Space Science Data Center
a Research Infrastructure by ASI

L. Angelo Antonelli

Italian Space Agency

agenzia spaziale
italiana

SSDC
SPACE SCIENCE DATA CENTER

ASI - Italian Space Agency

The Space Science Data Center is a Research Infrastructure of the Italian Space Agency

SSDC
SPACE SCIENCE DATA CENTER

ASI - Italian Space Agency

MAIN GOAL

acquire, manage, process and distribute data from (mainly) space based mission adopting the FAIR (Findable, Accessible, Interoperable, Reusable) principles.

SSDC adopts international standards ensuring both the long term preservation of archives and the interoperability with other data centers.

SSDC
SPACE SCIENCE DATA CENTER

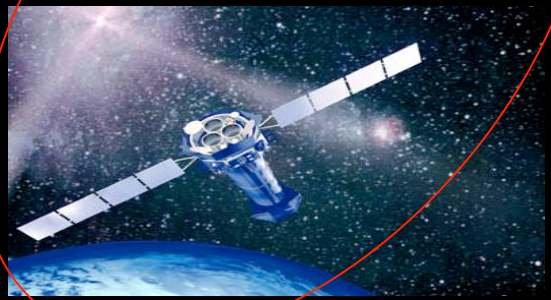
ASI - Italian Space Agency

Space Science Data Center

Since 2017

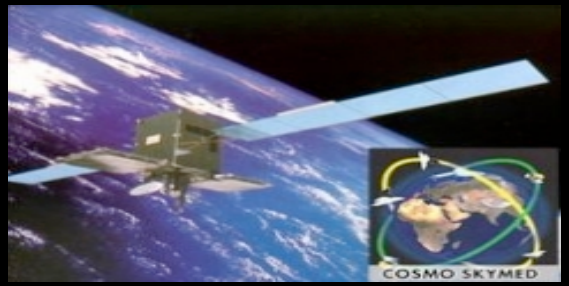
ex - ASDC

Universe Observation



Information & Computing Technologies

Earth Observation

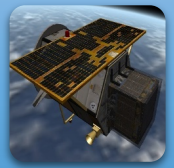


From ASDC to SSDC

ASI Science Data Center (ASDC) was founded in 2000 after the experience acquired by the previous BeppoSAX Science Data Centre in 1990s. The goal of ASDC was to support scientific mission operations for the Universe observation and exploration. In the past 20 years ASDC has provided operational scientific support to more than **25 space missions**.

Beppo SAX (Bruno Rossi Prize)

- 1996 - 2002
- X-Ray and Gamma-Ray Astrophysics



Agile (Bruno Rossi Prize)

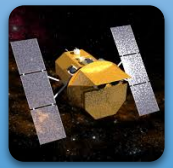
- 2007
- X-Ray and Gamma-Ray Astrophysics

Gaia

- 2013
- Astrometry and Stellar Astrophysics

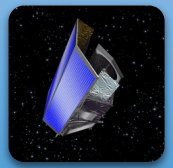
Fermi (Bruno Rossi Prize)

- 2008
- X-Ray and Gamma-Ray Astrophysics



Swift (Bruno Rossi Prize)

- 2004
- X-Ray and Gamma-Ray Astrophysics



Euclid

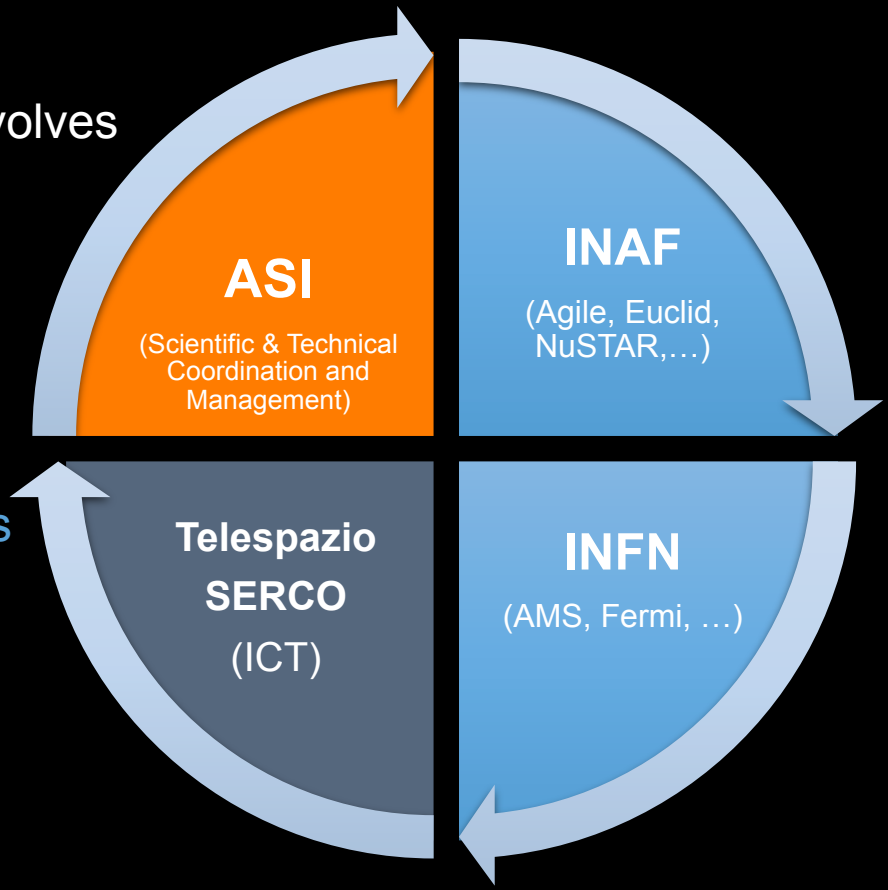
- 2022
- Dark Energy and Dark Matter

SSDC – Universe Observation

SSDC – UO management and organization involves several Research Institutes:

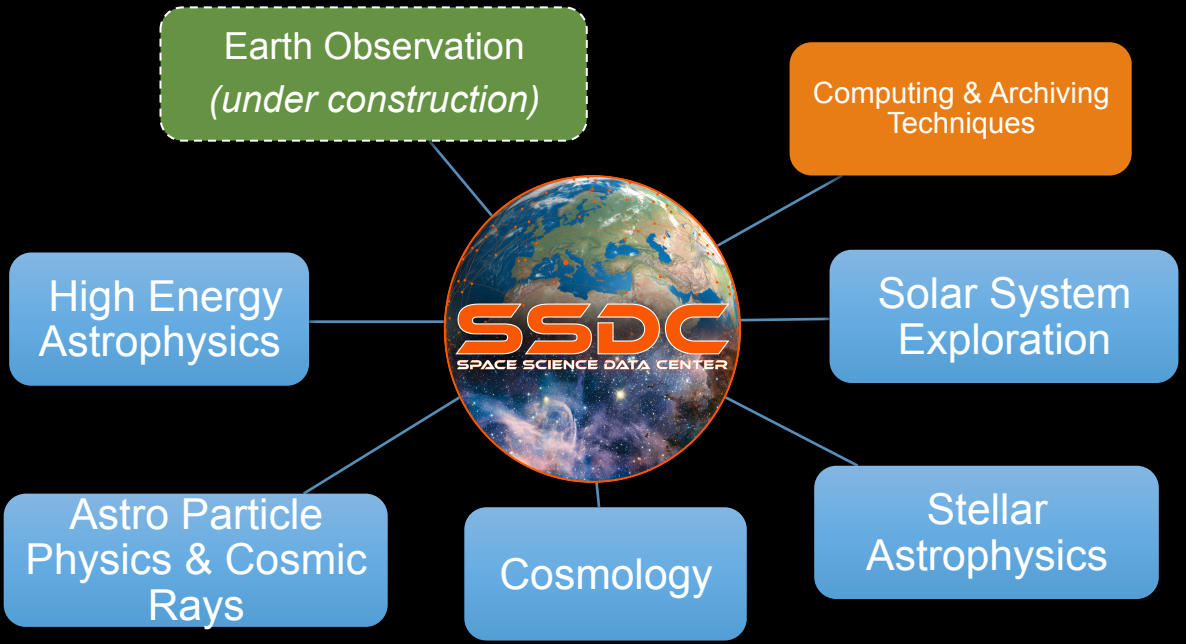
- **ASI** – Italian Space Agency
- **INAF** – National Institute for Astrophysics
- **INFN** – National Institute for Nuclear Physics

Industries are involved for Information and Communication Technology supports.



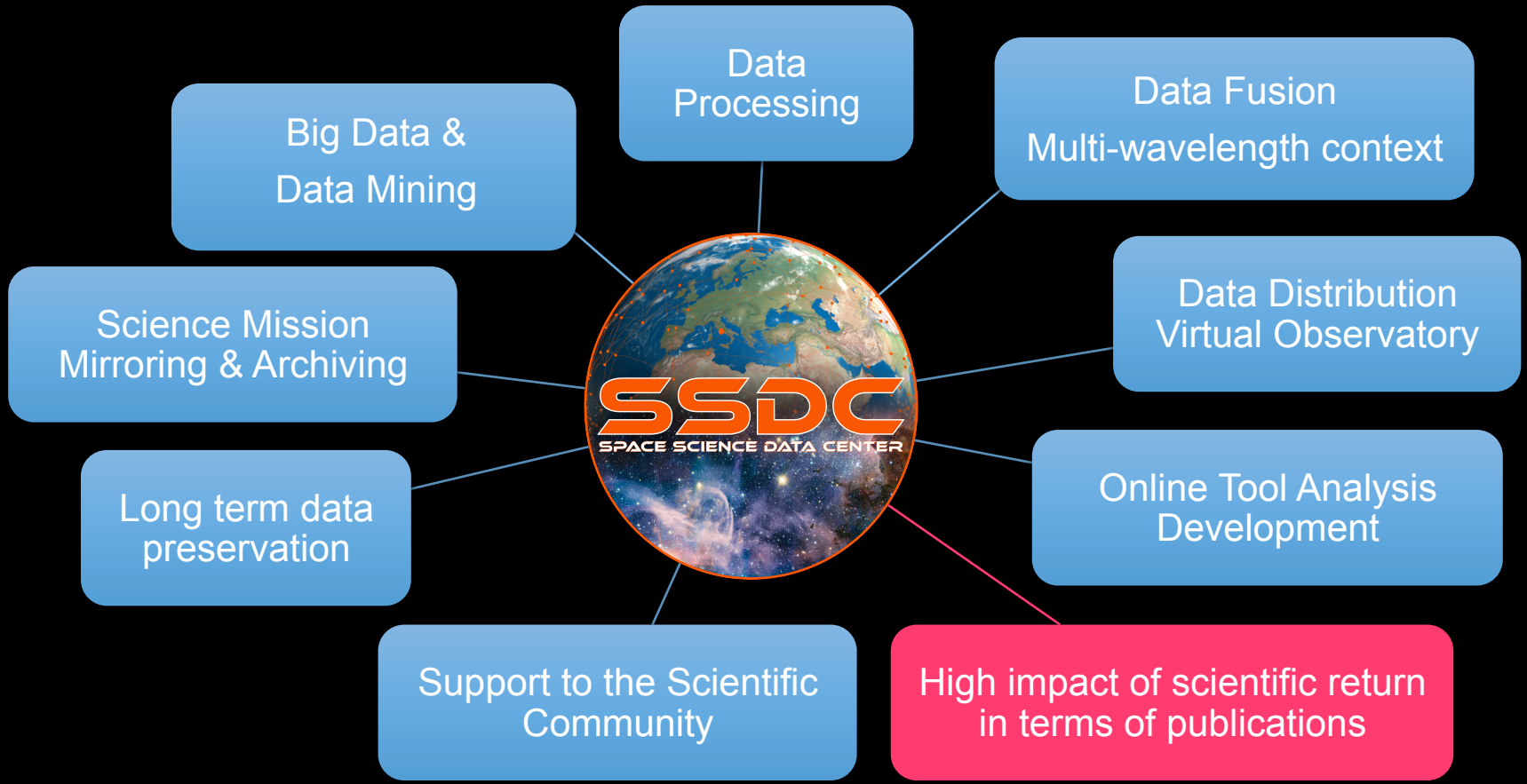
SSDC Scientific Expertise

At present, SSDC team involves around 40 people: scientists from ASI, INAF, INFN and SW engineers from Telespazio & SERCO, expert in different fields.



Effective approach: Developers and Users belong to same communities.

SSDC Experience



SSDC Science Gateway

Science Tools allow the on-line access to data within a multifrequency environment

On-line Access to Space Missions Data Archives

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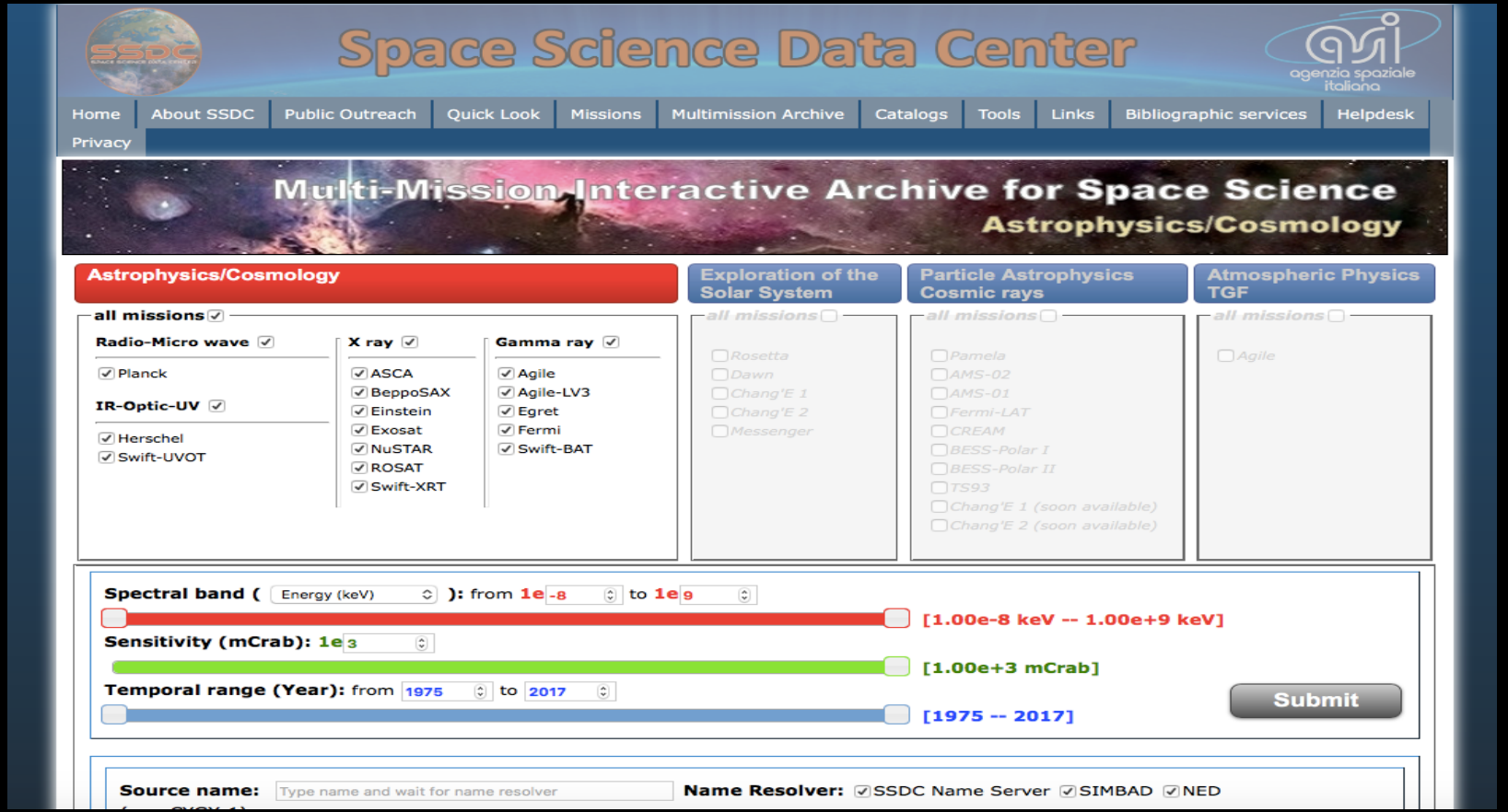
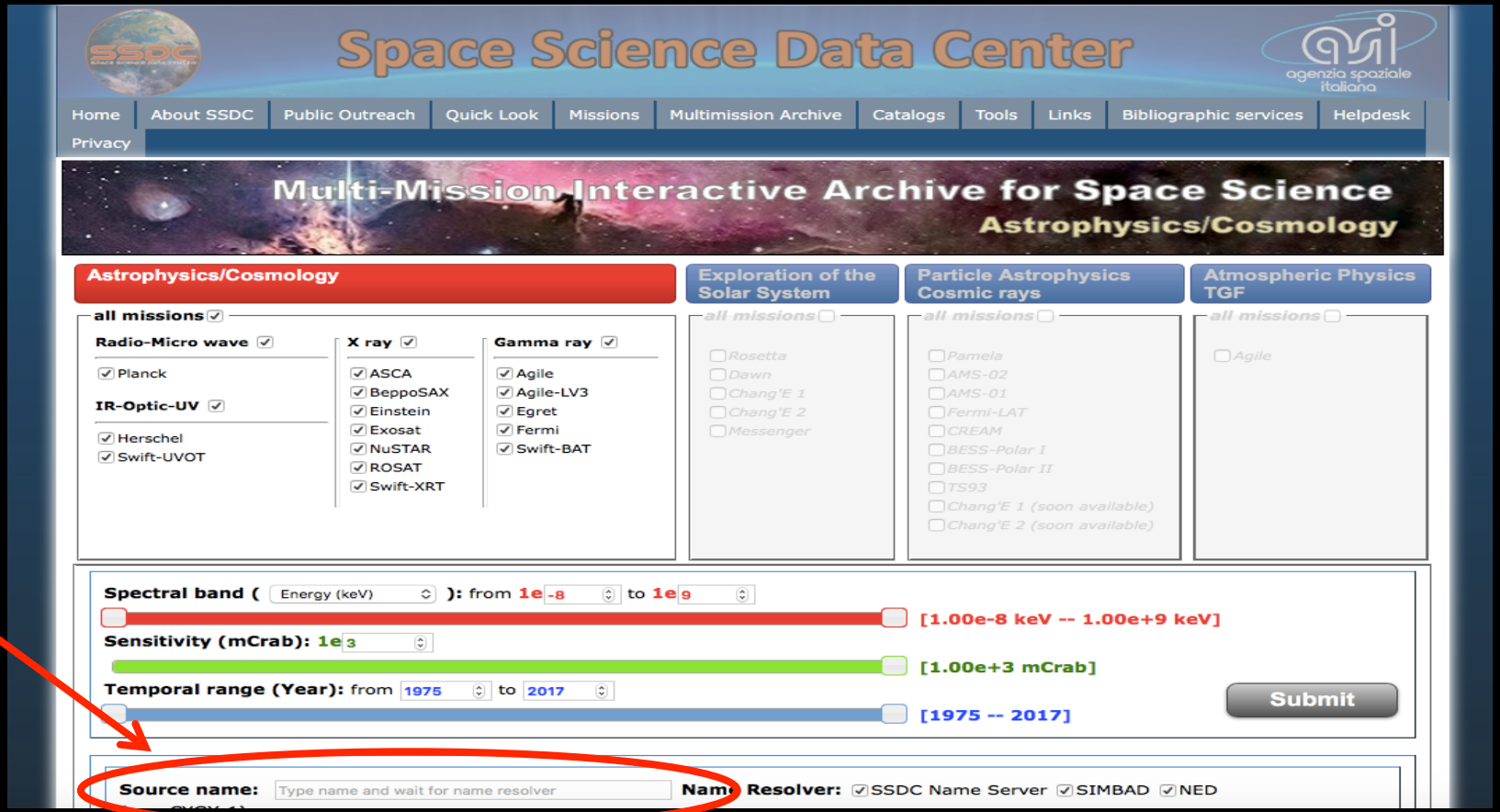


The Multi-Mission Interactive Archive



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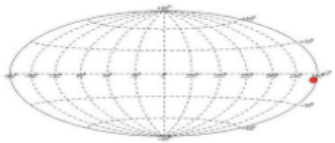
Multi-Mission Interactive Archive

Query results for: **CRAB**
RA = **83.6328** (deg); DEC = **22.014434** (deg); EQUINOX = **2000**
Source name resolved by **ASDC**



Source Names

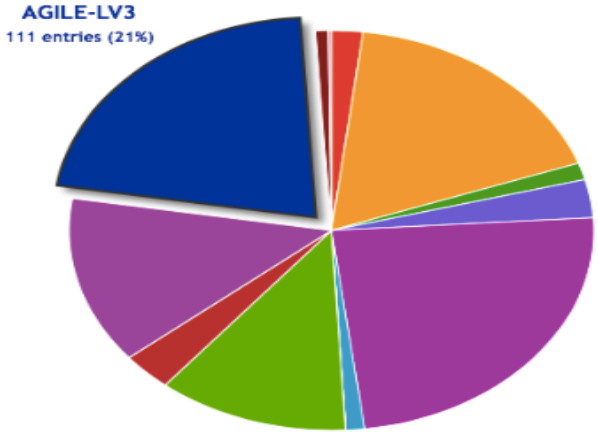
Bibliographic search

PKS0531+219

in time range between 1900 and 2017

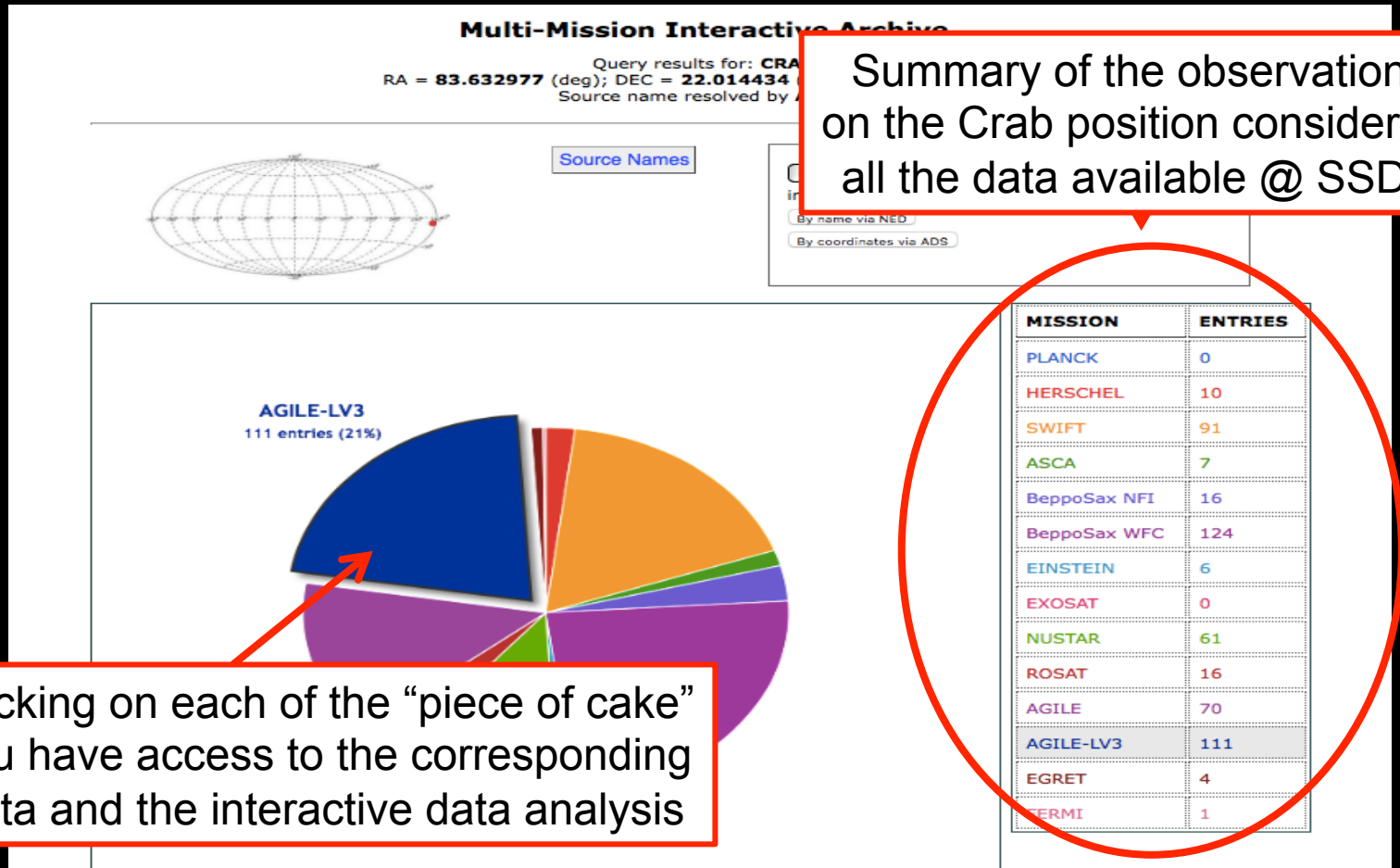
By name via NED

By coordinates via ADS



MISSION	ENTRIES
PLANCK	0
HERSCHEL	10
SWIFT	91
ASCA	7
BeppoSax NFI	16
BeppoSax WFC	124
EINSTEIN	6
EXOSAT	0
NUSTAR	61
ROSAT	16
AGILE	70
AGILE-LV3	111
EGRET	4
FERMI	1

The Multi-Mission Interactive Archive



Summary of the observations on the Crab position considering all the data available @ SSDC

Clicking on each of the “piece of cake” you have access to the corresponding data and the interactive data analysis

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Print complete table

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AGILE-LV3 Data

Query results for: 83.632977, 22.014434 (in RA, DEC)

Details: query by **COORDINATE** & **TIME** with **RA** = 83.632977; **DEC** = 22.014434; **L** = 184.557455; **B** = -5.784478; **Lon** = 84.097402; **Lat** = -1.294493; **EQUINOX** = 2000; **RADIUS** = 30 degrees; **Start date** = 01-12-2007; **End date** = 03-11-2017; **Duration** = 28 day(s); **Min EXP** = 100 cm² s sr; sort by **START DATE**; max lines retrieved 5000;

Modify AGILE-LV3 query parameters

Make Light Curve: LC likelihood

Export Current view of Table in: Latex format | FITS format | Raw text format | CSV text format | Browse table

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s view includes 111 entries

Entry number Selection mode: Include All		GRID LV3 data retrieval	GRID Interactive Analysis	START DATE	STOP DATE	RA (J2000) hh mm ss.d	DEC (J2000) dd mm ss.d	MEAN EXP (cm² s sr) Stats	Dist. from searched position degrees
1 Select	SSDC Data Explorer	Data Access	Interactive Analysis	2008-01-21 12:00:00	2008-02-18 12:00:00	04 36 06.62	+17 42 29.52	863.166	14.38
2 Select	SSDC Data Explorer	Data Access	Interactive Analysis	2008-03-17 12:00:00	2008-04-14 12:00:00	04 36 06.62	+17 42 29.52	1773.82	14.38
3 Select	SSDC Data Explorer	Data Access	Interactive Analysis	2008-06-09 12:00:00	2008-07-07 12:00:00	04 36 06.62	+17 42 29.52	163.635	14.38
4 Select	SSDC Data Explorer	Data Access	Interactive Analysis	2008-07-07 12:00:00	2008-08-04 12:00:00	04 36 06.62	+17 42 29.52	1343.54	14.38

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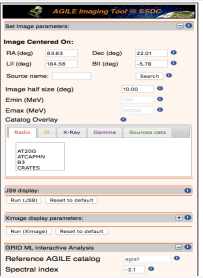
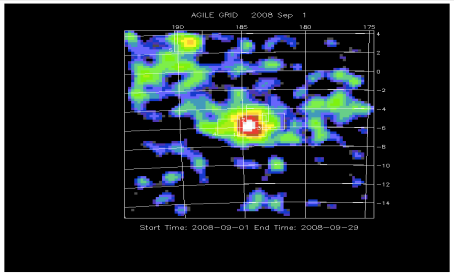
Help





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Modify AGILE-LV3 query parameters

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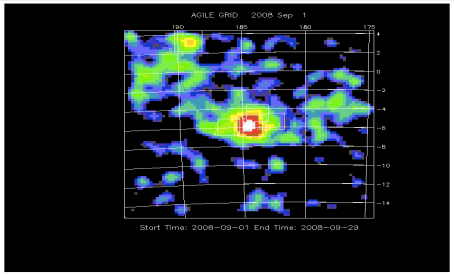

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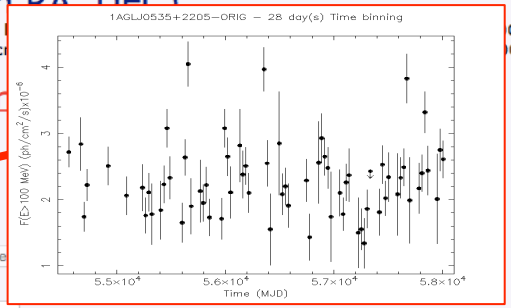

Make Light Curve: LC likelihood

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Multi-Mission Interactive Archive

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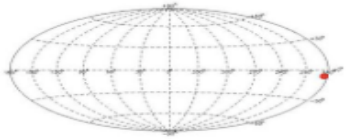

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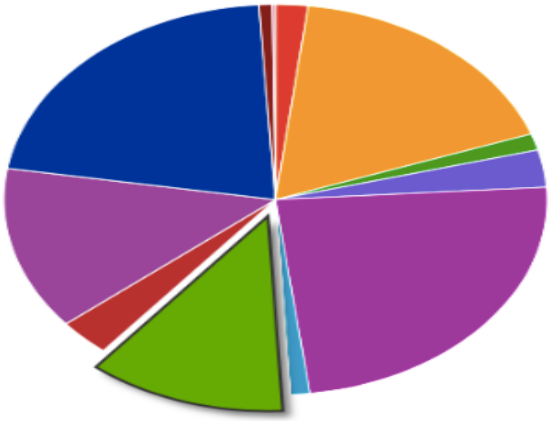

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AGILE-LV3	111
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FERMI	1

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Query results for: 83.632977, 22.014434 (in RA, DEC)

Details: query by **COORDINATE** with **RA** = 83.632977; **DEC** = 22.014434; **EQUINOX** = 2000; **RADIUS** = 10 arcmin; sort by **RA**; max lines retrieved: 5000 (on BROWSE catalog **numaster**)

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view includes 61 entries

Entry number Selection mode: Include All		Archive	Interactive Analysis	Target Name	obsid	RA (J2000) hh mm ss.d	Dec (J2000) dd mm ss.d	time	public_date	exposure_a	exposure_b	status	Dist. from searched position arcmin
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2	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL08	10013028002	05 34 10.36	+22 00 42.12	Sep 28, 2012 00:21:00	Sep 23, 2014 00:00:00	1601.8016	1564.5691	ARCHIVED	4.9
3	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_OA04	10013004002	05 34 10.89	+22 01 14.52	Jul 24, 2012 17:06:00	Sep 23, 2014 00:00:00	308.8379	298.59	ARCHIVED	4.8
4	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL08	10013028004	05 34 11.85	+22 00 51.47	Sep 28, 2012 05:11:00	Sep 23, 2014 00:00:00	1254.35	1225.3015	ARCHIVED	4.6
5	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL07	10013027004	05 34 14.06	+22 01 10.92	Sep 27, 2012 09:51:00	Sep 23, 2014 00:00:00	1105.0882	1090.9042	ARCHIVED	4.1
6	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL07	10013027002	05 34 14.59	+22 01 14.88	Sep 27, 2012 04:56:00	Sep 23, 2014 00:00:00	1182.0179	1166.5398	ARCHIVED	4
7	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_OA10	10013010001	05 34 17.01	+22 02 10.68	Jul 25, 2012 15:26:00	Sep 23, 2014 00:00:00	282.832	280.6575	ARCHIVED	3.6
8	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL13	10013033002	05 34 17.28	+21 59 13.56	Dec 19, 2012 22:46:00	Sep 23, 2014 00:00:00	1383.0562	1410.8179	ARCHIVED	3.7
9	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL04	10013024002	05 34 18.72	+22 00 04.32	Sep 20, 2012 11:16:00	Sep 23, 2014 00:00:00	2258.5909	2246.7719	ARCHIVED	3.1

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Query results for: **83.632977, 22.014434 (in RA, DEC)**

Details: query by **COORDINATE** with **RA** = 83.632977; **DEC** = 22.014434; **EQUINOX** = 2000; **RADIUS** = 10 arcmin; sort by **RA**; max lines retrieved: 5000 (on BROWSE catalog **numaster**)

Direct access to the *SSDC Data Explorer* tool

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view includes 61 entries

Entry number Selection mode: Include All		Archive	Interactive Analysis	Target Name	obsid	RA (J2000) hh mm ss.d	Dec (J2000) dd mm ss.d	time	public_date	exposure_a	exposure_b	status	Dist. from searched position arcmin
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4	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL08	10013028004	05 34 11.85	+22 00 51.47	Sep 28, 2012 05:11:00	Sep 23, 2014 00:00:00	1254.35	1225.3015	ARCHIVED	4.6
5	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL07	10013027004	05 34 14.06	+22 01 10.92	Sep 27, 2012 09:51:00	Sep 23, 2014 00:00:00	1105.0882	1090.9042	ARCHIVED	4.1
6	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL07	10013027002	05 34 14.59	+22 01 14.88	Sep 27, 2012 04:56:00	Sep 23, 2014 00:00:00	1182.0179	1166.5398	ARCHIVED	4
7	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_OA10	10013010001	05 34 17.01	+22 02 10.68	Jul 25, 2012 15:26:00	Sep 23, 2014 00:00:00	282.832	280.6575	ARCHIVED	3.6
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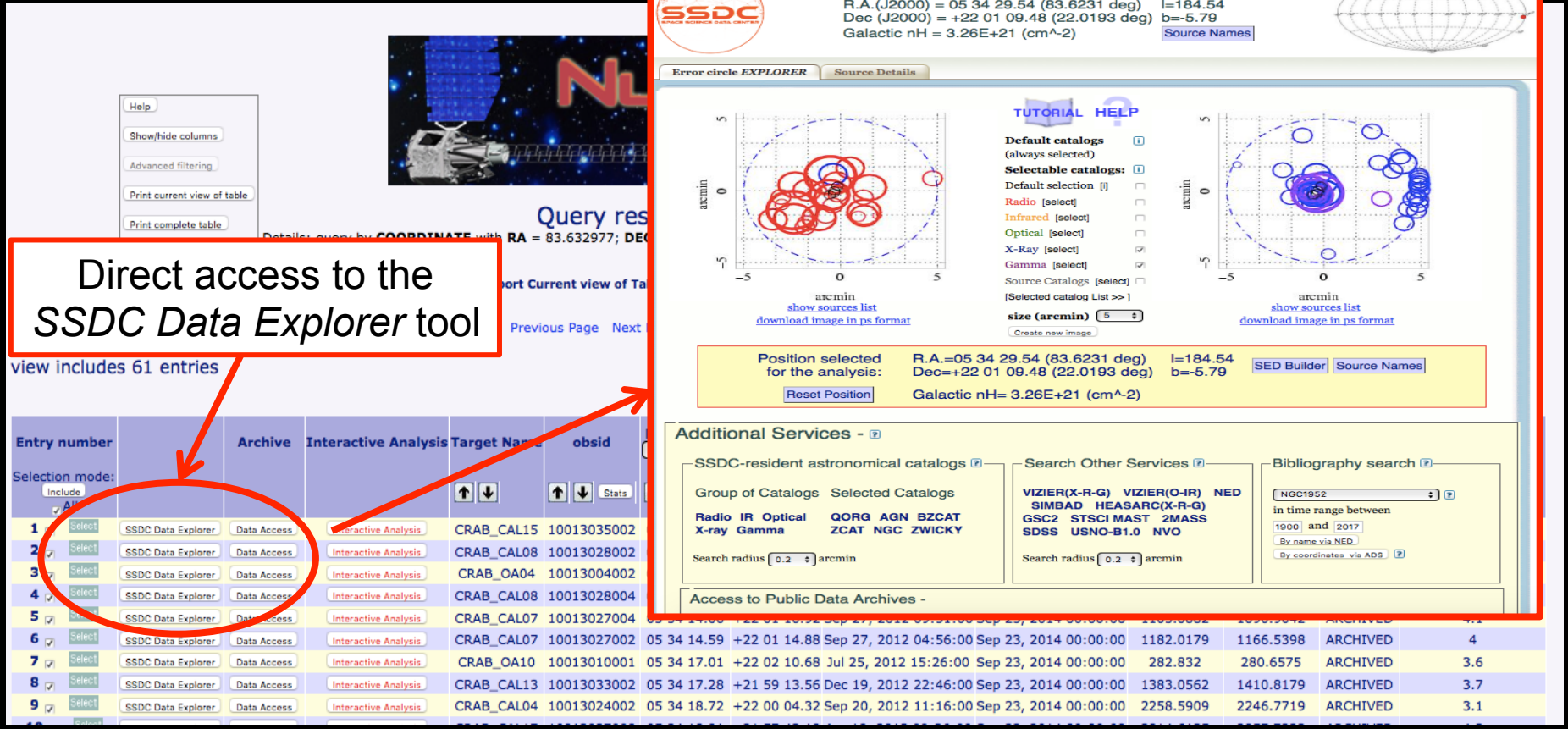
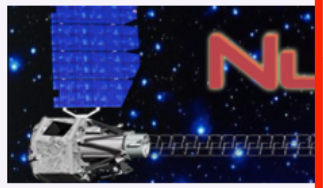


The Multi-Mission Interactive Archive



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Query res

Details: query by **COORDINATE** with **RA** = 83.632977; **DEC**

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view includes 61 entries

Entry number		Archive	Interactive Analysis	Target Name	obsid						
Selection mode: Include All											
1	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL15	10013035002					
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6	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL07	10013027002	05 34 14.59	+22 01 14.88	Sep 27, 2012 04:56:00	Sep 23, 2014 00:00:00	1182.0179	1166.5398	ARCHIVED	4
7	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_OA10	10013010001	05 34 17.01	+22 02 10.68	Jul 25, 2012 15:26:00	Sep 23, 2014 00:00:00	282.832	280.6575	ARCHIVED	3.6
8	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL13	10013033002	05 34 17.28	+21 59 13.56	Dec 19, 2012 22:46:00	Sep 23, 2014 00:00:00	1383.0562	1410.8179	ARCHIVED	3.7
9	Select	SSDC Data Explorer	Data Access	Interactive Analysis	CRAB_CAL04	10013024002	05 34 18.72	+22 00 04.32	Sep 20, 2012 11:16:00	Sep 23, 2014 00:00:00	2258.5909	2246.7719	ARCHIVED	3.1

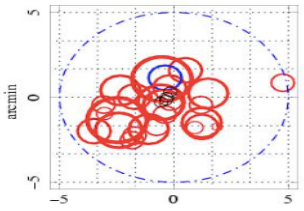
SSDC

Entry CRAB
R.A.(J2000) = 05 34 29.54 (83.6231 deg) l=184.54
Dec (J2000) = +22 01 09.48 (22.0193 deg) b=-5.79
Galactic nH = 3.26E+21 (cm^-2) Source Names

Error circle *EXPLORER* | Source Details

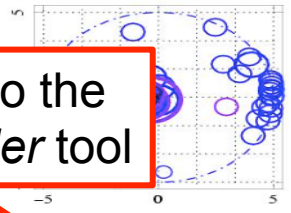
TUTORIAL HELP

Default catalogs



arcmin
show sources list
download image in ps format

Source Catalogs [select]
[Selected catalog List >>]
size (arcmin) 5
Create new image



arcmin
show sources list
download image in ps format

Access to the *SEDBuilder* tool

Position selected for the analysis:
R.A.=05 34 29.54 (83.6231 deg) l=184.54
Dec=+22 01 09.48 (22.0193 deg) b=-5.79
Reset Position
Galactic nH= 3.26E+21 (cm^-2)
SED Builder Source Names

Additional Services -

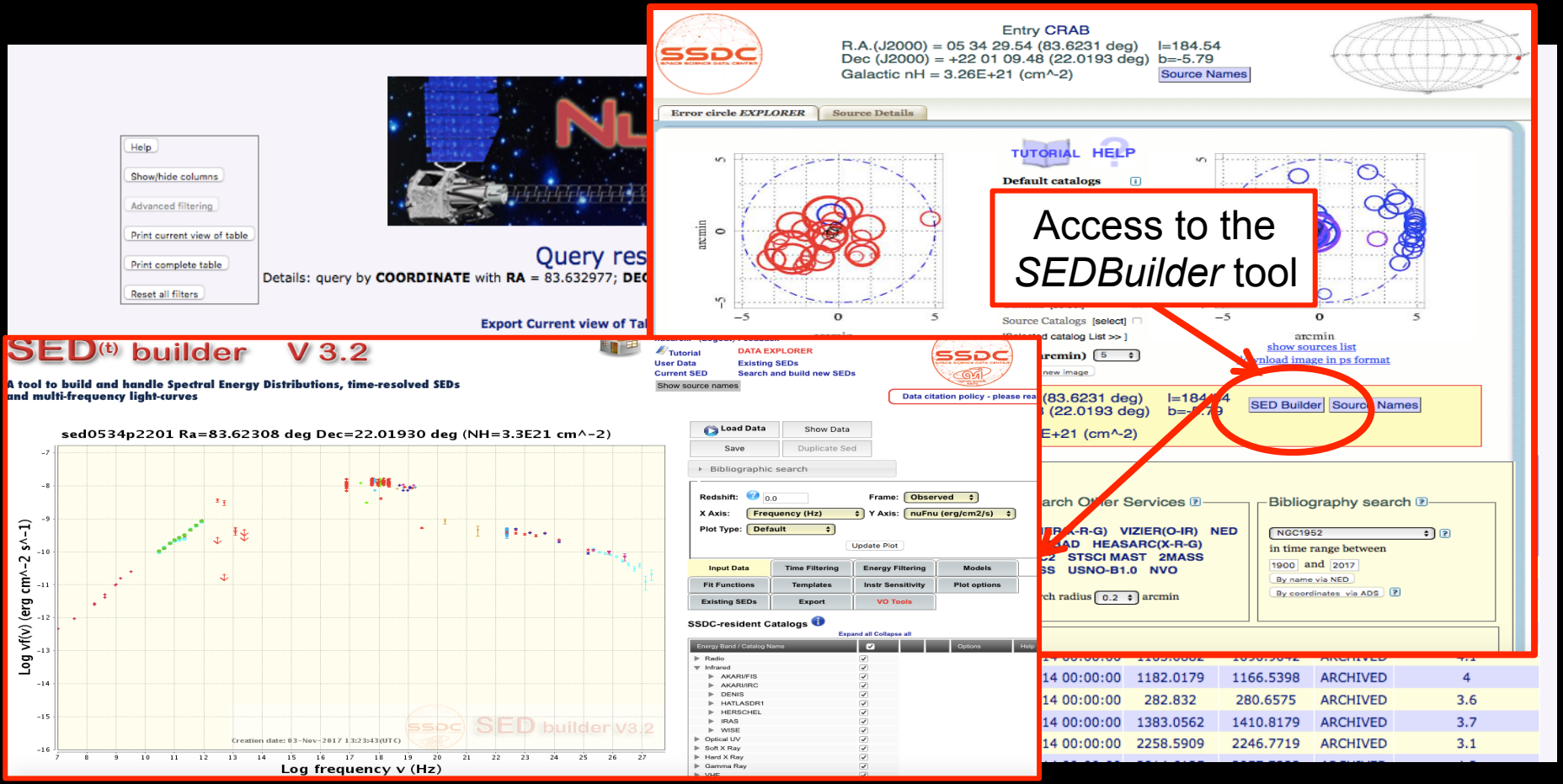
SSDC-resident astronomical catalogs
Group of Catalogs Selected Catalogs
Radio IR Optical QORG AGN BZCAT
X-ray Gamma ZCAT NGC ZWICKY
Search radius 0.2 arcmin

Search Other Services
VIZIER(X-R-G) VIZIER(O-IR) NED
SIMBAD HEASARC(X-R-G)
GSC2 STSCI MAST 2MASS
SDSS USNO-B1.0 NVO
Search radius 0.2 arcmin

Bibliography search
NGC1952
in time range between
1900 and 2017
By name via NED
By coordinates via ADS

Access to Public Data Archives -

The Multi-Mission Interactive Archive



SSDC
SPACE SCIENCE DATA CENTER

ASI - Italian Space Agency

Since 2017

Space Science Data Center

Universe Observation

Information & Computing Technologies

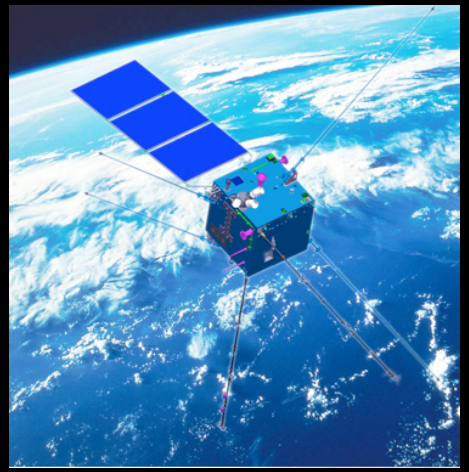
Earth Observation

SSDC – Earth Observation

SSDC is part of the Scientific Ground Segment of the Chinese mission CSES (China Seismo-Electromagnetic Satellite) with the Italian participation (ASI + INFN) LIMADOU. The mission (launch in 2018) is dedicated to explore terrestrial electric and magnetic fields.

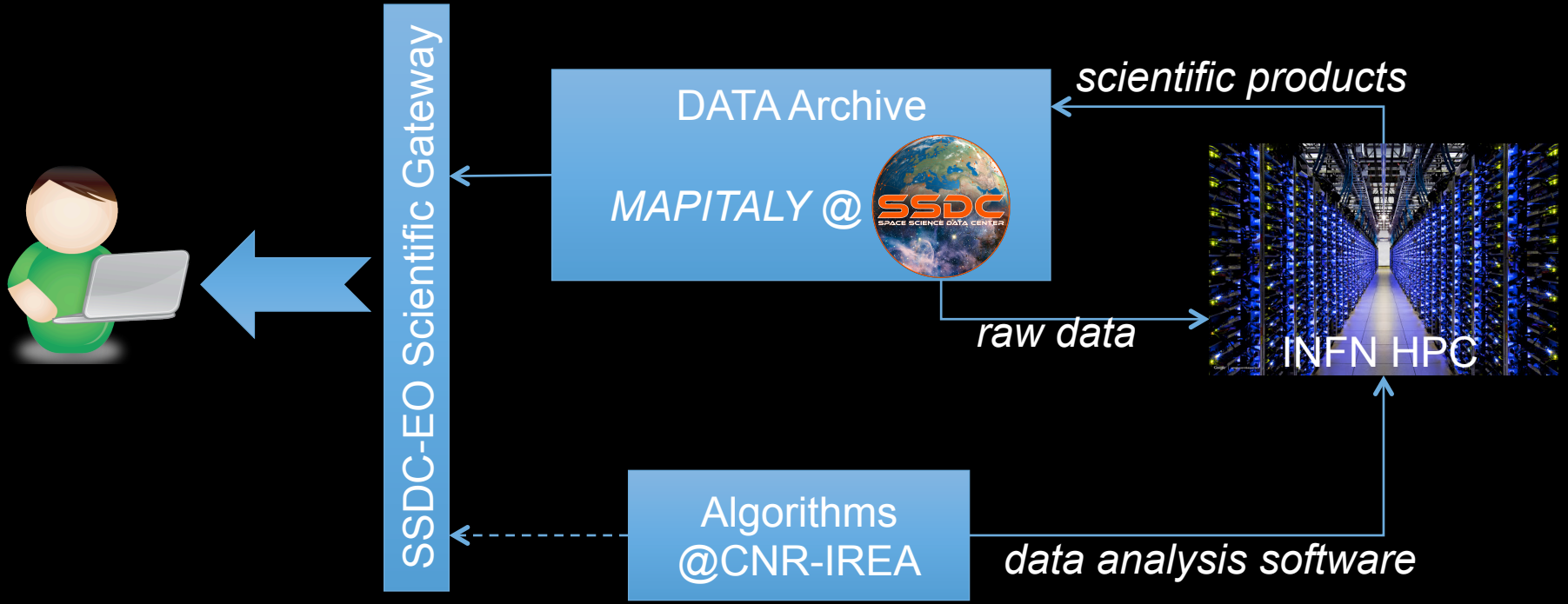
SSDC will process data from Lev0 to Lev2 of LIMADOU payload and will allow access to the italian scientific community to Lev2 data of all other instruments of CSES.

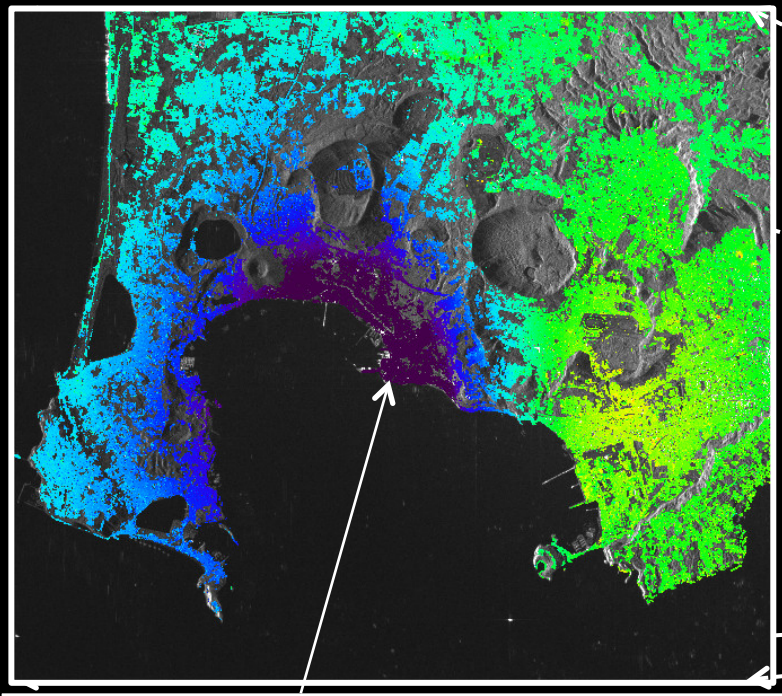
Measurement of the electrical and magnetic fields and their perturbations in ionosphere	Search-Coil Magnetometer
	Fluxgate Magnetometer
	Electric Field Detector (EFD)
Measurement of the disturbance of plasma in ionosphere	Plasma analizer
	Langmuir probe
Measurement of the flux and energy spectrum of the particles in the radiation belts	High Energic Particle Detector (HEPD)
Measurement of the profile of electronic content	GPS Occultation Receiver
	Tri-frequency transmitter

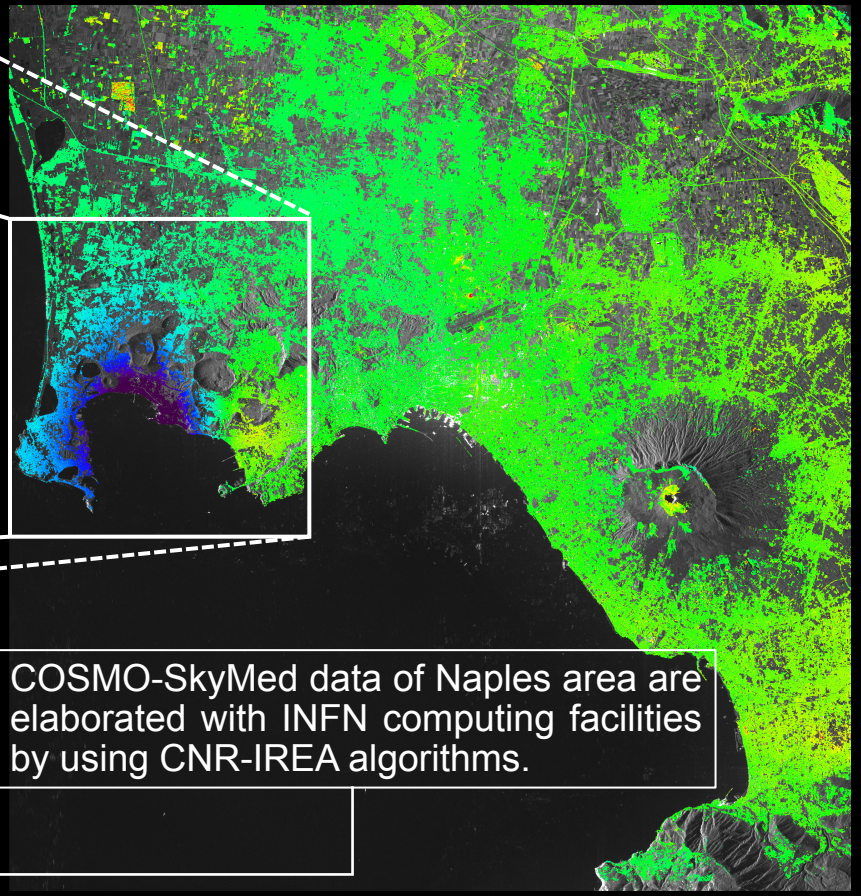


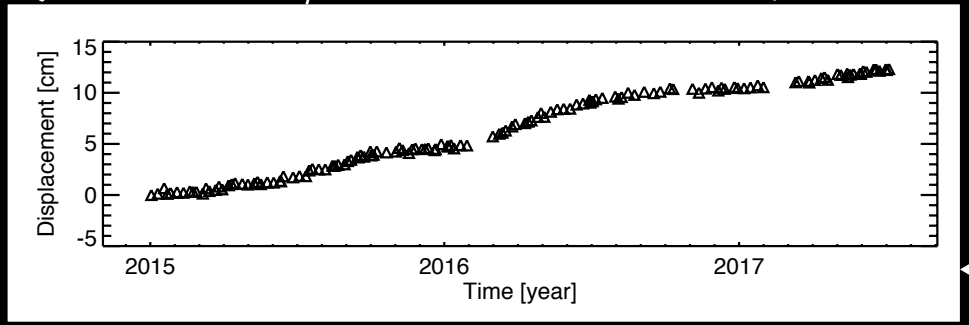
SSDC – Earth Observation

A pilot project in SSDC to support Earth Observation scientific research. The project is aimed to allow access to a subset of COSMO-SkyMed data (MapItaly) as well as scientific products (velocity maps) obtained in collaboration with CNR and INFN.









COSMO-SkyMed data of Naples area are elaborated with INFN computing facilities by using CNR-IREA algorithms.

SSDC – Information & Computing Technology

The SSDC – ICT office is devoted to support both data archiving and data analysis techniques in SSDC. Research & Development activities in ICT play an important role for this office in view of the Big Data management.

The *Artificial Intelligence for Astronomy* (AIfA) project is carried on together with the GeoInformation Dept. at University of Tor Vergata, INAF, E4 within the H2020 ASTERICS Project.

AIfA aims to develop new algorithms for image analysis for astronomy, astroparticle and Earth observation using Deep Neural Networks.

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E4 COMPUTER ENGINEERING

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