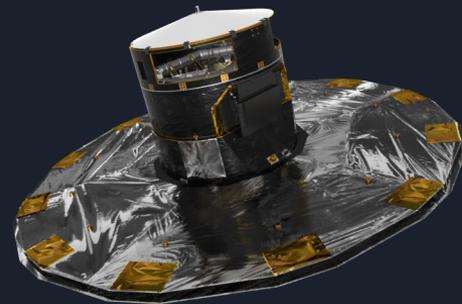


Gaia verso la Data Release 3

e il contributo italiano per i campi affollati...

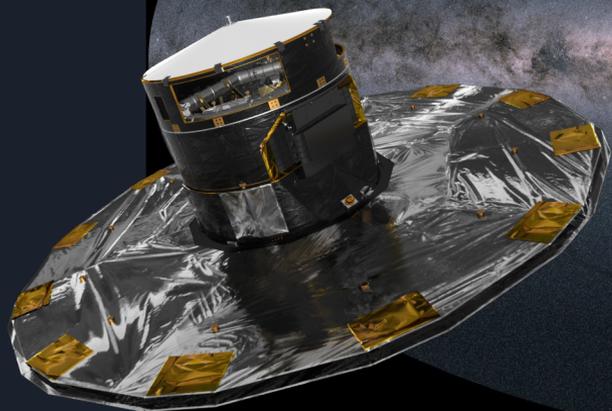


Marco Castellani , Luigi Pulone, Giuliano Giuffrida
INAF - Oss. Astronomico di Roma



La Via Lattea sopra il Cile (ESO)

Lancio: 19 dicembre 2013

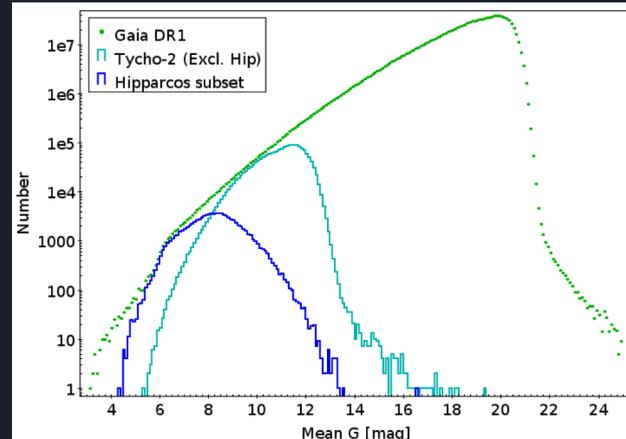
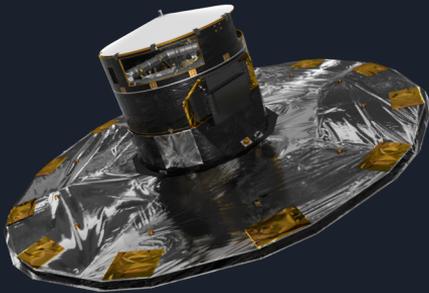


MISSION STATUS NUMBERS

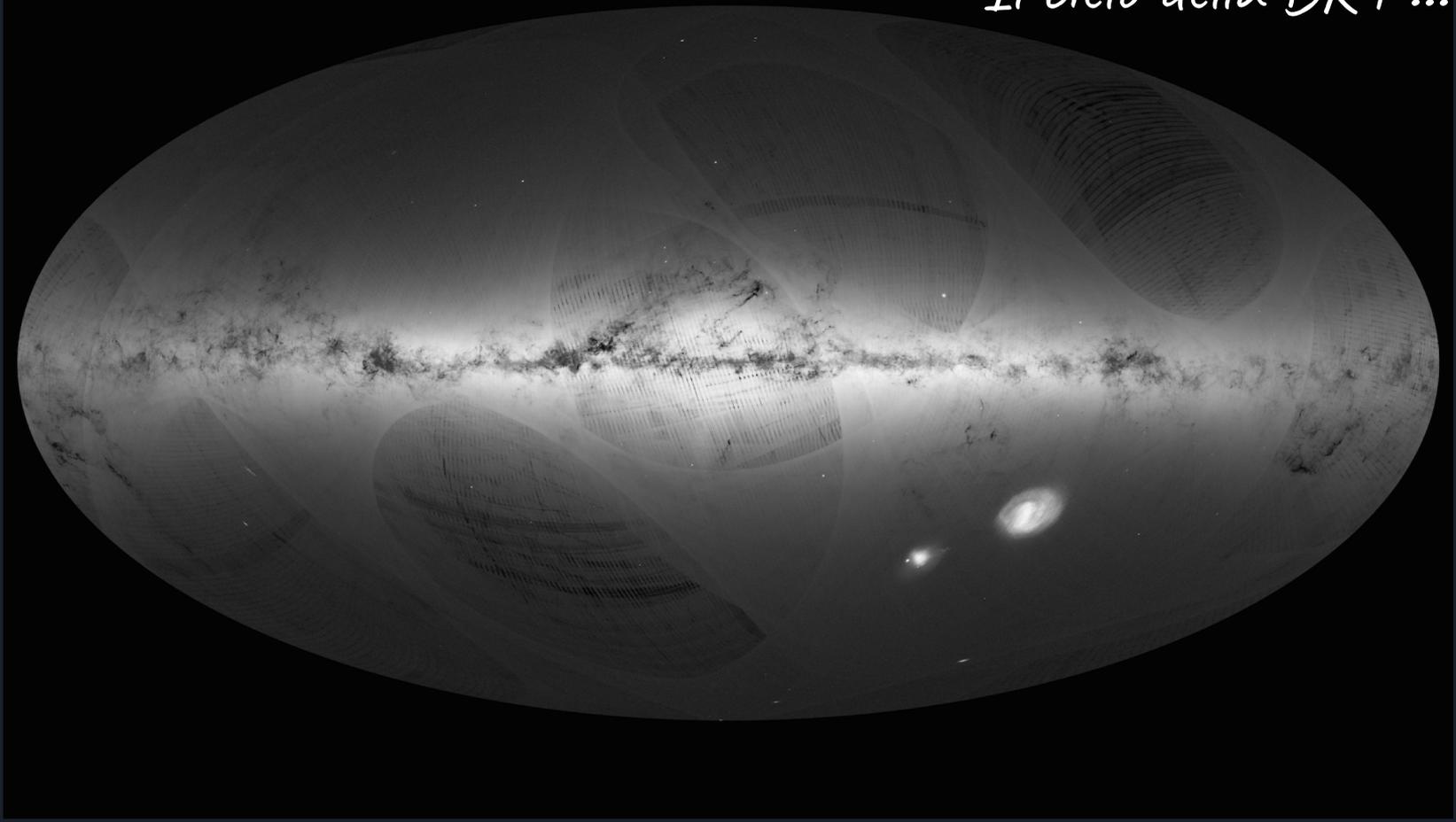
CURRENT DATE AND TIME	2019-05-12T13:30:58 (TCB)
MISSION STATUS	
Satellite distance from Earth (in km)	1,612,867
Number of days having passed since 25 July 2014	1752
OPERATIONS DATA (collected since 2014/07/25)	
Volume of science data collected (in GB)	65,891
Number of object transits through the focal plane	125,767,235,411
Number of astrometric CCD measurements	1,239,705,606,190
Number of photometric CCD measurements	250,994,230,690
Number of spectroscopic CCD measurements	24,246,114,663
Number of object transits through the RVS instrument	8,095,416,231

Data Release 1 (14 settembre 2016)

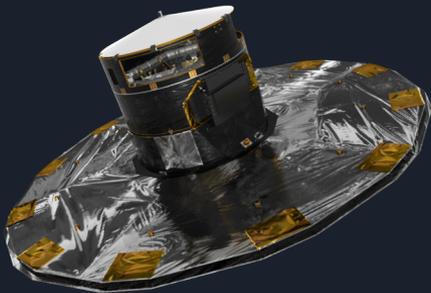
- Posizione e magnitudine G per tutte le sorgenti (più di un miliardo di stelle)
- Posizione e magnitudine G per più di duemila quasar
- Posizione, parallasse e moti propri per le stelle in comune tra Gaia e il catalogo Tycho-2 (circa due milioni di stelle)



Il cielo della DR1 ...



Data Release 2 (25 aprile 2018)



	# sources in Gaia DR2	# sources in Gaia DR1
Total number of sources	1,692,919,135	1,142,679,769
Number of 5-parameter sources	1,331,909,727	2,057,050
Number of 2-parameter sources	361,009,408	1,140,622,719
Sources with mean G magnitude	1,692,919,135	1,142,679,769
Sources with mean G_{BP} -band photometry	1,381,964,755	-
Sources with mean G_{RP} -band photometry	1,383,551,713	-
Sources with radial velocities	7,224,631	-
Variable sources	550,737	3,194
Known asteroids with epoch data	14,099	-
Gaia-CRF sources	556,869	2,191
Effective temperatures (T_{eff})	161,497,595	-
Extinction (A_G) and reddening ($E(G_{BP}-G_{RP})$)	87,733,672	-
Sources with radius and luminosity	76,956,778	-

Il cielo della DR2 ...



*Gaia DR2 has really changed
the field for us*

*Gaia DR2 helped
quite a bit...*

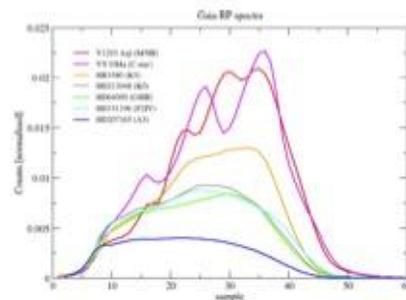
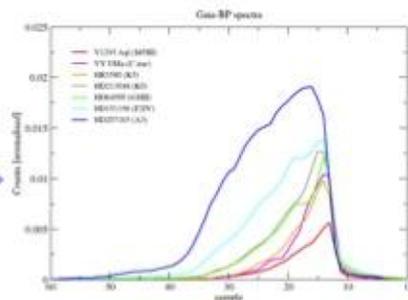
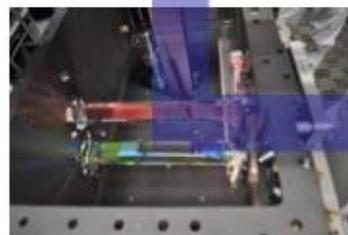
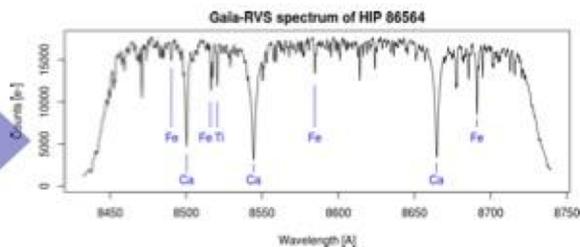
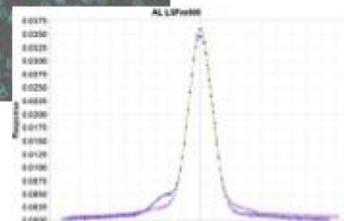
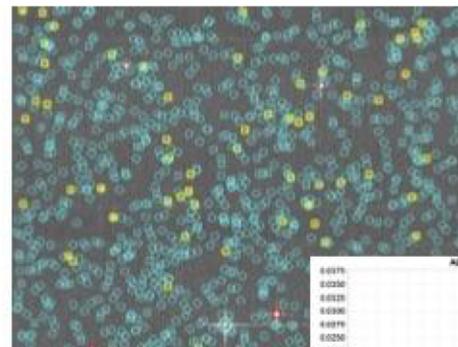
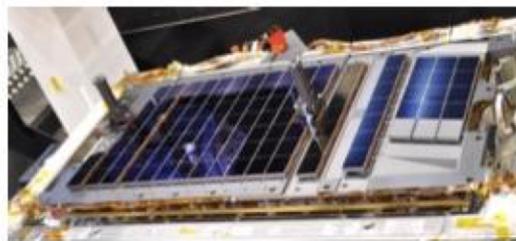
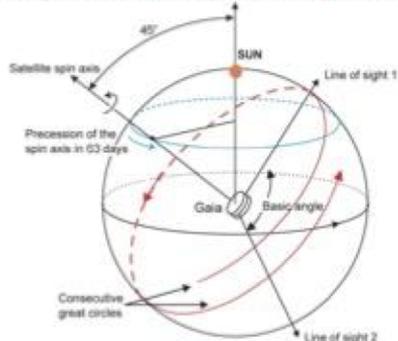
**This would not have been
possible without Gaia DR2**

*Gaia DR2 makes
my life easier*

Revolution!

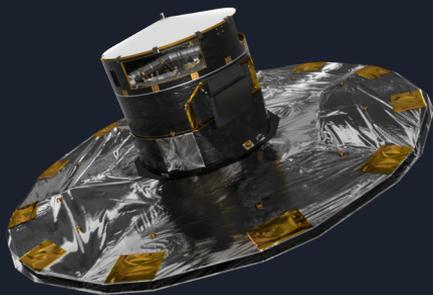


Gaia instruments and measurements



Rilascio previsto dei dati per Gaia EDR3/DR3

- Gaia EDR3 tra ottobre e dicembre 2020
- Gaia DR3 tra luglio e dicembre 2021
- Tutte e due i rilasci condividono la medesima lista delle sorgenti
 - 34 mesi di dati di input



Per la prima volta vengono rilasciati dati per le stelle i cui profili spettrali risultano parzialmente sovrapposti sul rivelatore

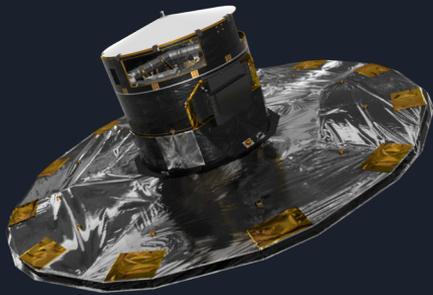
Contents of Gaia EDR3

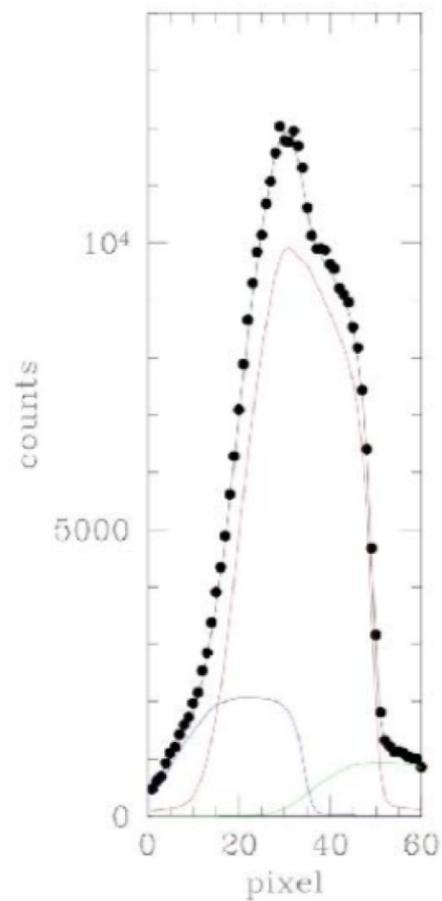
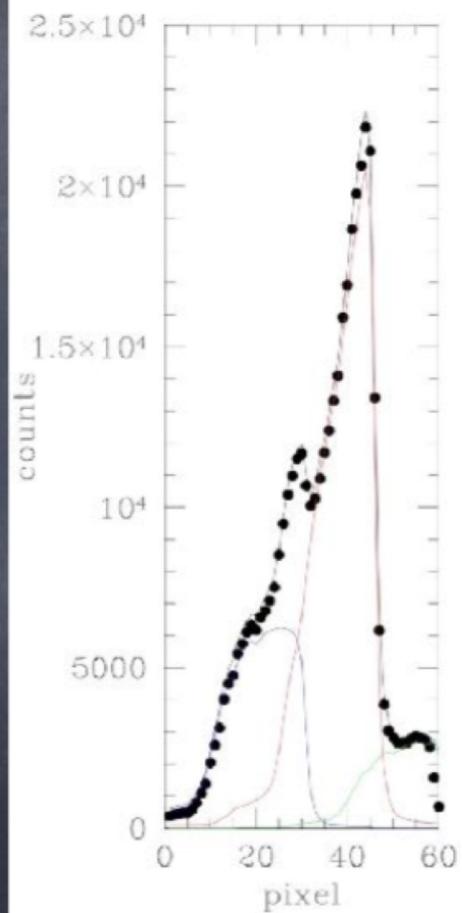
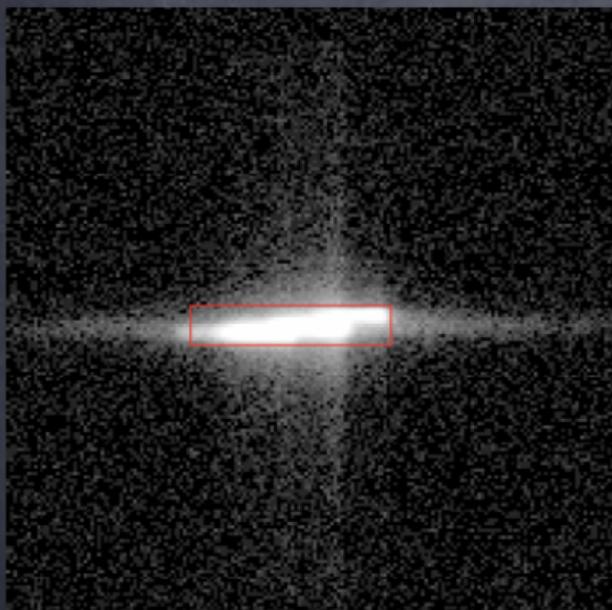
Data Product	No. of sources	Comments
Astrometry	~ 1.8 billion	including new quality indicators: RUWE, source image descriptors
Integrated G , G_{BP} , G_{RP} photometry	~ 1.8 billion	with corresponding passbands
QSO host and galaxy morphological characterization	~ 3 million	based on input list
Cross-match with external catalogues		
Gaia-CRF		
DR2-to-DR3 match table		

Contents of Gaia DR3

Data Product	No. of sources	Comments
Repeat of EDR3 contents		
Source Classification and astrophysical parameters	\gtrsim 300 million	based on the BP/RP spectra, magnitude limit TBD
Radial velocities	\sim 30 million	$G_{RVS} \lesssim 14$
<u>Mean</u> BP/RP/RVS spectra	TBD subset of sources	
Photometric variability characterization, classification, light curves	\sim 7 million	eclipsing, (MS) pulsating, transients, spotted, flaring, evolved pulsators, and quasars
Solar system objects epoch astrometry/photometry	\sim 100 000	including orbit solutions
Solar system objects mean BP/RP reflectance spectra	\sim 5000	
Catalogue of astrometric, spectroscopic, eclipsing non-single stars	TBD	Combined solutions where possible

Il problema dei campi affollati...





HD 270801

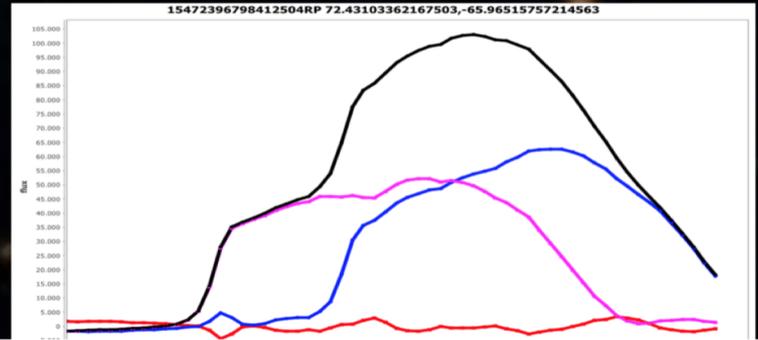
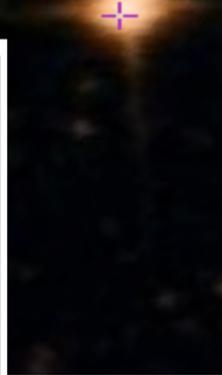
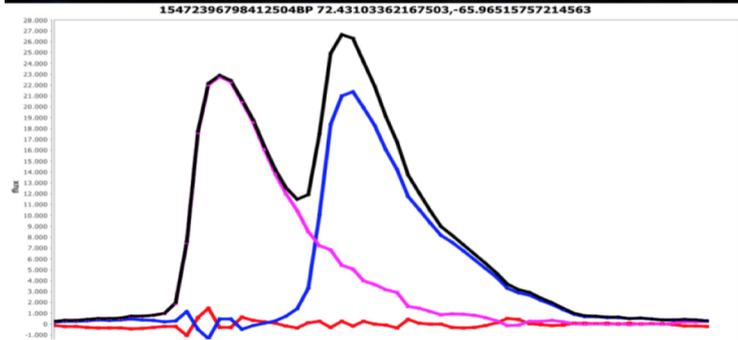
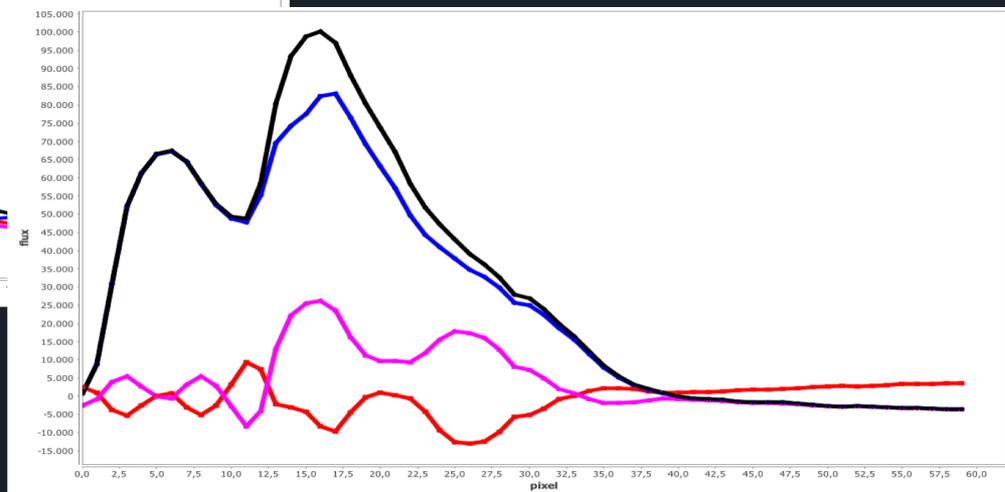
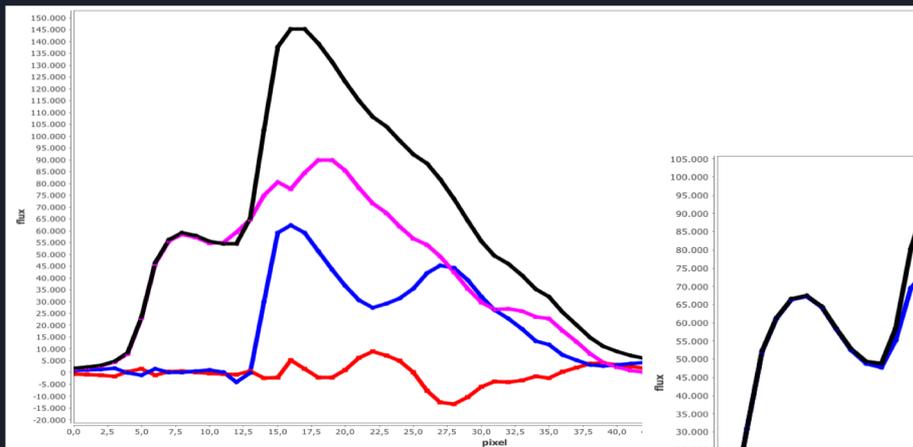


Immagine DSS della stella doppia **HD270801**.

Sinistra: in nero, lo spettro osservato BP e in magenta e blu, i due spettri estratti; in rosso i residui. **Destra:** lo stesso per RP

Come valutare la bontà del “deblending” ?



Valutare i residui non basta...

A&A 559, A7 (2013)
DOI: [10.1051/0004-6361/201321445](https://doi.org/10.1051/0004-6361/201321445)
© ESO 2013

**Astronomy
&
Astrophysics**

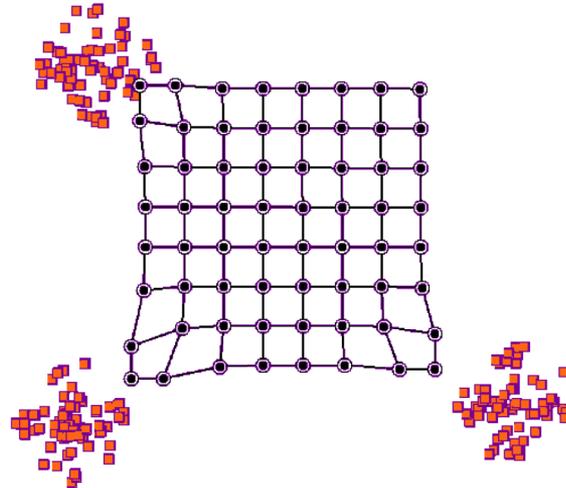
An approach to the analysis of SDSS spectroscopic outliers based on self-organizing maps

Designing the outlier analysis software package for the next *Gaia* survey

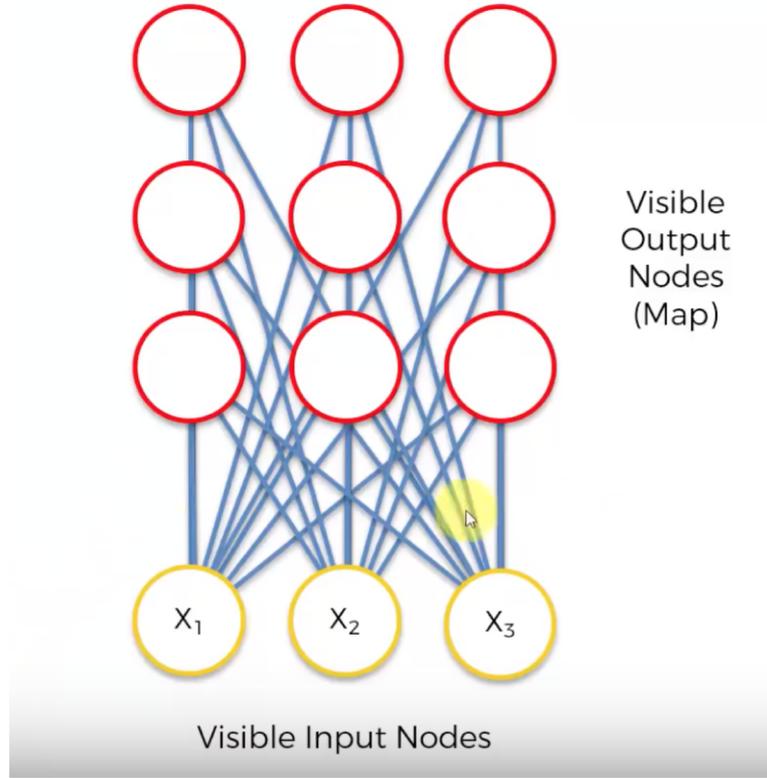
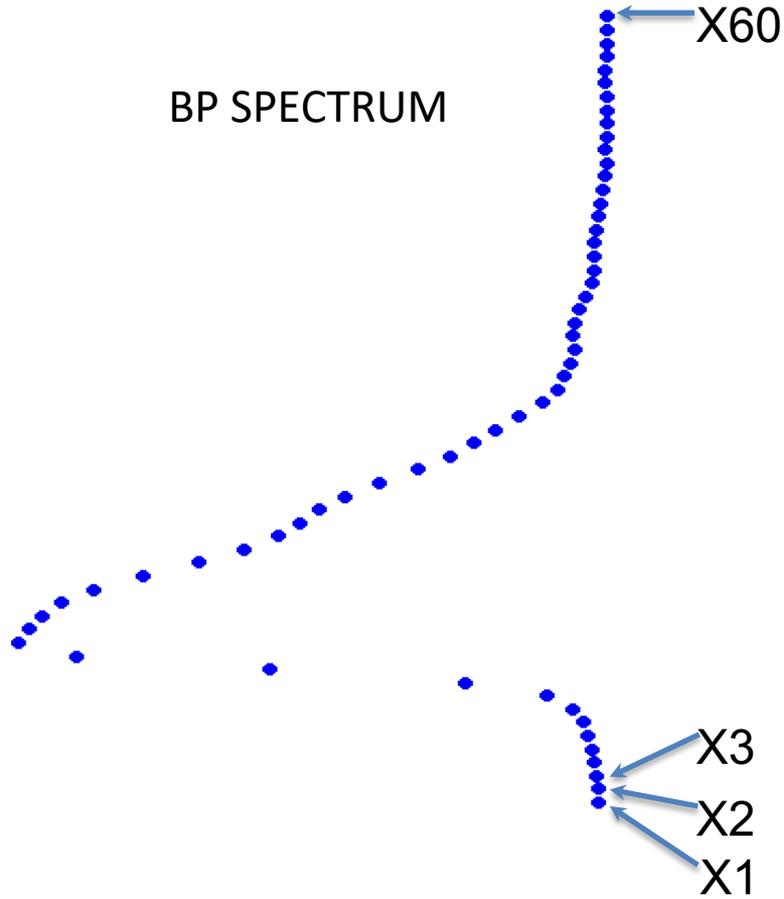
D. Fustes¹, M. Manteiga¹, C. Dafonte¹, B. Arcay¹, A. Ulla², K. Smith³, R. Borrachero⁴, and R. Sordo⁵

Le *Self-Organizing Map* sono un metodo di analisi dati adatto ad individuare relazioni di similarità

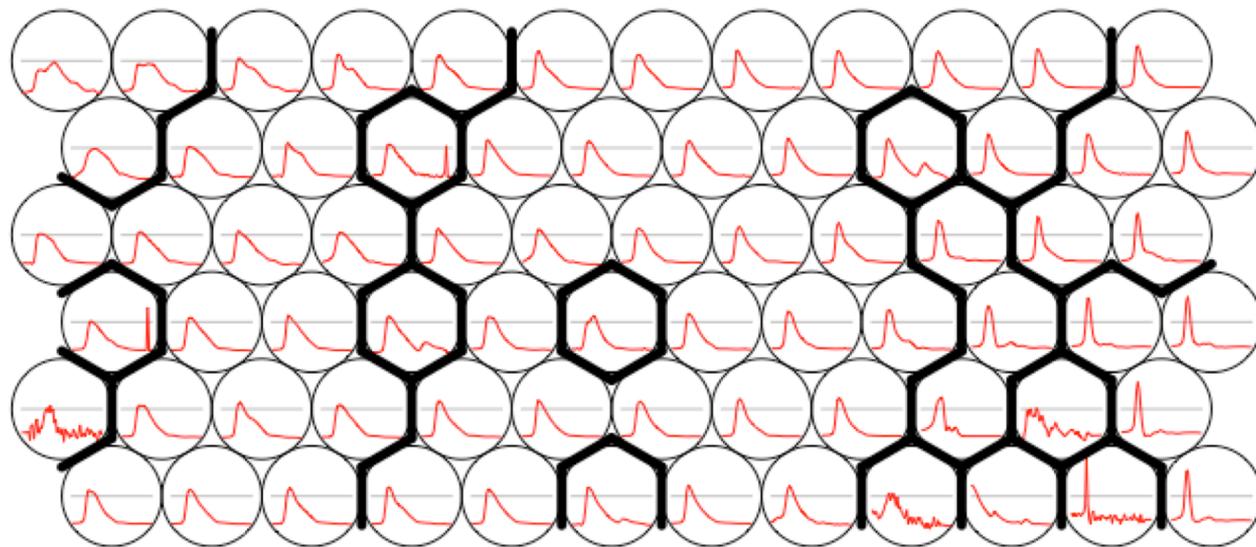
Kohonen T. (1995) Self-Organizing Maps. Springer-Verlag, Berlin



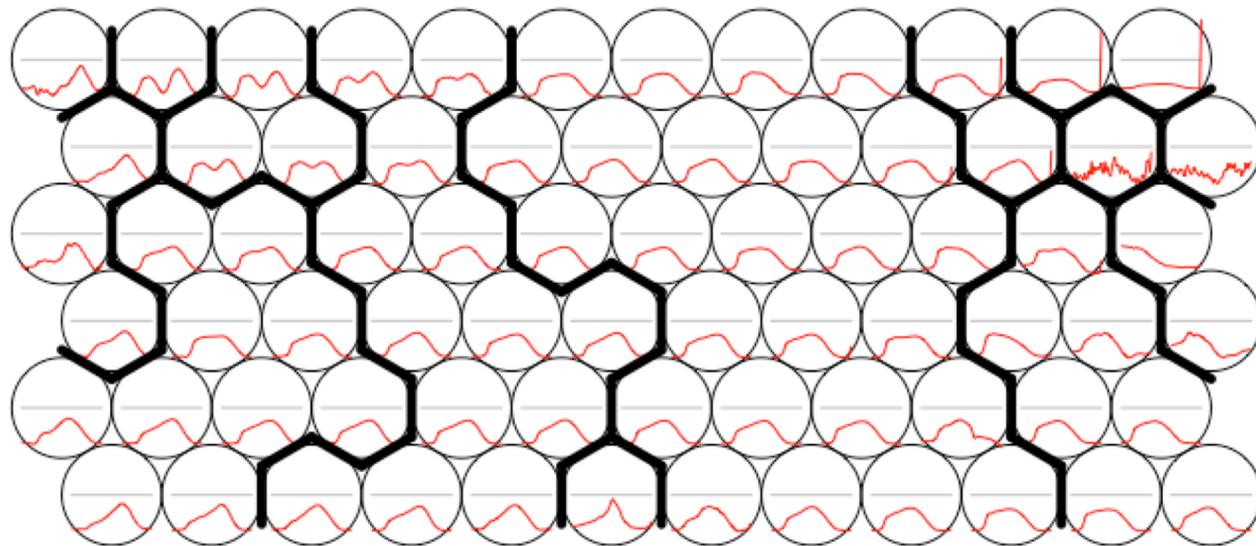
BP SPECTRUM



Self Organized Map degli spettri BP



Self Organized Map degli spettri RP

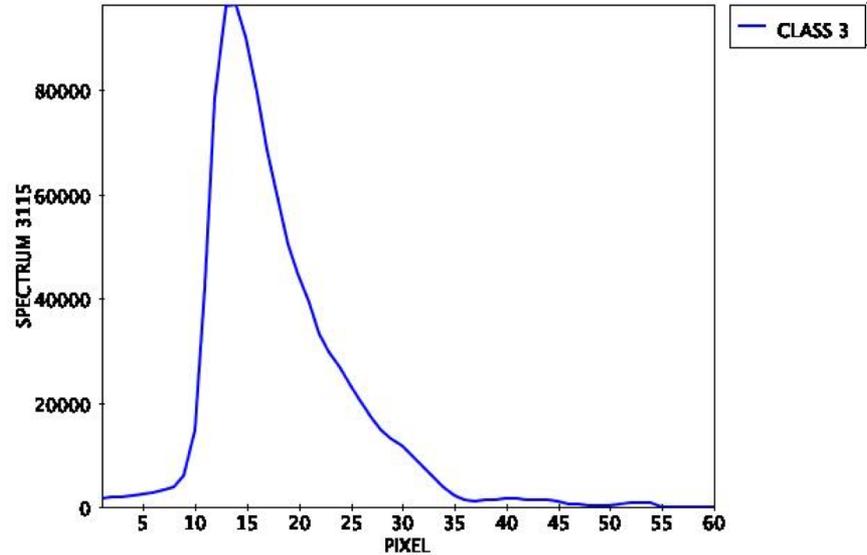


Classificazione spettri “validi” BP

TOPCAT(12): Row Subsets

Row Subsets for 12: spectraBpClassified.csv

ID	Name	Size	Fraction
_1	All	3119	100%
_2	cluste_4	793	25%
_3	cluste_5	714	23%
4	cluste_3	585	19%
_5	cluste_9	521	17%
_6	cluste_6	152	5%
_7	cluste_8	105	3%
_8	cluste_15	51	2%
_9	cluste_1	39	1%
_10	cluste_16	37	1%
_11	cluste_11	33	1%
_12	cluste_14	22	1%
_13	cluste_7	21	1%
_14	cluste_2	14	0%
_15	cluste_18	14	0%
_16	cluste_17	5	0%
_17	cluste_10	4	0%
_18	cluste_13	4	0%
_19	cluste_19	3	0%
_20	cluste_20	2	0%

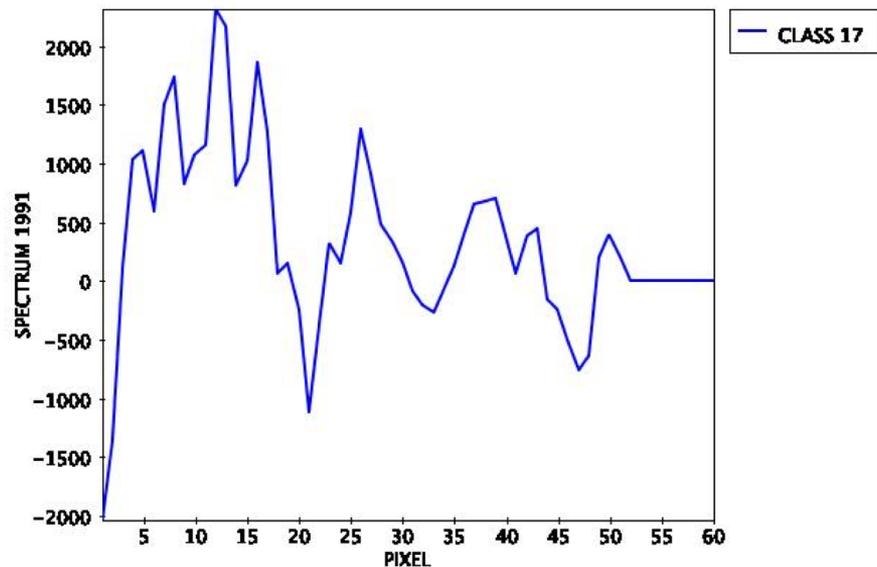


Classificazione di spettri “rigettati” BP

TOPCAT(12): Row Subsets

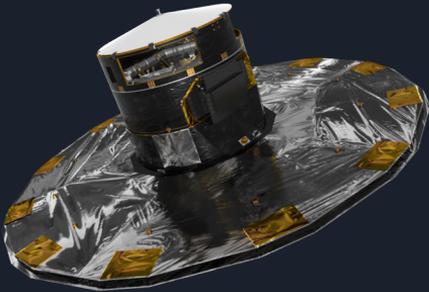
Row Subsets for 12: spectraBpClassified.csv

ID	Name	Size	Fraction
_1	All	3119	100%
_2	cluste_4	793	25%
_3	cluste_5	714	23%
_4	cluste_3	585	19%
_5	cluste_9	521	17%
_6	cluste_6	152	5%
_7	cluste_8	105	3%
_8	cluste_15	51	2%
_9	cluste_1	39	1%
_10	cluste_16	37	1%
_11	cluste_11	33	1%
_12	cluste_14	22	1%
_13	cluste_7	21	1%
_14	cluste_2	14	0%
_15	cluste_18	14	0%
_16	cluste_17	5	0%
_17	cluste_10	4	0%
_18	cluste_13	4	0%
_19	cluste_19	3	0%
_20	cluste_20	2	0%

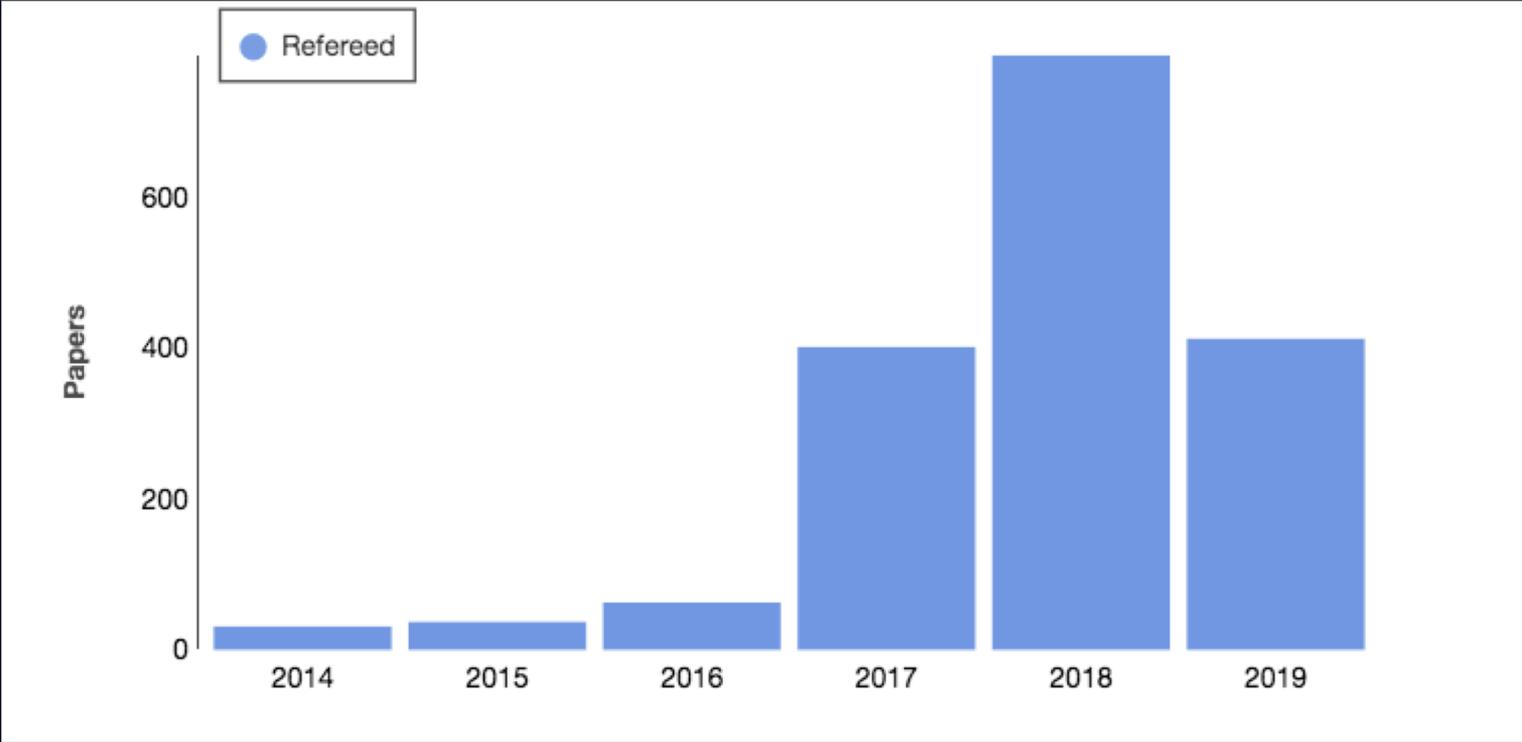


E poi? Il futuro di Gaia...

- La missione nominale termina a metà di quest'anno
- Hardware in ottime condizioni
- Fattore limitante, la quantità di carburante
- La missione potrebbe durare fino al 2024!
- Approvata estensione al 2020
- Possibilità di successive estensioni, già proposte



Gaia per la comunità scientifica... un progetto europeo che “funziona”



A person wearing a cap and a jacket is sitting on a wooden bench in a field at night. They are looking towards the sky, where the Milky Way galaxy is visible as a bright, cloudy band of stars. The field is dark with some dry grass and a few small structures in the distance.

Grazie per l'attenzione!

Marco Castellani

www.marcocastellani.me