



*Multiobject spectroscopy
as a complement for Gaia*

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Nice, France)*

ESO spectroscopic workshop 9th-10th March 2009

Outcome of a workshop gathering the French community involved in Galactic Archeology and stellar physics

<http://www.oca.eu/rousset/GaiaSpectro/>

Spectroscopie multi-objets en complément à Gaia
ATELIER les 19 et 20 février 2009, Nice.

Contexte	Venue	SOC	LOC	Programme et présentations	Participants	Inscriptions
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SOC

- Misha Haywood (GEPI, Paris)
- Vanessa Hill (Observatoire de la Côte d'Azur, Nice)
- Christophe Martayan (Bruxelles)
- Alejandra Recio-Blanco (Observatoire de la Côte d'Azur, Nice)
- Frédéric Royer (GEPI, Paris)
- Arnaud Siebert (Observatoire de Strasbourg)
- Caroline Soubiran (Observatoire de Bordeaux)



Observatoire
de la CÔTE d'AZUR



LOC: Vanessa Hill, A. Recio-Blanco, S. Rousset

BRIEF SUMMARY OF GAIA PERFORMANCES

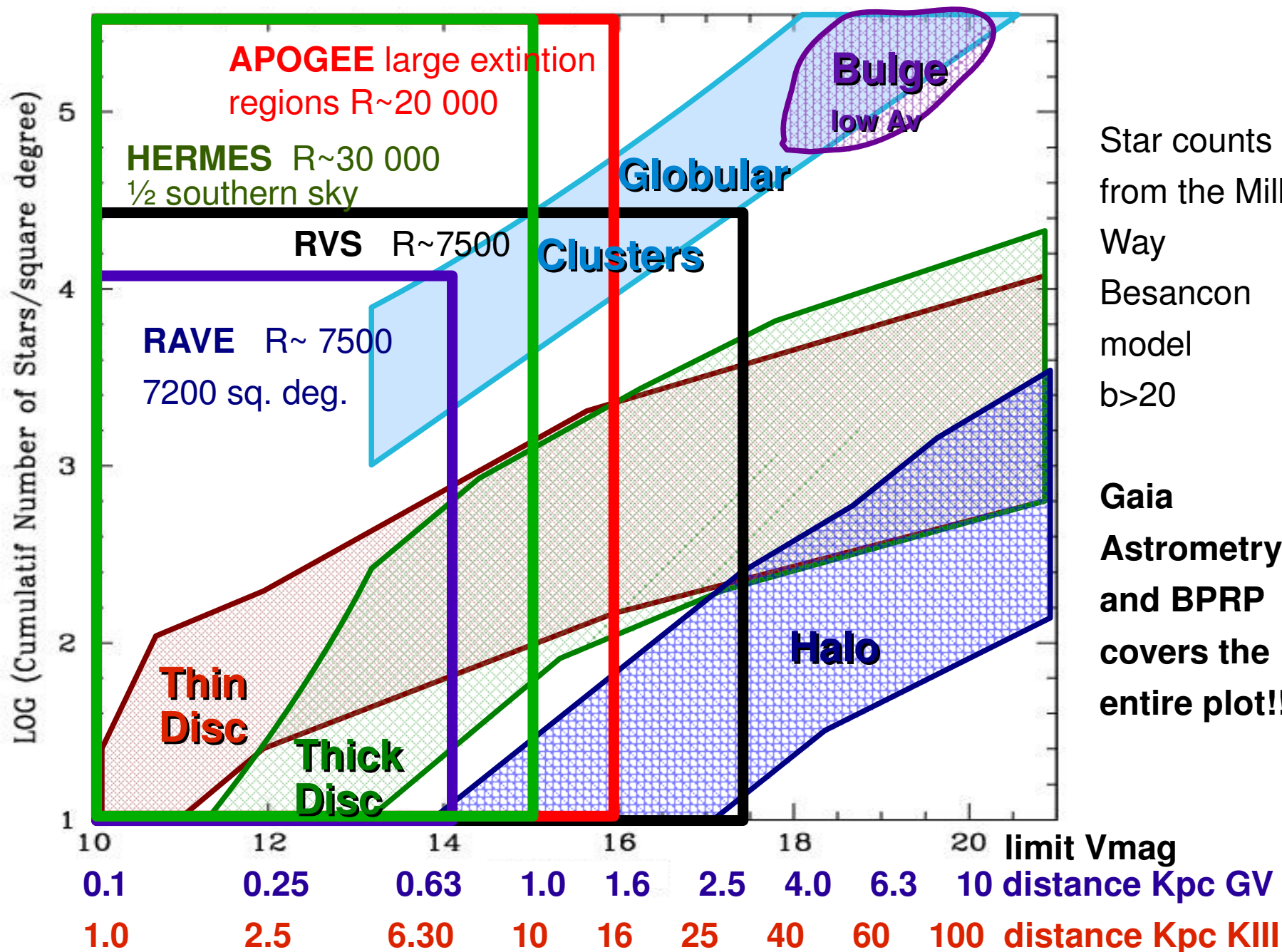
c.f. D. Katz talk

Sky-average standard errors for **GOV stars** (single stars, no extinction)

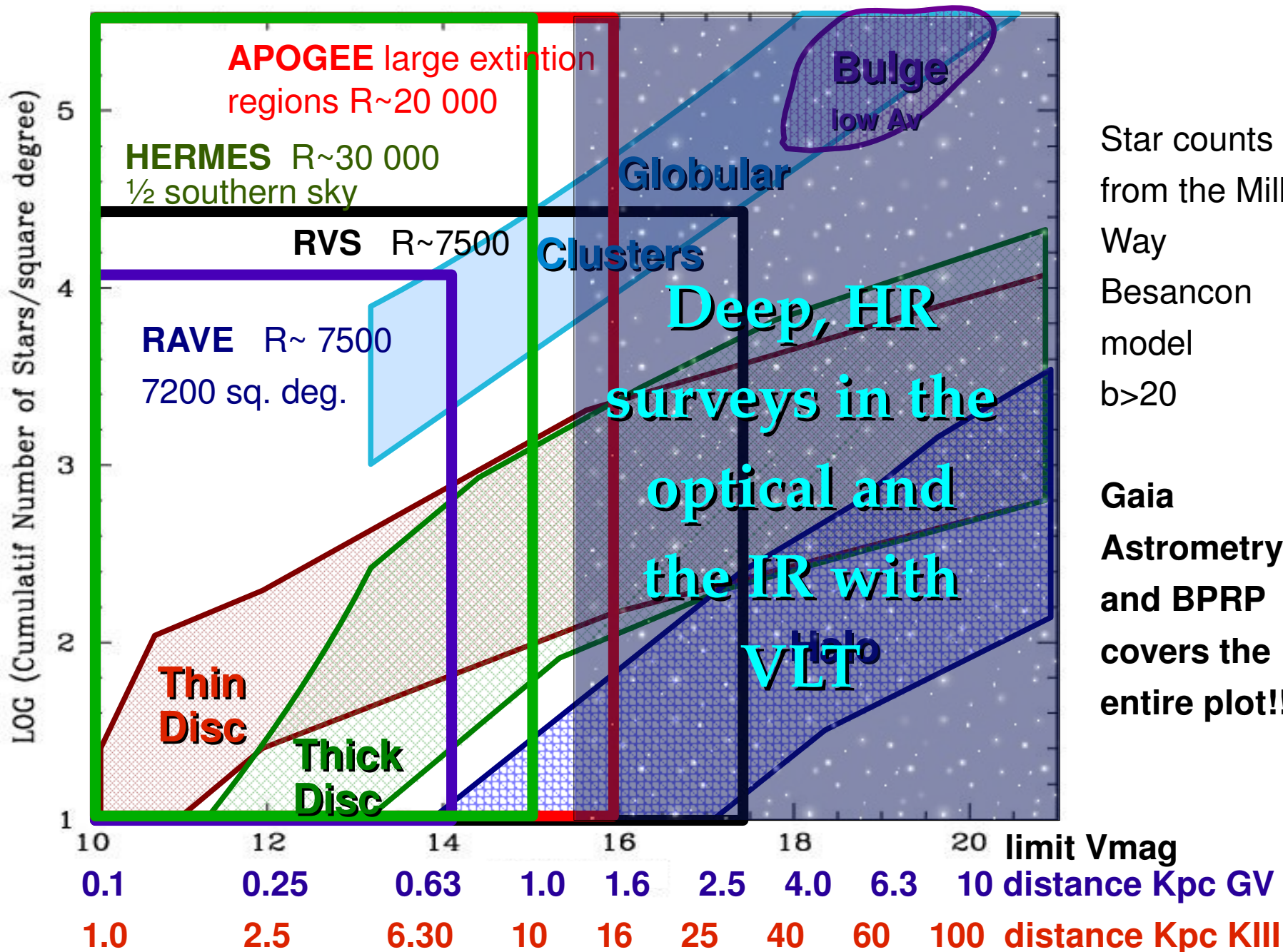
Distance	<0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	kpc
V magnitude	6 - 13	14	15	16	17	18	19	20	mag
Parallax	8	13	21	34	55	90	155	275	μas
Proper motion	5	7	11	18	30	50	80	145	$\mu\text{as/yr}$
Position @2015	6	10	16	25	40	70	115	205	μas
Transversal velocity	<0.15	0.25	0.7	1.5	4.0	10	30	75	km/s
Radial velocity	< 1	2.0	6.0	14.0	-	-	-	-	km/s

Atmospheric parameters, A_v , chemical abundances from BPRP and RVS

MILKY WAY SURVEYS PICTURE



MILKY WAY SURVEYS PICTURE



SCIENCE CASES

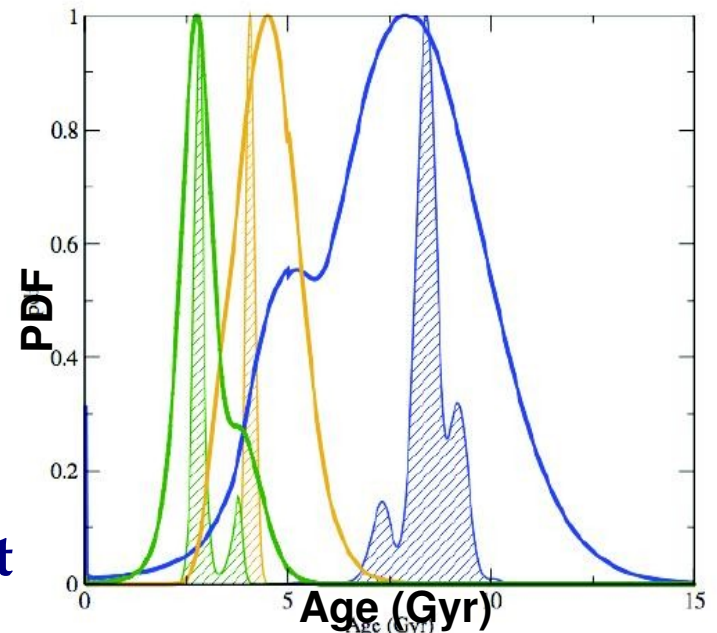
THIN DISC

- Disc evolution constraints... as a function of stellar AGES!
 - SFR over several Kpc (inside-out scenario)
 - Chemical abundances - age dependence (infall evolution)

Improve Gaia stellar ages with better atmospheric parameters $V > 16$

- Chemical abundance gradients:
radial mixing?
- Cinematic groups and thin disc structure:
chemical tagging

Improve Gaia chemical abundances for faint stars.



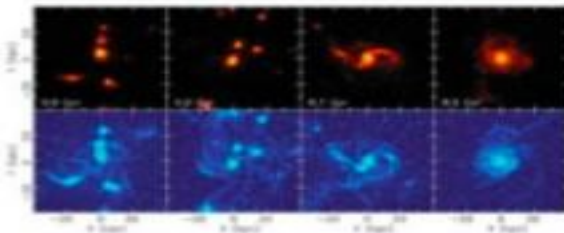
Haywood, Nice workshop
Exemples pour une F6, G2IV, G2V
 $\sigma_{\pi}/\pi=10\%$, $[\text{Fe}/\text{H}]$ à 0.1 dex, T_{eff} à 2-3% ($\approx 150\text{K}$)

SCIENCE CASES

THICK DISC

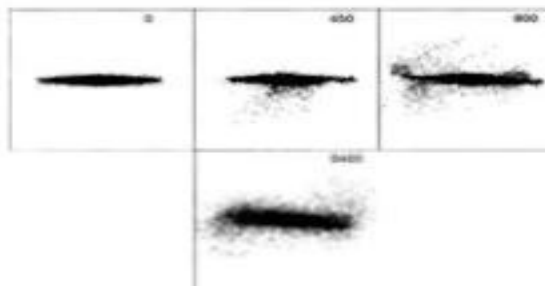
- Characterization far from the solar neighbourhood
 - Radial and vertical chemical and velocity gradient
 - scale-height variation with Galactocentric distance
- Detection of accretion events, inhomogeneities
- Chemical evolution with age constraints

Complement of Gaia Vrad and chemical abundances for faint stars

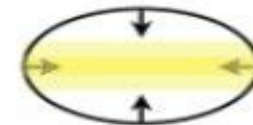


Brook et al. 2005 ApJ 630 298

Taken from Soubiran (Nice workshop)



Quinn et al. 1993 ApJ 403 74



Eggen et al. 1962 ApJ 136 748

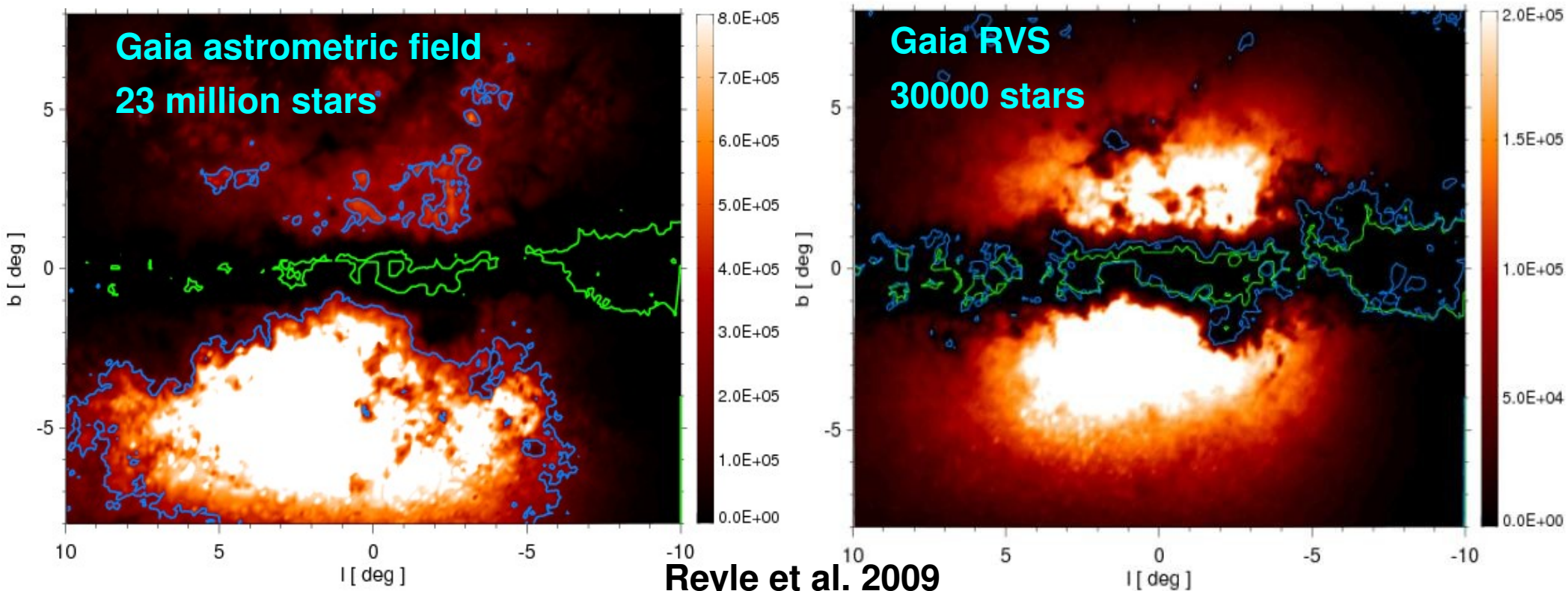
Burkert et al. 1992 ApJ 391 651

SCIENCE CASES

BULGE (Infra-red)

- Formation scenario: bulge vs. pseudo-bulge
- Matter accretion traces
- Star formation history
- Impact on disc chemical evolution and dynamics

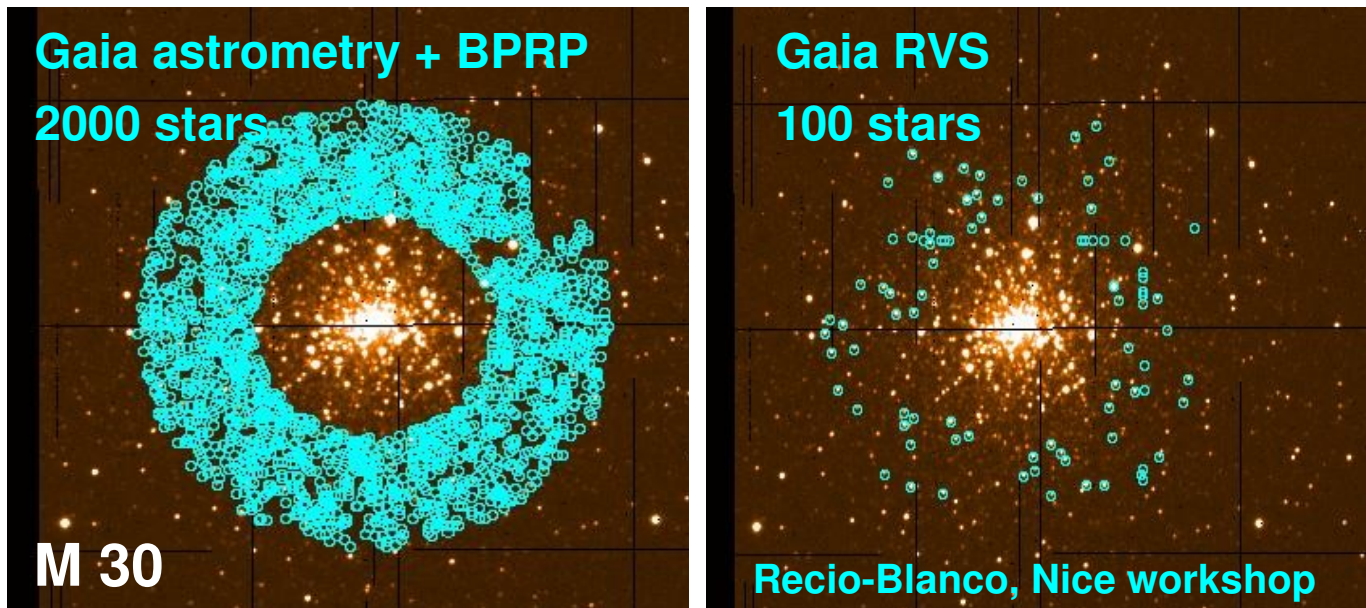
Complement of Gaia Vrad and chemical abundances for faint stars and larger (l,b) coverage



SCIENCE CASES

GLOBULAR CLUSTERS

- Internal dynamics: **Vrad complement to Gaia absolute proper motions**
 - Multiple stellar populations identification vs. age, dynamics...
 - Possible new GCs identified by Gaia: **chemical characterization**
- Galactic potential with tidal tails: **Vrad + abundances complement**



- Fraction of accreted stars throughout the Halo
- Field Halo – dwarfs galaxies comparison

Chemical tagging and Vrad complement to Gaia, FOV ~ 1-2 deg²

SCIENCE CASES

DWARF GALAXIES

Talk by G. Battaglia (yesterday)

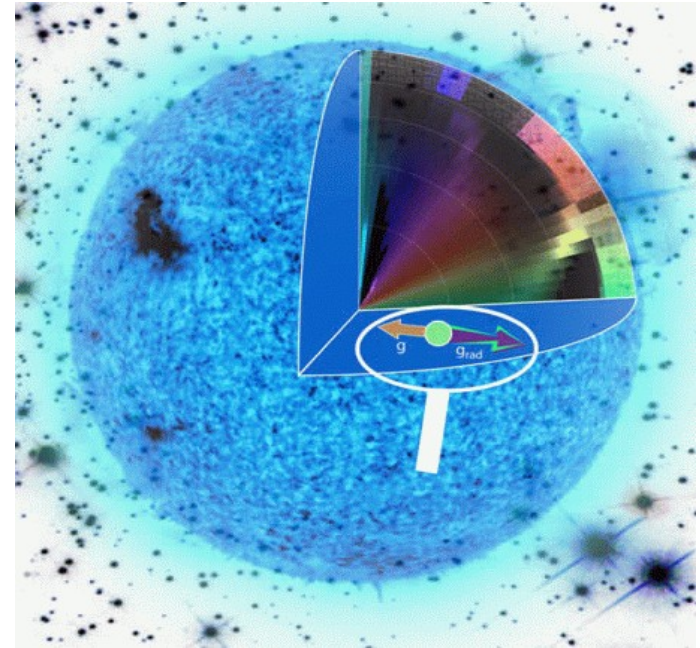
HR complement to Gaia

STELLAR PHYSICS

- Non-standard mixing processes
- Nucleosynthesis
- Angular momentum evolution
- Clusters vs. field stellar evolution

HR complement for stellar rotation and chemical abundances

Blue wavelength range for hot stars



CONCLUSIONS

FOV : 0.25 deg² ok, *1deg² better (Halo)*

RESOLUTION : 20000 – 40000

MULTIPLEXITY : 250 fibers ok, *1000 better*

WAVELENGTH RANGE : 3700 - 1200 (non-contiguous orders)
>500Å in one single shot (the largest the better)

TARGET'S MAGNITUDE : V>14-15

A SUPER-GIRAFFE survey of **Galactic Archaeology?**

