RadLab: Advancing Databases and Graphical and Programming Interfaces for Space Radiation Data

Biological and Physical Sciences

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NASA Open Science Data Repository

Open Science Projects

Open Science Projects primary goals aim to increase collaborative scientific data sharing, analysis and more rapid scientific advancement.

GeneLab

GeneLab, an open science multi-omics repository, covering transcriptomics, metagenomics, epigenomics, proteomics, and metabolomics. Studies comprise of data from model organisms including microbes, plants, fruit flies, rodents and humans.

Learn more GeneLab

BSP

The NASA Space Biology Biospecimen Sharing Program (BSP) collects biospecimens to maximize the scientific return from biological spaceflight and associated ground investigations and to encourage and broaden participation from the scientific community in space biology-related research.

Learn more about BSP

ALSDA

Ames Life Sciences Data Archive (ALSDA) collects, curates, and makes available space-relevant higher-order phenotypic datasets. Datasets that enable scientists to perform retrospective analysis across missions, experiments, life science disciplines, research subjects, and species.

Learn more about ALSDA

NBISC

NASA Biological Institutional Scientific Collection (NBISC) is a biorepository of non-human samples collected from NASA-funded spaceflight investigations and correlative ground studies. The purpose of NBISC is to receive, store, document, preserve, and make the collection available to the scientific community.

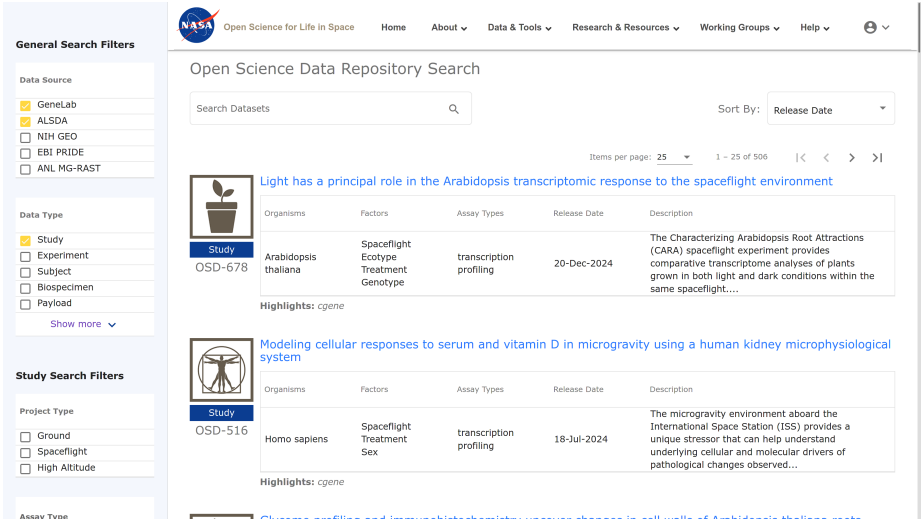
Learn more about NBISC

FAIR data

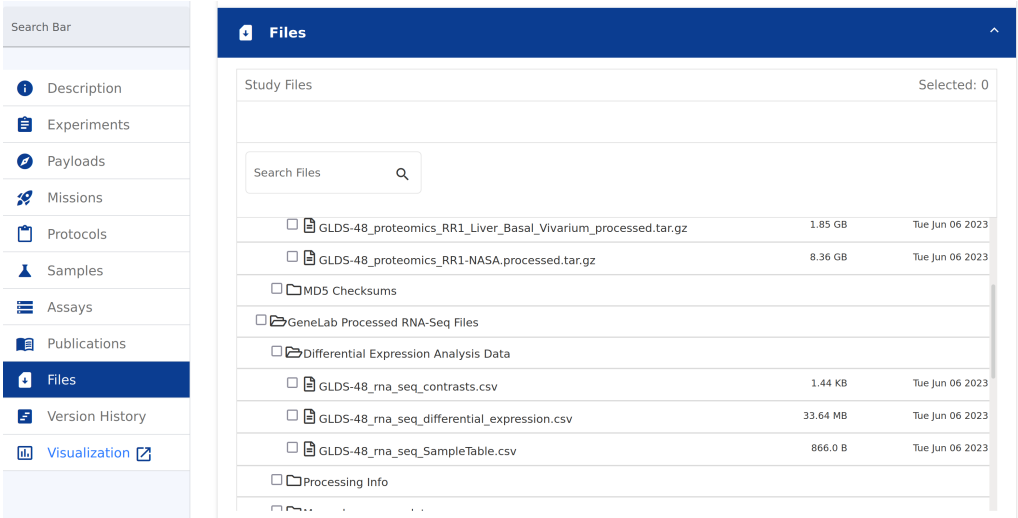
"[...] all research objects should be
Findable, Accessible, Interoperable and Reusable (FAIR)
both for machines and for people."

Wilkinson, M., Dumontier, M., Aalbersberg, I. *et al*.
"The FAIR Guiding Principles for scientific data management and stewardship" (2016)
doi.org/10.1038/sdata.2016.18

OSDR: GeneLab and ALSDA



OSDR: FAIR data



OSDR: FAIR data

[12,3] "Space Flight"

id.accession	id.assay name	study.factor value.altered gravity	study.factor value.spaceflight	study.factor value.treatment
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	1G by centrifugation	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	1G by centrifugation	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	1G by centrifugation	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Non-activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Non-activated
OSD-13	OSD-13_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Non-activated
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G with centrifugation	Space Flight	Not Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G with centrifugation	Space Flight	Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Not Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Ground Control	Not Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Ground Control	Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Vivarium Control	Not Osteo-induced
OSD-29	OSD-29_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Vivarium Control	Osteo-induced
OSD-35	OSD-35_transcription-profiling_dna-microarray_affymetrix	uG	Space Flight	NaN
OSD-35	OSD-35_transcription-profiling_dna-microarray_affymetrix	1G on Earth	Ground Control	NaN
OSD-35	OSD-35_transcription-profiling_dna-microarray_affymetrix	3G with centrifugation	Ground Control	NaN
OSD-35	OSD-35_transcription-profiling_dna-microarray_affymetrix	1G on Earth	Vivarium Control	NaN
OSD-35	OSD-35_transcription-profiling_dna-microarray_affymetrix	uG with clinorotation	Ground Control	NaN
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	uG	Space Flight	cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	1G on Earth	Ground Control	cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	10G with centrifugation	Not Applicable	no cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	uG with random positioning machine	Not Applicable	cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	uG with random positioning machine	Not Applicable	no cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	1G on Earth	Not Applicable	cold treatment
OSD-36	OSD-36_transcription-profiling_dna-microarray_affymetrix	1G on Earth	Not Applicable	no cold treatment
OSD-63	OSD-63_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Not Applicable	NaN
OSD-63	OSD-63_transcription-profiling_dna-microarray_Affymetrix	2G by centrifugation	Not Applicable	NaN
OSD-63	OSD-63_transcription-profiling_dna-microarray_Affymetrix	uG	Space Flight	NaN
OSD-63	OSD-63_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Ground Control	NaN
OSD-63	OSD-63_transcription-profiling_dna-microarray_Affymetrix	1G on Earth	Vivarium Control	NaN

OSDR: FAIR data

[15,2] "GO:0051641|GO:0033036|GO:0034613|GO:0006810|GO:0071705|GO:0015833|GO:0009987|GO:0045184|GO:0008104|GO:0051179|GO:0042886|GO:0071702|GO:0070727|GO:0051168|GO:0051234|GO:0006…

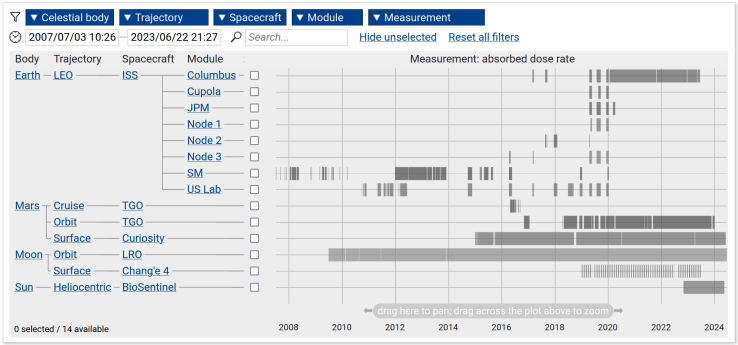
OSD-48 ↳OSD-48_transcript… ↳ENSEMBL	OSD-48 ↳OSD-48_transcription-profiling_rna-sequencing-(rna-seq)_illumina ↳GENENAME	OSD-48 ↳OSD-48_transcription-profiling_rna-sequenc… ↳OOSLIM_IDS	OSD-48 ↳OSD-48_transcription-profilin… ↳Mmus_C57-6J_LVR_OC_I_Rep1_M31	OSD-48 ↳OSD-48_transc… ↳Mmus_C57-6J_L
ENSMUSG00000000001	guanine nucleotide binding protein (G protein), alpha inhibiting 3	GO:0051339|GO:0007188|GO:0010646|GO:0051716…	2450.13688856518	2309.559786176
ENSMUSG00000000028	cell division cycle 45	GO:0044085|GO:0000280|GO:0010467|GO:1903507…	28.6526881385803	33.82961571689
ENSMUSG00000000031	H19, imprinted maternally expressed transcript	NaN	10.5588958133492	3796.122210136
ENSMUSG00000000037	Scm polycomb group protein like 2	NaN	1.7193854310211	1.778112720319
ENSMUSG00000000049	apolipoprotein H	NaN	45421.4265727202	46534.14335752
ENSMUSG00000000056	nuclear prelamin A recognition factor	GO:0071840|GO:0022607|GO:0044085|GO:0006790…	781.554492826276	845.5620404107
ENSMUSG00000000058	caveolin 2	GO:0044085|GO:0043408|GO:0031399|GO:0051246…	114.448170029084	226.7024394541
ENSMUSG00000000078	Kruppel-like factor 6	NaN	398.10745387507	657.9002071837
ENSMUSG00000000085	sex comb on midleg homolog 1	GO:0010629|GO:0006725|GO:0031324|GO:2000113…	224.117468091416	204.7537286697
ENSMUSG00000000088	cytochrome c oxidase subunit 5A	GO:0009199|GO:0009141|GO:0006754|GO:1902600…	2605.95419439322	3657.5595655535
ENSMUSG00000000093	T-box 2	GO:0006725|GO:0051171|GO:0010670|GO:0044260…	101.320034717567	106.8834914275
ENSMUSG00000000094	T-box 4	GO:0009799|GO:0051171|GO:0010467|GO:2001141…	5.2004284928493	7.680559652211
ENSMUSG00000000120	nerve growth factor receptor (TNFR superfamily, member 16)	GO:0050789|GO:0007264|GO:0050896|GO:0007165…	200.811035307446	190.3972852390
ENSMUSG00000000126	wingless-type MMTV integration site family, member 9A	GO:1905114|GO:0048869|GO:0051716|GO:0007165…	11.7787183486455	39.75292142997
ENSMUSG00000000127	fer (fms/fps related) protein kinase	GO:0043207|GO:0002764|GO:0051641|GO:0051640…	209.297276279945	148.4313094841
ENSMUSG00000000131	exportin 6	GO:0051641|GO:0033036|GO:0034613|GO:0006810…	729.202869200051	750.7611768339
ENSMUSG00000000134	transcription factor E3	GO:0006725|GO:0051171|GO:0010670|GO:0044260…	763.81858151224	583.8278269288
ENSMUSG00000000142	axin 2	NaN	231.20860547084	218.3883980141
ENSMUSG00000000148	BRCA1-associated ATM activator 1	GO:0051173|GO:0031399|GO:0019220|GO:0051246…	257.323085858097	192.9190841670
ENSMUSG00000000149	guanine nucleotide binding protein, alpha 12	GO:0051339|GO:0007188|GO:0010646|GO:0045761…	2209.69968870336	2103.0117090117
ENSMUSG00000000154	solute carrier family 22 (organic cation transporter), member 18	GO:0022857|GO:0005215	1918.77861131579	1739.7443859437
ENSMUSG00000000159	immunoglobulin superfamily, member 5	NaN	435.850967772864	378.7892197495
ENSMUSG00000000167	PIH1 domain containing 2	GO:0006725|GO:0022607|GO:0046483|GO:0044085…	11.1639867542554	5.655197864039
ENSMUSG00000000168	dihydrolipoamide S-acetyltransferase (E2 component of pyruvate de…	NaN	1661.69610099969	2176.939572560
ENSMUSG00000000171	succinate dehydrogenase complex, subunit D, integral membrane pro…	GO:0009199|GO:0009141|GO:0006754|GO:1902600…	3811.54474307907	4403.415205196
ENSMUSG00000000183	fibroblast growth factor 6	GO:0010628|GO:0031399|GO:0051246|GO:0051171…	1	20.38709476711
ENSMUSG00000000184	cyclin D2	GO:0031399|GO:0051246|GO:0051171|GO:0000280…	456.561414996354	453.6693194546
ENSMUSG00000000194	G protein-coupled receptor 107	GO:0051179|GO:0071840|GO:0006900|GO:0051234…	353.979352465345	382.0157915351
ENSMUSG00000000197	sodium leak channel, non-selective	NaN	1	1.465764415052
ENSMUSG00000000204	schlafen 4	NaN	9.04671466479752	2.484579107502
ENSMUSG00000000214	tyrosine hydroxylase	GO:1901615|GO:0006725|GO:0043436|GO:0006570…	1	3.683444857318
ENSMUSG00000000223	dystrophin related protein 2	GO:0099536|GO:0007154|GO:0009987|GO:0023052…	1	23.09013124349
ENSMUSG00000000244	tetraspanin 32	GO:0031224|GO:0005887|GO:0031226|GO:0110165…	19.4800406201126	11.96845158522

OSDR: FAIR data

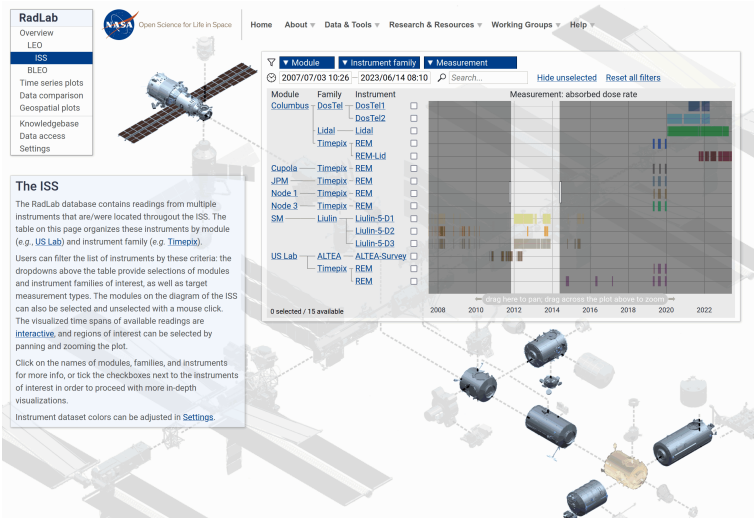
[5,3] 49649

index	Mmus_C57-6J_LVR_FLT_C_Rep1_M25	Mmus_C57-6J_LVR_FLT_C_Rep2_M26	Mmus_C57-6J_LVR_FLT_C_Rep3_M27	Mmus_C57-6J_LVR_FLT_C_Rep4_M28	Mmus_C57-6J_LVR_FLT_C_Rep5_M
ENSMUSG00000000001	1255	1297	1636	1263	1153
ENSMUSG00000000003	0	0	0	0	0
ENSMUSG00000000028	12	11	14	14	16
ENSMUSG00000000031	10	19	18	8	3
ENSMUSG00000000037	0	0	2	3	3
ENSMUSG00000000049	32753	31585	49649	38397	35106
ENSMUSG00000000056	377	166	285	292	376
ENSMUSG00000000058	40	55	40	27	19
ENSMUSG00000000078	317	398	340	398	252
ENSMUSG00000000085	137	152	141	199	147
ENSMUSG00000000088	2506.52	2432	4282.6	2803.71	2485
ENSMUSG00000000093	136	95	88	153	102
ENSMUSG00000000094	1	0	0	0	2
ENSMUSG00000000103	0	0	0	0	0
ENSMUSG00000000120	66	43	53	41	20
ENSMUSG00000000125	0	0	0	0	0
ENSMUSG00000000126	11	3	6	3	7
ENSMUSG00000000127	96	115	114	100	98
ENSMUSG00000000131	563	615	562	900	675
ENSMUSG00000000134	396	536	473	555	373
ENSMUSG00000000142	94	252	236	330	186
ENSMUSG00000000148	129	143	149	179	138
ENSMUSG00000000149	662	498	694	538	644
ENSMUSG00000000154	1489	1723	1717	1724	1717
ENSMUSG00000000157	0	0	1	2	0
ENSMUSG00000000159	398	281	380	286	329
ENSMUSG00000000167	13	17	8	11	6
ENSMUSG00000000168	639	828	1000	989	794
ENSMUSG00000000171	2741	2675	4323	2885	2497
ENSMUSG00000000182	0	0	0	0	0
ENSMUSG00000000183	0	0	0	0	0
ENSMUSG00000000184	227	392	294	337	156
ENSMUSG00000000194	237	294	268	328	267
ENSMUSG00000000197	0	0	0	1	0

RadLab: Data


▼ Celestial body
▼ Trajectory
▼ Spacecraft
▼ Module
▼ Measurement
2007/07/03 10:26
2023/06/22 21:27
Search...
Hide unselected
Reset all filters
Body
Trajectory
Spacecraft
Module
Measurement: absorbed dose rate
Earth
LEO
ISS
Columbus
Cupola
JPM
Node 1
Node 2
Node 3
SM
US Lab
Mars
Cruise
TGO
Orbit
TGO
Surface
Curiosity
Moon
Orbit
LRO
Surface
Chang'e 4
Sun
Heliocentric
BioSentinel
drag here to pan; drag across the plot above to zoom
0 selected / 14 available
2008
2010
2012
2014
2016
2018
2020
2022
2024

RadLab: GUI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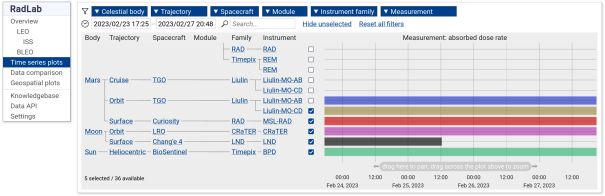
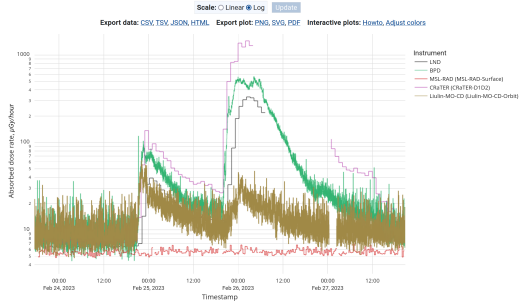
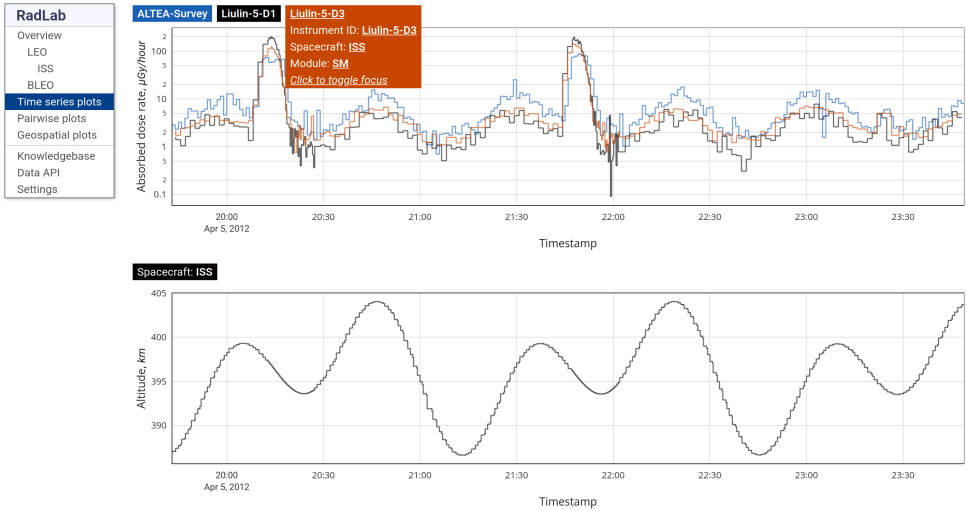
The ISS
The RadLab database contains readings from multiple instruments that are/were located throughout the ISS. The table on this page organizes these instruments by module (e.g., US Lab) and instrument family (e.g. Timepix).
Users can filter the list of instruments by these criteria: the dropdowns above the table provide selections of modules and instrument families of interest, as well as target measurement types. The modules on the diagram of the ISS can also be selected and unselected with a mouse click. The visualized time spans of available readings are interactive, and regions of interest can be selected by panning and zooming the plot.
Click on the names of modules, families, and instruments for more info, or tick the checkboxes next to the instruments of interest in order to proceed with more in-depth visualizations.
Instrument dataset colors can be adjusted in Settings.
▼ Module
▼ Instrument family
▼ Measurement
2007/07/03 10:26
2023/06/14 08:10
Search...
Hide unselected
Reset all filters
Module
Family
Instrument
Measurement: absorbed dose rate
Columbus
DosTel
DosTel1
DosTel2
Lidal
Lidal
Timepix
REM
REM-Lid
Cupola
Timepix
REM
JPM
Timepix
REM
Node 1
Timepix
REM
Node 3
Timepix
REM
SM
Liulin
Liulin-5-D1
Liulin-5-D2
Liulin-5-D3
US Lab
ALTEA
ALTEA-Survey
Timepix
REM
REM
Drag here to pan; drag across the plot above to zoom
0 selected / 15 available
2008
2010
2012
2014
2016
2018
2020
2022

RadLab: Visualizations

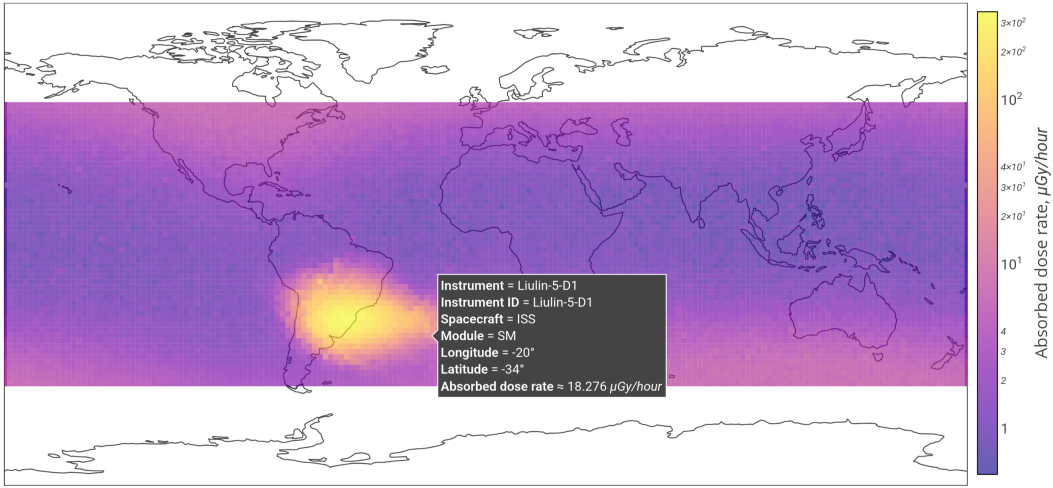




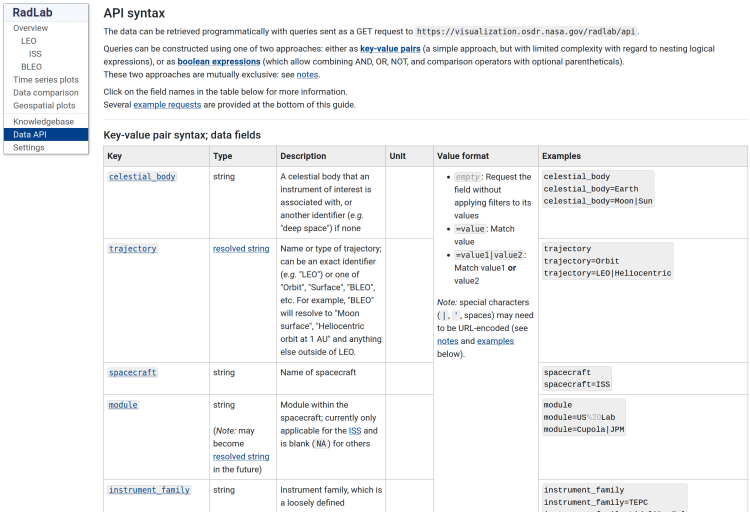
RadLab: Visualizations



RadLab: Visualizations



RadLab: API



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API syntax

The data can be retrieved programmatically with queries sent as a GET request to `https://visualization.osdr.nasa.gov/radlab/api`.

Queries can be constructed using one of two approaches: either as **key-value pairs** (a simple approach, but with limited complexity with regard to nesting logical expressions), or as **boolean expressions** (which allow combining AND, OR, NOT, and comparison operators with optional parentheticals).
These two approaches are mutually exclusive: see notes.

Click on the field names in the table below for more information.
Several example requests are provided at the bottom of this guide.

Key-value pair syntax; data fields

Key	Type	Description	Unit	Value format	Examples

`celestial_body`	string	A celestial body that an instrument of interest is associated with, or another identifier (*e.g.* "deep space") if none		• `empty`: Request the field without applying filters to its values
				• `=value`: Match value
				• `=value1|value2`: Match value1 **or** value2
				
				Note: special characters (`|`, `%`, spaces) may need to be URL-encoded (see notes and examples below).
					`celestial_body`
					`celestial_body=Earth`
					`celestial_body=Moon|Sun`

`trajectory`	resolved string	Name or type of trajectory; can be an exact identifier (*e.g.* "LEO") or one of "Orbit", "Surface", "BLEO", etc. For example, "BLEO" will resolve to "Moon surface", "Heliocentric orbit at 1 AU" and anything else outside of LEO.			`trajectory`
					`trajectory=Orbit`
					`trajectory=LEO|Heliocentric`

`spacecraft`	string	Name of spacecraft			`spacecraft` `spacecraft=ISS`

`module`	string
	
	(*Note:* may become resolved string in the future)
		Module within the spacecraft; currently only applicable for the ISS and is blank (`NA`) for others			`module`
					`module=US%20Lab`
					`module=Cupola|JPM`

`instrument_family`	string	Instrument family, which is a loosely defined			`instrument_family` `instrument_family=TEPC`

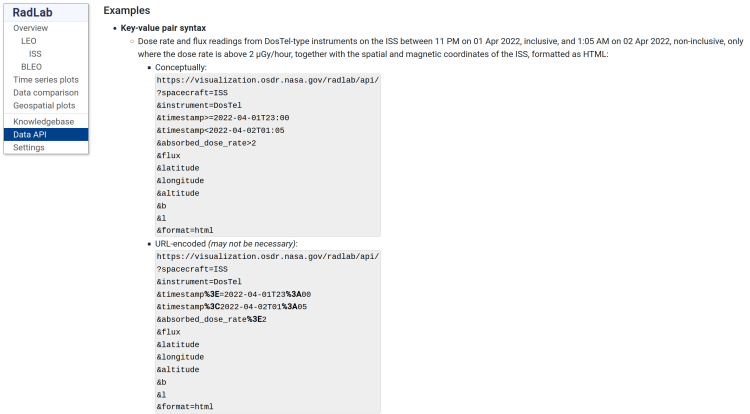
RadLab: API

`instrument_id`	string	**Note: case-sensitive**. A specific ID of an instrument, detector, or configuration; this is guaranteed to be unique in the database. *E.g.*: REM-Lid, the REM instrument affixed to the lid of Lidal and included in the DORELI project; or Liulin-5-D2, the second detector of the Liulin-5 instrument. **Note:** is always returned, even when not explicitly requested. The ID can be used to look up the specifics of the instrument and the dataset in the knowledgebase.			`instrument_id`
					`instrument_id=ALTEA-Survey`
					`instrument_id=DosTel1|DosTel2`

`timestamp`	ISO-formatted string (or Unix timestamp)	Timestamp of recorded value(s). **Note: case-sensitive** if passed as an ISO-formatted string.		• `empty`: Request the field without applying filters to its values
				• `<value`: Match any less than value
				• `<=value`: Match any less or equal to value
				• `=value`: Match value
				• `>=value`: Match any greater or equal to value
				• `>value`: Match any greater than value
				Note: can be used more than once in a single query
					`timestamp`
					`timestamp=2021-01-01T15:25`
					`timestamp>=2022-01-01&timestamp<2023-01-01`
					`timestamp>1683786900`

`absorbed_dose_rate`	number	Absorbed radiation dose rate	µGy/hour		`absorbed_dose_rate` `absorbed_dose_rate>=2`
`dose_equivalent_rate`	number	Dose equivalent rate	µSv/hour		`dose_equivalent_rate` `dose_equivalent_rate<=20`
`flux`	number	Particle flux	$cm^{-2}sr^{-1}s^{-1}$		`flux` `flux<1`
`latitude`	number	Latitude of a spacecraft at given timestamp, where available. This and the values below are currently only tracked for the ISS and are blank (`NA`) for others.	deg		`latitude` `latitude<-10`

RadLab: API



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Examples

- **Key-value pair syntax**
  - Dose rate and flux readings from DosTel-type instruments on the ISS between 11 PM on 01 Apr 2022, inclusive, and 1:05 AM on 02 Apr 2022, non-inclusive, only where the dose rate is above 2 μGy/hour, together with the spatial and magnetic coordinates of the ISS, formatted as HTML:
    - Conceptually:

```
https://visualization.osdr.nasa.gov/radlab/api/
?spacecraft=ISS
&instrument=DosTel
&timestamp>=2022-04-01T23:00
&timestamp<2022-04-02T01:05
&absorbed_dose_rate>2
&flux
&latitude
&longitude
&altitude
&b
&l
&format=html
```

    - URL-encoded *(may not be necessary)*:

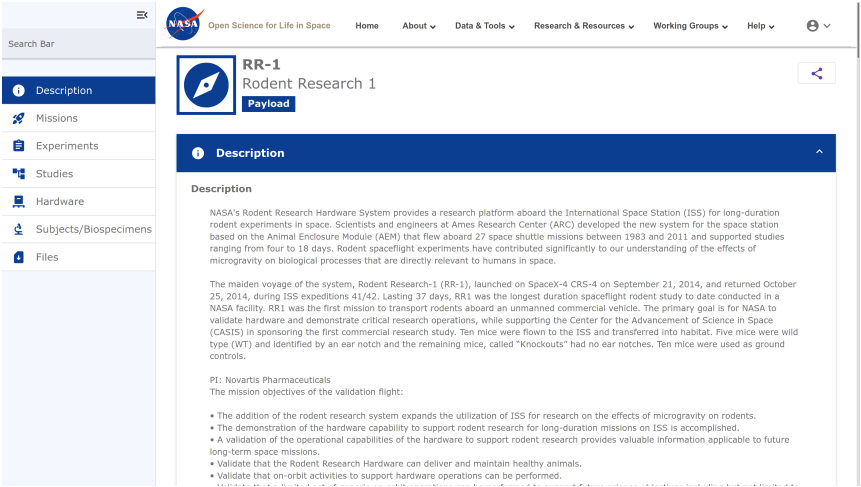
```
https://visualization.osdr.nasa.gov/radlab/api/
?spacecraft=ISS
&instrument=DosTel
&timestamp%3E=2022-04-01T23%3A00
&timestamp%3C2022-04-02T01%3A05
&absorbed_dose_rate%3E2
&flux
&latitude
&longitude
&altitude
&b
&l
&format=html
```

    - Full URL: https://visualization.osdr.nasa.gov/radlab/api/?spacecraft=ISS&instrument=DosTel&timestamp%3E=2022-04-01T23%3A00&timestamp%3C2022-04-02T01%3A05&absorbed_dose_rate%3E2&flux&latitude&longitude&altitude&b&l&format=html
    - Full URL without encoding (should work in most browsers, Python, ...): https://visualization.osdr.nasa.gov/radlab/api/?spacecraft=ISS&instrument=DosTel&timestamp>=2022-04-01T23:00&timestamp<2022-04-02T01:05&absorbed_dose_rate>2&flux&latitude&longitude&altitude&b&l&format=html
- **Boolean expression syntax**
  - Dose rate readings from all detectors in either the Cupola or JPM modules, between 5 Dec 2019 inclusive and 25 Dec 2019, non-inclusive; also retrieve the value of 'instrument_family' for each reading and format the output as TSV:

RadLab: API

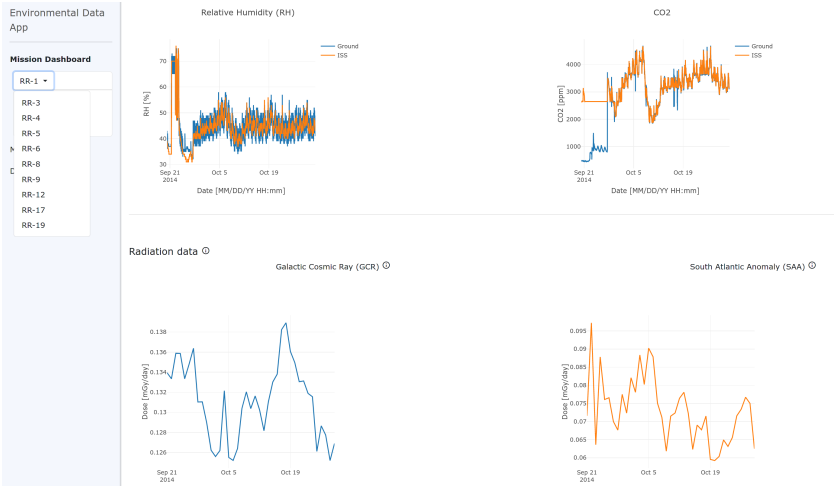
timestamp	instrument_id	absorbed_dose_rate	altitude	b	flux	l	latitude	longitude	module	spacecraft
2022-04-01T00:00:00	REM-Lid	0.9107814	416.851987	32511.1	0.0731268…	1.09344	-8.324694	162.94325	Columbus	ISS
2022-04-01T00:00:00	DosTel2	2.368557	416.851987	32511.1	0.1394459…	1.09344	-8.324694	162.94325	Columbus	ISS
2022-04-01T00:00:00	DosTel1	1.99686266666667	416.851987	32511.1	0.1160901…	1.09344	-8.324694	162.94325	Columbus	ISS
2022-04-01T00:00:00	Lidal	2.2391858088147	416.851987	32511.1	0.0982921…	1.09344	-8.324694	162.94325	Columbus	ISS
2022-04-01T00:05:00	REM-Lid	2.0818824	415.176415	27547.8	0.1663191…	1.02651	6.951546	173.790418	Columbus	ISS
2022-04-01T00:05:00	DosTel2	2.08211030188679	415.176415	27547.8	0.1343182…	1.02651	6.951546	173.790418	Columbus	ISS
2022-04-01T00:05:00	DosTel1	1.87163492307692	415.176415	27547.8	0.1053458…	1.02651	6.951546	173.790418	Columbus	ISS
2022-04-01T00:05:00	Lidal	2.0517677736311	415.176415	27547.8	0.0981521…	1.02651	6.951546	173.790418	Columbus	ISS
2022-04-01T00:10:00	REM-Lid	2.291432	416.22943	28879	0.1320885…	1.15888	21.89461	-174.5494…	Columbus	ISS
2022-04-01T00:10:00	DosTel2	2.46097266666667	416.22943	28879	0.1473333…	1.15888	21.89461	-174.5494…	Columbus	ISS
2022-04-01T00:10:00	DosTel1	2.18748766666667	416.22943	28879	0.1266577…	1.15888	21.89461	-174.5494…	Columbus	ISS
2022-04-01T00:10:00	Lidal	2.42490397146081	416.22943	28879	0.1122379…	1.15888	21.89461	-174.5494…	Columbus	ISS
2022-04-01T00:15:00	REM-Lid	3.86292	419.150222	34088	0.2971092…	1.52678	35.576278	-160.0008…	Columbus	ISS
2022-04-01T00:15:00	DosTel2	3.78154447435897	419.150222	34088	0.2223902…	1.52678	35.576278	-160.0008…	Columbus	ISS
2022-04-01T00:15:00	DosTel1	4.11190379487179	419.150222	34088	0.2051074…	1.52678	35.576278	-160.0008…	Columbus	ISS
2022-04-01T00:15:00	Lidal	3.94472706410343	419.150222	34088	0.1846939…	1.52678	35.576278	-160.0008…	Columbus	ISS
2022-04-01T00:20:00	REM-Lid	10.904088	422.420509	40921.5	0.4180964…	2.36792	46.397315	-139.8094…	Columbus	ISS
2022-04-01T00:20:00	DosTel2	7.48317466666667	422.420509	40921.5	0.4153514…	2.36792	46.397315	-139.8094…	Columbus	ISS
2022-04-01T00:20:00	DosTel1	7.80761766666667	422.420509	40921.5	0.3730812…	2.36792	46.397315	-139.8094…	Columbus	ISS
2022-04-01T00:20:00	Lidal	6.11440798239105	422.420509	40921.5	0.2980769…	2.36792	46.397315	-139.8094…	Columbus	ISS
2022-04-01T00:25:00	REM-Lid	11.048988	424.567687	45611.9	0.5415207…	3.89651	51.663254	-112.4683…	Columbus	ISS
2022-04-01T00:25:00	DosTel2	10.6957077435897	424.567687	45611.9	0.5561581…	3.89651	51.663254	-112.4683…	Columbus	ISS
2022-04-01T00:25:00	DosTel1	11.0199630897436	424.567687	45611.9	0.5182704…	3.89651	51.663254	-112.4683…	Columbus	ISS
2022-04-01T00:25:00	Lidal	6.96877643785163	424.567687	45611.9	0.3478796…	3.89651	51.663254	-112.4683…	Columbus	ISS
2022-04-01T00:30:00	REM-Lid	11.574072	424.812496	45307.7	0.5625323…	3.85842	49.120498	-83.450832	Columbus	ISS
2022-04-01T00:30:00	DosTel2	10.6151193333333	424.812496	45307.7	0.5378740…	3.85842	49.120498	-83.450832	Columbus	ISS
2022-04-01T00:30:00	DosTel1	10.8238516666667	424.812496	45307.7	0.5084686…	3.85842	49.120498	-83.450832	Columbus	ISS
2022-04-01T00:30:00	Lidal	6.38013989877022	424.812496	45307.7	0.3076296…	3.85842	49.120498	-83.450832	Columbus	ISS
2022-04-01T00:35:00	REM-Lid	7.364856	423.385667	39608.2	0.3250669…	2.25814	39.968035	-60.605414	Columbus	ISS
2022-04-01T00:35:00	DosTel2	7.15227441025641	423.385667	39608.2	0.3641040…	2.25814	39.968035	-60.605414	Columbus	ISS
2022-04-01T00:35:00	DosTel1	6.20494814102564	423.385667	39608.2	0.3208913…	2.25814	39.968035	-60.605414	Columbus	ISS

GeneLab/ALSDA Applications: OSDR and EDA*



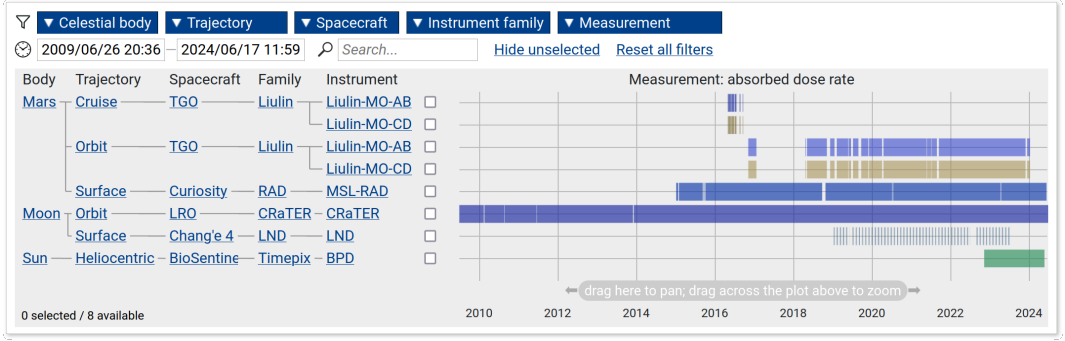
*EDA == the Environmental Data Application

GeneLab/ALSDA Applications: OSDR and EDA*



*EDA == the Environmental Data Application; visualization.osdr.nasa.gov/eda

Modeling Applications



Modeling Applications

Frontier Development Labs: FDL-X Heliolab 2024 Challenge
"Forecasting Radiation Exposure for Human Space Flight"

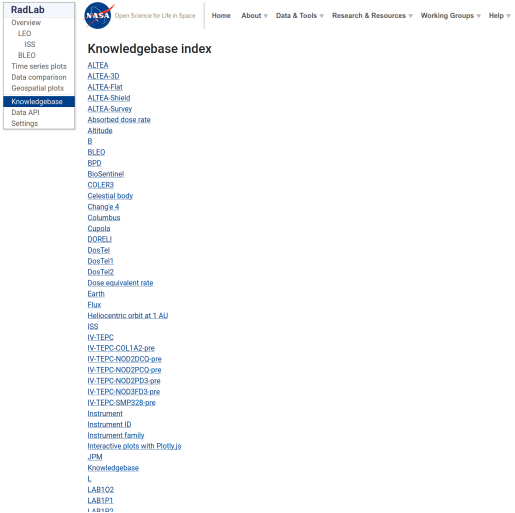
Team: Elena Massara, Xiaomei Song, Rutuja Gurav, Kimberly Sinclair
Faculty: Matt Kusner, Atılım Güneş Baydin, Bala Poduval
Advisors: Sylvain Costes, Jack Miller, Kirill Grigorev

Resources used: GOES, SDO, RadLab (BioSentinel + CRaTER)

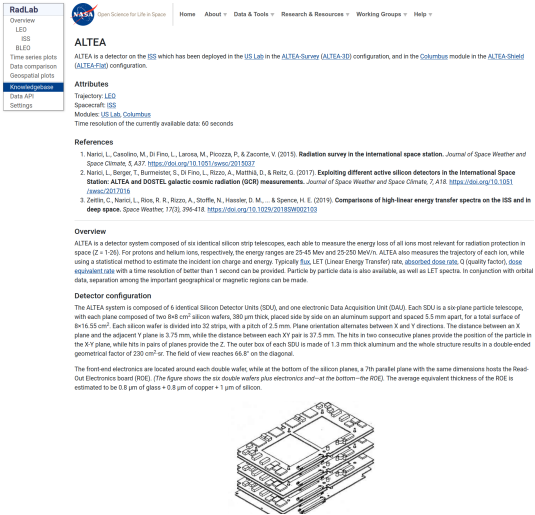
Training an early warning model

frontierdevelopmentlab.org/fdl2024
youtube.com/watch?v=VYe9wpx8PXQ

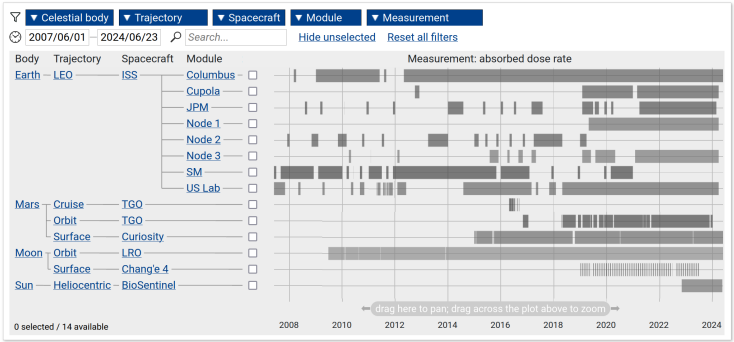
Knowledgebase



Knowledgebase



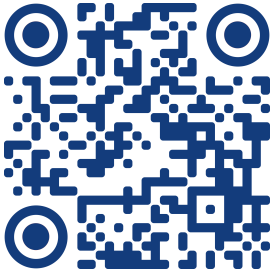
Goals



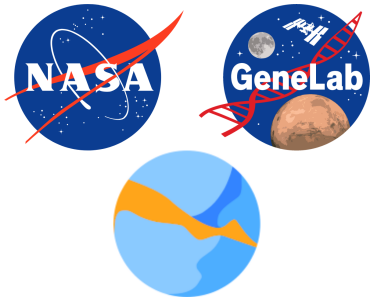
+ Known historical SPE annotations (in both the API and the GUI)
+ Federated GOES and POES data
+ Integration with other resources (*e.g. Space Radiation Intelligence System a.k.a. SPRINTS*)

The RadLab Working Group (RLWG)

- Integration of new and historical datasets
- Development of standards (data harmonization, *etc.*)
- Guiding the development of the platform
- Establishing the use of RadLab in radiation and biology research
- **Collaborative projects** (AWGs)



Acknowledgments



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  - Sylvain Costes
  - Samrawit Gebre
  - Danielle Lopez
  - Jack Miller
  - Livio Narici
  - Lauren Sanders
  - Amanda Saravia-Butler
  - Ryan Scott
  - Ana Uriarte Acuna
  - *and many more*
- All collaborators / data providers
- Compute
  - NASA Science Managed Compute Environment
- Support
  - NASA Space Biology Program
  - NASA Human Research Program
  - NASA Biological and Physical Sciences Division

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