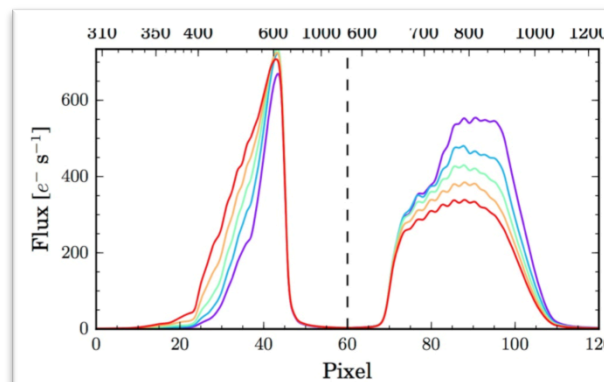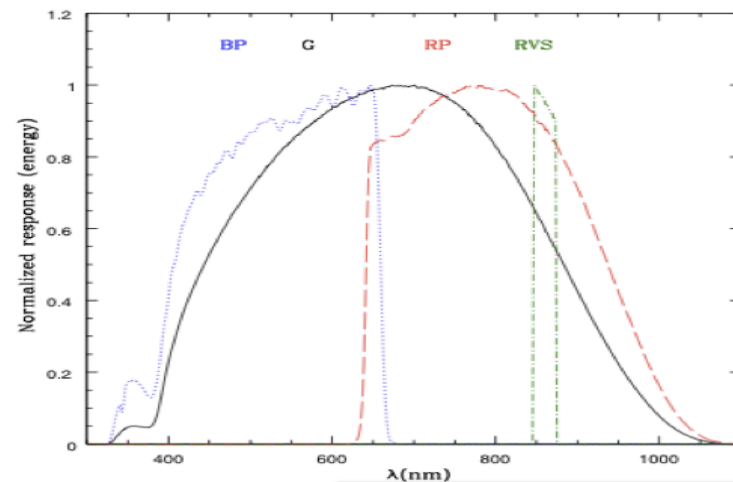
BP/RP, R~100, V<20.5

RVS, R~10000, V<17

HIP 70674

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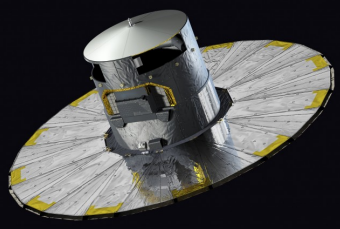
Gaia SPSS survey

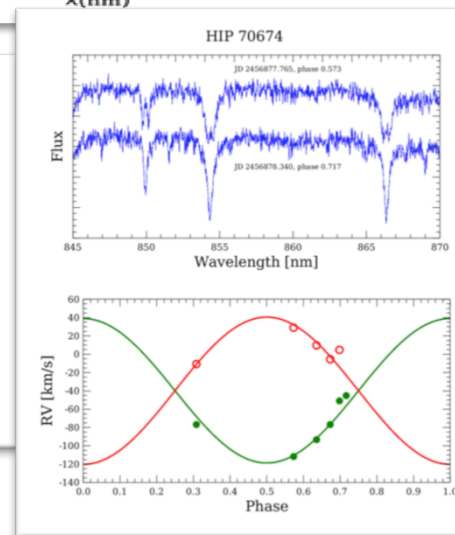- 8 instruments/telescopes
- Three campaigns
  - Constancy monitoring
  - Absolute photometry
  - Spectrophotometry
- 515 observing nights
- 9+ years (2005-2015)
- 200 000 frames obtained
- With 3-5 FTE each year
  - Core team: Pancino (PI), Altavilla, Marinoni, Cocozza, Ragaini, Galleti, Bellazzini, Bragaglia, Cacciari, Carrasco, Voss, Jordi, and others

CAHA 2.2m

TJO 0.8m

NTT 3.58m

San Pedro Mártir 1.5m

Cassini 1.5m

TNG 3.58m

REM 0.6m

NOT 2.5m
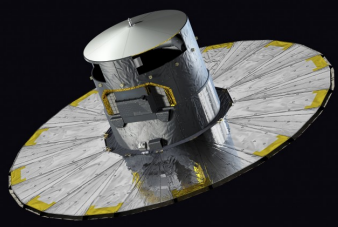
Project status

- Funds INAF-ASI contracts (PI Lattanzi)
- Campaign status
  - Observations completed (2015)
  - Data (pre-)reductions completed (2016)
  - Data analysis (ongoing)
- Publications and deliveries
  - Survey description: Pancino et al., 2012
  - Data analysis: Altavilla et al., 2015
  - Constancy monitoring: Marinoni et al., 2016
- Deliveries
  - Pre-launch internal DPAC release: Oct 2013
  - First internal DPAC release: Jul 2015
- SPSS archive and DB at ASDC
  - ~10^5 raw and reduced frames
  - Public with first flux table release (expected 2018)
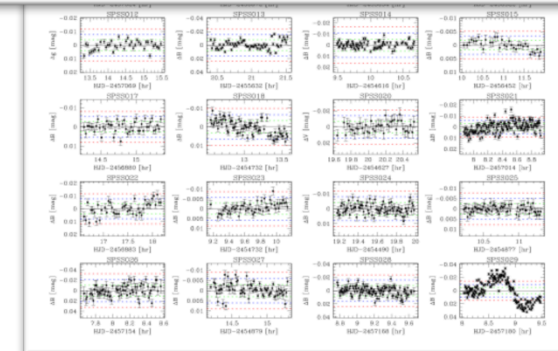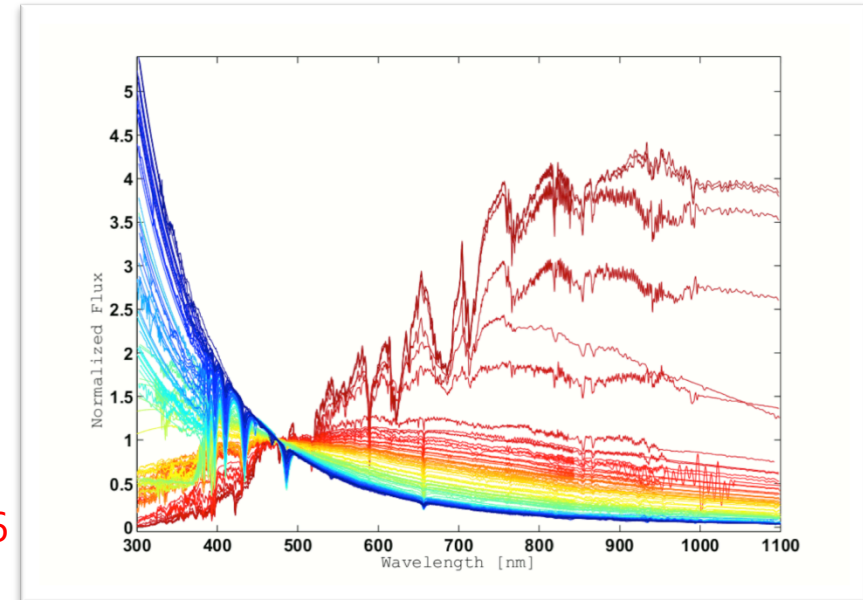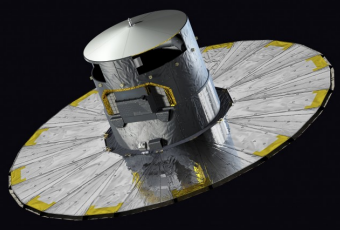
Observing support

| Ins@tel	Large prog	Req	Rej
ALFOSC@NOT	**No**	**2 runs**	**0 (0%)**
BFOSC@Cassini	No	16 runs	0 (0%)
CAFOS@CAHA	**Yes (twice)**	**8 runs**	**1 (13%)**
DOLORES@TNG	**Partially**	**9 runs**	**1 (11%)**
EFOSC2@NTT	**Yes**	**9 runs**	**1 (11%)**
MEIA@TJO	No	4 runs	0 (0%)
LaRuca@SPM	No	7 runs	0 (0%)
ROSS@REM	No	12 runs	0 (0%)

- **Problem1:** Difficult to get support for **calibration** programs (2-4m class)
- **Problem2:** Difficult to get **continuative** support (calibration monitoring)
- **Problem3:** The TNG TAC did not have **stable policies** from year to year
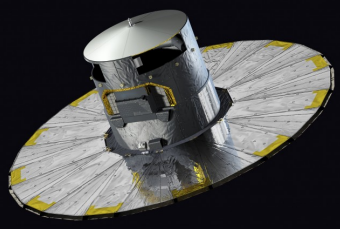
Final considerations

- Large space missions and surveys need ground-based support
  - For calibrations (for flux, radial velocity, benchmark stars, VLBI ...)
  - For follow-up and verification (Gaia science alerts, Variables, Gaia FUN-SSO)
  - For many other activities (Gaia GBOT – ground-based optical tracking)

- Most support activities are ideal for 1-2m and 2-4m class telescopes

- Telescopes like the TNG could (should?) devote part of their time to support activities of nationally funded key projects like Gaia

- We are assembling the largest (~200 SPSS), most homogeneous and accurate (~1%), and the only constancy-monitored (±0.05 mag) SPSS grid for Gaia, useful for photometric and dark energy surveys as well

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