

RadLab: A Comprehensive Database and
Graphical and Programming Interfaces for
Space Radiation Data

Biological and
Physical Sciences

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Blue Marble Space Institute of Science

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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 Guiding Principles

"... 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

General Search Filters

Data Source

☒ GeneLab

☒ ALSDA

☐ NIH GEO

☐ EBI PRIDE

☐ ANL MG-RAST

Data Type

☒ Study

☐ Experiment

☐ Subject

☐ Biospecimen

☐ Payload

Show more ▾

Study Search Filters

Project Type

☐ Ground

☐ Spaceflight

☐ High Altitude

Assay Type

 Open Science for Life in Space

HomeAbout ▾Data & Tools ▾Research & Resources ▾Working Groups ▾Help ▾

Open Science Data Repository Search

Search Datasets

Sort By: Release Date ▾

Items per page: 25 ▾1 - 25 of 506|< < > >|



Study
OSD-678

Light has a principal role in the Arabidopsis transcriptomic response to the spaceflight environment

Organisms	Factors	Assay Types	Release Date	Description
Arabidopsis thaliana	Spaceflight Ecotype Treatment Genotype	transcription profiling	20-Dec-2024	The Characterizing Arabidopsis Root Attractions (CARA) spaceflight experiment provides comparative transcriptome analyses of plants grown in both light and dark conditions within the same spaceflight....

Highlights: *cgene*



Study
OSD-516

Modeling cellular responses to serum and vitamin D in microgravity using a human kidney microphysiological system

Organisms	Factors	Assay Types	Release Date	Description
Homo sapiens	Spaceflight Treatment Sex	transcription profiling	18-Jul-2024	The microgravity environment aboard the International Space Station (ISS) provides a unique stressor that can help understand underlying cellular and molecular drivers of pathological changes observed....

Highlights: *cgene*



Study
OSD-517

Characterizing cellular responses to spaceflight using a human kidney microphysiological system

Organisms	Factors	Assay Types	Release Date	Description
Homo sapiens	Spaceflight Treatment Sex	transcription profiling	18-Jul-2024	The microgravity environment aboard the International Space Station (ISS) provides a unique stressor that can help understand underlying cellular and molecular drivers of pathological changes observed....

Highlights: *cgene*

OSDR: GeneLab and ALSDA

☰

Search Bar

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Description

📅

Experiments

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Payloads

🚀

Missions

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Protocols

👤

Samples

📊

Assays

📖

Publications

📁

Files

📅

Version History

📈

Visualization

Modeling cellular responses to serum and vitamin D in microgravity using a human kidney microphysiological system.

Authors: Lidberg KA, Jones-Isaac K, Yang J, Bain J, Wang L, MacDonald JW, Bammler TK, Calamia J, Thummel KE, Yeung CK, Countryman S, Koenig P, Himmelfarb J, Kelly EJ.
PubMed ID: 38982119
DOI: 10.1038/s41526-024-00415-2

📁 Files

Study Files

Selected: 0

Search Files

🔍

☐ 📁 OSD-516

☐ 📁 Study Metadata Files

☐ 📁 RNA-Seq

☐ 📁 Raw sequence data

☐ 📁 Aligned sequence data

☐ 📄 GLDS-516_rna-seq_367402.accepted_hits.merged.markeddups.recal.bai

4.25 MB

Fri Jul 19 2024

☐ 📄 GLDS-516_rna-seq_367402.accepted_hits.merged.markeddups.recal.bam

1.07 GB

Fri Jul 19 2024

☐ 📄 GLDS-516_rna-seq_367403.accepted_hits.merged.markeddups.recal.bai

4.41 MB

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☐ 📄 GLDS-516_rna-seq_367403.accepted_hits.merged.markeddups.recal.bam

1.28 GB

Fri Jul 19 2024

☐ 📄 GLDS-516_rna-seq_367404.accepted_hits.merged.markeddups.recal.bai

4.40 MB

Fri Jul 19 2024

"RadLab: DB, GUI, API for Space Radiation Data"
Kirill Grigorev

NASA OSDR
NASA ARC, BMSIS

WRMISS
2024-09-04

5/28

OSDR: GLOpenAPI

Generated URL:

```
https://visualization.genelab.nasa.gov/GLOpenAPI/samples/?id=OSD-37|OSD-48&file.datatype=unnormalized%20counts&format=csv
```

Retrieval of entries with metadata field values

*This interactive widget is temporarily disabled pending performance improvements and backend refactoring.
Please refer to the examples below.*

Follow generated URL

The search can be constrained to only the samples that are annotated with specific **value(s)** of an ISA field.

- The logical AND of several conditions is achieved by passing them at the same time ($x=a\&y=b$).
- The logical OR for a *single* condition is achieved by passing the target values joined by a vertical pipe ($x=a|b$).
- Under view levels "assays" and "samples", the values of target field(s) will be reported in table columns.

Example: `/samples/?study.characteristics.genotype=WT`

Example: `/samples/?study.characteristics.genotype=WT|TK6`

Retrieval of files or data

- ☐ & file.filename=
- ☐ & file.datatype
- ☒ & file.datatype= OR

For the resultant queried datasets, assays, and samples, there may be files associated.

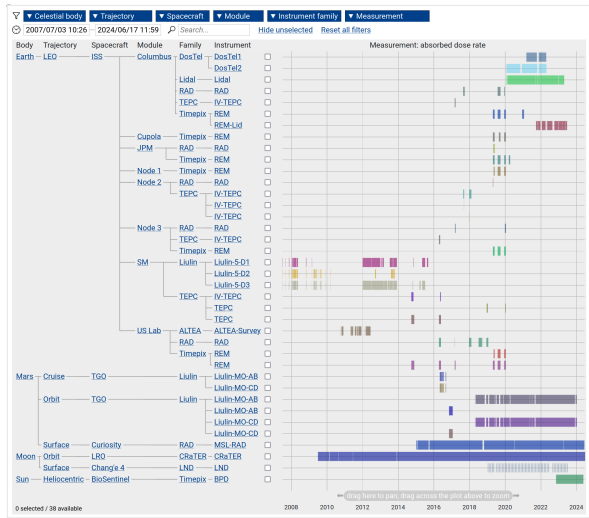
- All files with recognized datatypes can be queried by passing `file.datatype`.
- The query can be constrained to files of particular datatypes by specifying these datatypes in the query (`file.datatype=pca`).

OSDR: GLOpenAPI

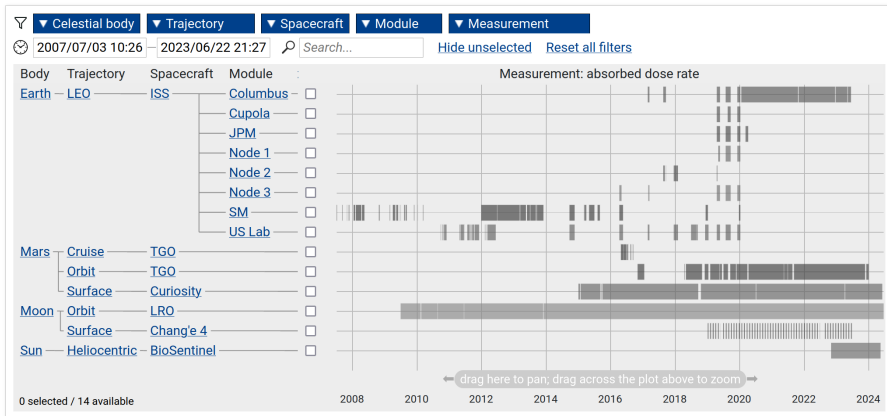
Navigate: (Shift-)click headers to sort. Hover to highlight equal values. [Toggle crosshairs](#).
Download: as [csv](#), [tsv](#), [json](#), [gct](#). Switch view level: [assays](#), [samples](#), [data](#).

GLDS-91 gse65943_transcription_profiling_RNA-Sequencing_(RNA-Seq)					GLDS-127 e-geod-84582_transcription_pr
index	Hsap_TK6cells_LCL_1G_Rep1	Hsap_TK6cells_LCL_1G_Rep2	Hsap_TK6cells_LCL_suG_Rep1	Hsap_TK6cells_LCL_suG_Rep2	Hsap_IMR90iPSCs_CPCs_1G_f
ENSG00000000003	0	0	0	0	2626
ENSG00000000005	0	0	0	0	1
ENSG000000000419	8626	8795	7877	10306	543
ENSG000000000457	949	972	1041	1095	358.29
ENSG000000000460	1519	1583	1387	1620	327.71
ENSG000000000938	2048	1881	1675	1745	0
ENSG000000000971	2	3	1	0	0
ENSG000000001036	1250	1315	1239	1534	577.56
ENSG000000001084	961	988	1046	1194	348.96
ENSG000000001167	3102	3102	2909	3149	1342
ENSG000000001460	2	2	4	1	204
ENSG000000001461	141	131	143	121	492
ENSG000000001497	6047	6088	5433	6249	1058
ENSG000000001561	749	848	843	859	95
ENSG000000001617	1	1	1	0	764
ENSG000000001626	0	2	3	0	380
ENSG000000001629	2523	2755	2639	2638	1116.84
ENSG000000001630	7438.87	8272.86	8505.75	9655.86	833.4
ENSG000000001631	2124.14	2269.97	2063.21	2337.41	687.57
ENSG000000002016	863	932	944	846.09	355.05
ENSG000000002079	1	6	4	2	2
ENSG000000002330	325	356	296	419	426.27
ENSG000000002549	2830	3108	2554	3022	679
ENSG000000002586	2451	2523	2227	2349	4079
ENSG000000002587	0	1	0	1	179
ENSG000000002726	35	43	37	34	2

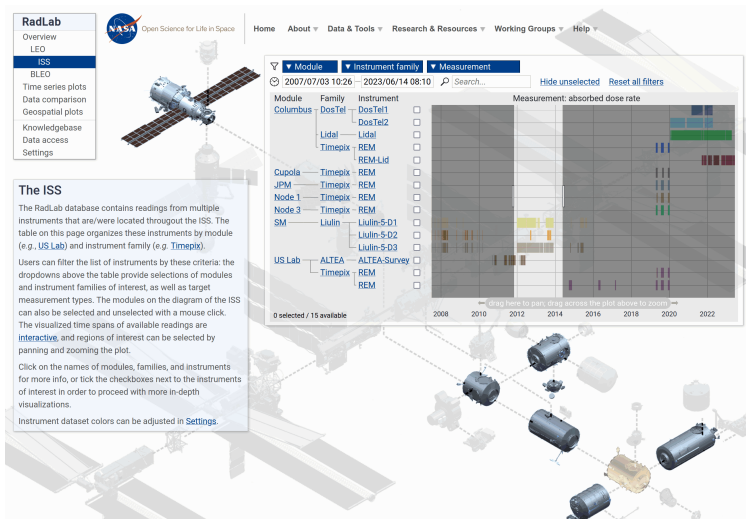
RadLab: Current State



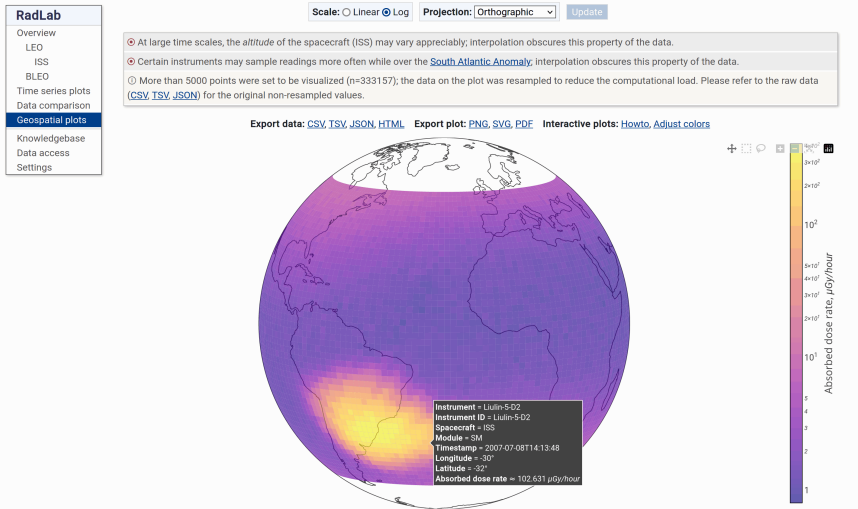
RadLab: Current State



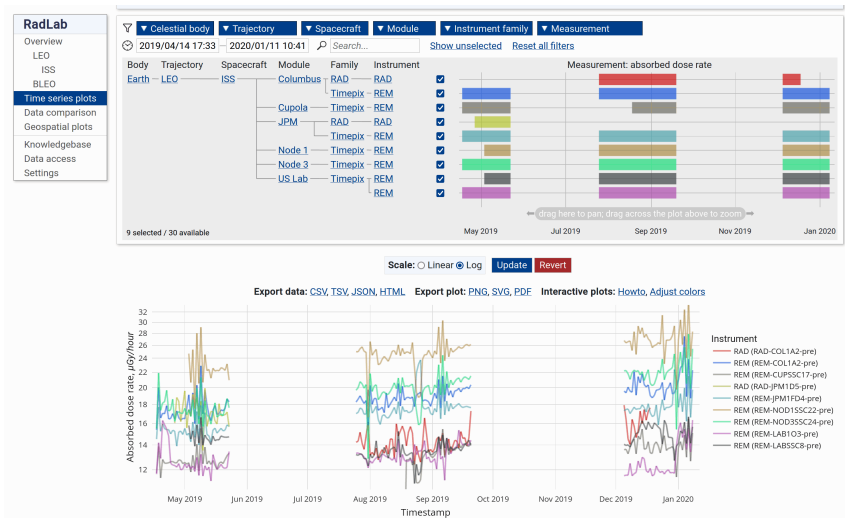
RadLab: GUI (Bells and Whistles)



RadLab: GUI (Geospatial Plots)



RadLab: GUI (Time Series Plots)



RadLab: API

RadLab

Overview

LEO

ISS

BLEO

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Geospatial plots

Knowledgebase

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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 parentheses).

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).	<code>celestial_body</code> <code>celestial_body=Earth</code> <code>celestial_body=Moon Sun</code>
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.			<code>trajectory</code> <code>trajectory=Orbit</code> <code>trajectory=LEO Heliocentric</code>
spacecraft	string	Name of spacecraft			<code>spacecraft</code> <code>spacecraft=ISS</code>
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			<code>module</code> <code>module=US%20Lab</code> <code>module=Cupola JPM</code>
instrument_family	string	Instrument family, which is a loosely defined			<code>instrument_family</code> <code>instrument_family=TEPC</code>

RadLab: API

RadLab Overview LEO ISS BLEO Time series plots Data comparison Geospatial plots Knowledgebase Data API Settings	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 Lidaj and included in the DORELL 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 .		<pre>instrument_id instrument_id=ALTEA-Survey instrument_id=DosTel1 DosTel2</pre>
	timestamp	ISO-formatted string (or Unix timestamp)	Timestamp of recorded value(s). Note: case-sensitive if passed as an ISO-formatted string.	<code>empty</code>: Request the field without applying filters to its values <code><value</code>: Match any less than value <code><=value</code>: Match any less or equal to value <code>=value</code>: Match value <code>>=value</code>: Match any greater or equal to value <code>>value</code>: Match any greater than value <i>Note: can be used more than once in a single query</i>	<pre>timestamp timestamp=2021-01-01T15:25 timestamp>=2022-01-01&timestamp<2023-01-01 timestamp>1683786900</pre>
	absorbed_dose_rate	number	Absorbed radiation dose rate	μGy/hour	<pre>absorbed_dose_rate absorbed_dose_rate>=2</pre>
	dose_equivalent_rate	number	Dose equivalent rate	μSv/hour	<pre>dose_equivalent_rate dose_equivalent_rate<=20</pre>
	flux	number	Particle flux	cm ⁻² sr ⁻¹ s ⁻¹	<pre>flux flux<1</pre>
	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	<pre>latitude latitude<-10</pre>

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 $\mu\text{Gy}/\text{hour}$, 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×tamp%3E=2022-04-01T23%3A00×tamp%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×tamp=>2022-04-01T23:00×tamp<2022-04-02T01:05&absorbed_dose_rate>2&flux&latitude&longitude&altitude&b&l&format=html

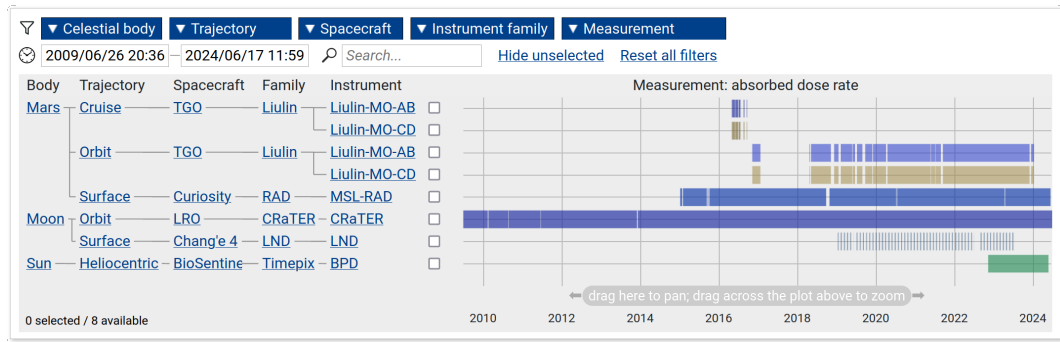
• Boolean expression syntax

- 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	10.61511933333333	424.812496	45307.7	0.5378740...	3.85842	49.120498	-83.450832	Columbus	ISS
2022-04-01T00:30:00	DosTel1	10.82385166666667	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	6.70494814102564	423.385667	39608.2	0.3208913...	2.25814	39.968035	-60.605414	Columbus	ISS

RadLab: AI/ML Applications



RadLab: AI/ML 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)

Results: An early warning model capable of predicting a likely radiation dose spike within the next 24 hours

frontierdevelopmentlab.org/fdl2024

youtube.com/watch?v=VYe9wpX8PXQ

RadLab: GeneLab/ALSDA Applications

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 **RR-1**
Rodent Research 1

Payload



Description

↑

Description

NASA's Rodent Research Hardware System provides a research platform aboard the International Space Station (ISS) for long-duration rodent experiments in space. Scientists and engineers at Ames Research Center (ARC) developed the new system for the space station based on the Animal Enclosure Module (AEM) that flew aboard 27 space shuttle missions between 1983 and 2011 and supported studies ranging from four to 18 days. Rodent spaceflight experiments have contributed significantly to our understanding of the effects of microgravity on biological processes that are directly relevant to humans in space.

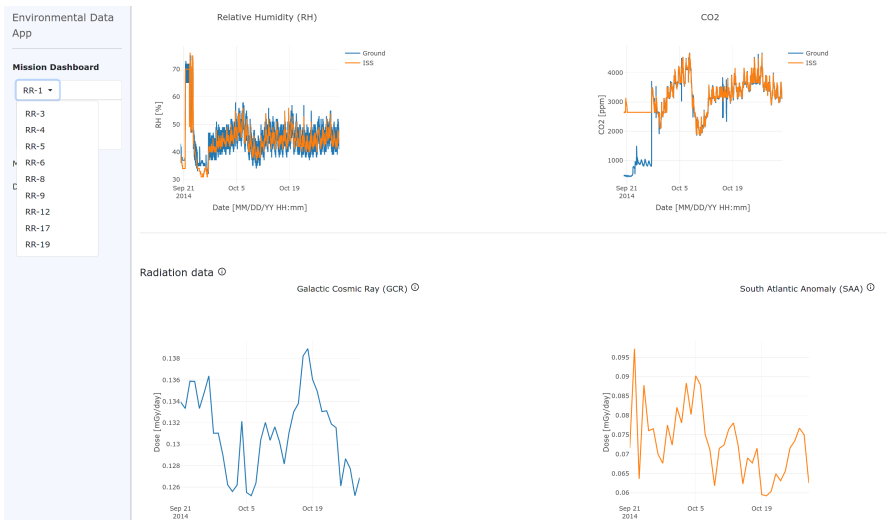
The maiden voyage of the system, Rodent Research-1 (RR-1), launched on SpaceX-4 CRS-4 on September 21, 2014, and returned October 25, 2014, during ISS expeditions 41/42. Lasting 37 days, RR1 was the longest duration spaceflight rodent study to date conducted in a NASA facility. RR1 was the first mission to transport rodents aboard an unmanned commercial vehicle. The primary goal is for NASA to validate hardware and demonstrate critical research operations, while supporting the Center for the Advancement of Science in Space (CASIS) in sponsoring the first commercial research study. Ten mice were flown to the ISS and transferred into habitat. Five mice were wild type (WT) and identified by an ear notch and the remaining mice, called "Knockouts" had no ear notches. Ten mice were used as ground controls.

PI: Novartis Pharmaceuticals

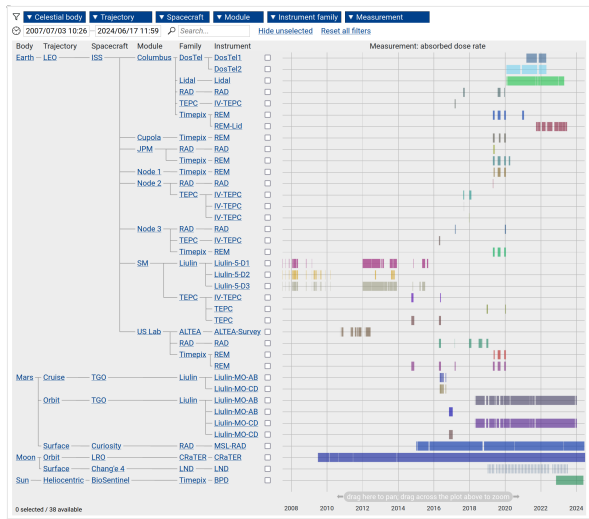
The mission objectives of the validation flight:

- The addition of the rodent research system expands the utilization of ISS for research on the effects of microgravity on rodents.
- The demonstration of the hardware capability to support rodent research for long-duration missions on ISS is accomplished.
- A validation of the operational capabilities of the hardware to support rodent research provides valuable information applicable to future long-term space missions.
- Validate that the Rodent Research Hardware can deliver and maintain healthy animals.
- Validate that on-orbit activities to support hardware operations can be performed.

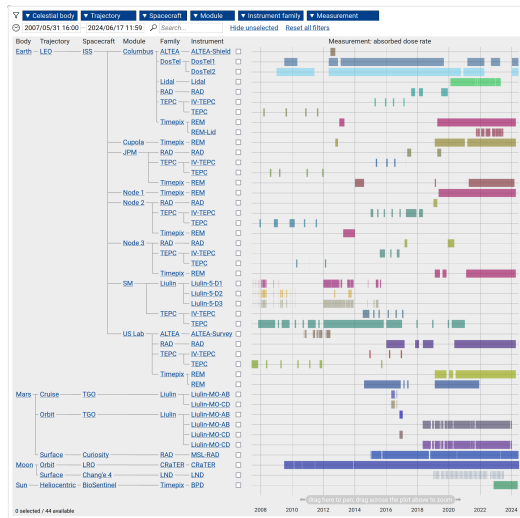
RadLab: GeneLab/ALSDA Applications



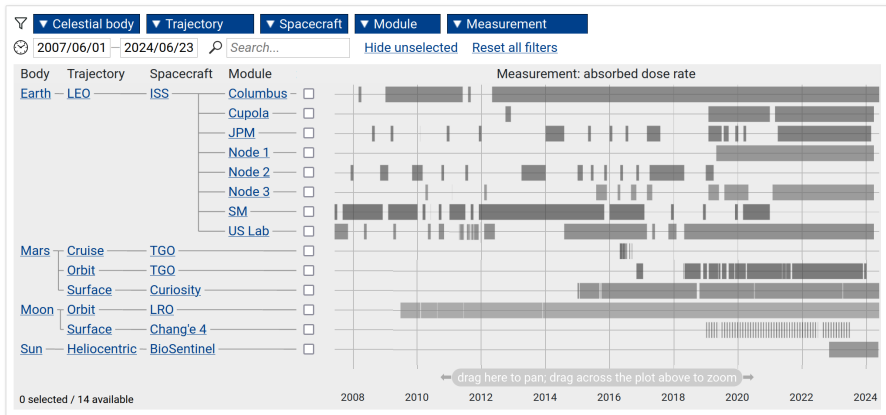
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RadLab: Goals



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ALTEA

ALTEA is a detector on the [ISS](#) which has been deployed in the [US Lab](#) in the [ALTEA-Survey \(ALTEA-30\)](#) configuration, and in the [Columbus](#) module in the [ALTEA-Shield \(ALTEA-Fig\)](#) configuration.

Attributes

Trajectory: [LEO](#)
Spacecraft: [ISS](#)
Modules: [US Lab](#), [Columbus](#)

Time resolution of the currently available data: 60 seconds

References

1. Nariel, L., Casolino, M., Di Fino, L., Larosa, M., Picozza, P., & Zaccante, V. (2015). **Radiation survey in the international space station**. *Journal of Space Weather and Space Climate*, 5, A37. <https://doi.org/10.1002/swsc.2015037>
2. Nariel, L., Berger, T., Burmeister, S., Di Fino, L., Rizzo, A., Matthä, D., & Reitz, G. (2017). **Exploiting different active silicon detectors in the International Space Station: ALTEA and DOSTEL galactic cosmic radiation (GCR) measurements**. *Journal of Space Weather and Space Climate*, 7, A18. <https://doi.org/10.1002/swsc.2017018>
3. Zeffin, C., Nariel, L., Rios, R. R., Rizzo, A., Stoffe, N., Hessler, D. M., ... & Spence, H. E. (2019). **Comparisons of high-linear energy transfer spectra on the ISS and in deep space**. *Space Weather*, 17(3), 396-418. <https://doi.org/10.1029/2018SW002193>

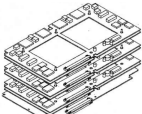
Overview

ALTEA is a detector system composed of six identical silicon strip telescopes, each able to measure the energy loss of all ions most relevant for radiation protection in space ($Z > 1$ –26). For protons and helium ions, respectively, the energy ranges are 25–45 MeV and 25–250 MeV/n. ALTEA also measures the trajectory of each ion, while using a statistical method to estimate the incident ion charge and energy. Typically [flux](#), LET (Linear Energy Transfer) rate, [absorbed dose rate](#), Q (quality factor), [dose equivalent rate](#) with a time resolution of better than 1 second can be provided. Particle by particle data is also available, as well as LET spectra. In conjunction with orbital data, separation among the important geographical or magnetic regions can be made.

Detector configuration

The ALTEA system is composed of 6 identical Silicon Detector Units (SDU), and one electronic Data Acquisition Unit (DAU). Each SDU is a six-plane particle telescope, with each plane composed of two 8×4 cm² silicon wafers, 389 µm thick, placed side by side on an aluminum support and spaced 5.5 mm apart, for a total surface of 8×16.55 cm². Each silicon wafer is divided into 32 strips, with a pitch of 2.5 mm. Plane orientation alternates between X and Y directions. The distance between an X plane and the adjacent Y plane is 3.75 mm, while the distance between each XY pair is 37.5 mm. The hits in two consecutive planes provide the position of the particle in the X-Y plane, while hits in pairs of planes provide the Z. The outer box of each SDU is made of 1.3 mm thick aluminum and the whole structure results in a double-ended geometrical factor of 230 cm² sr. The field of view reaches 66.8° on the diagonal.

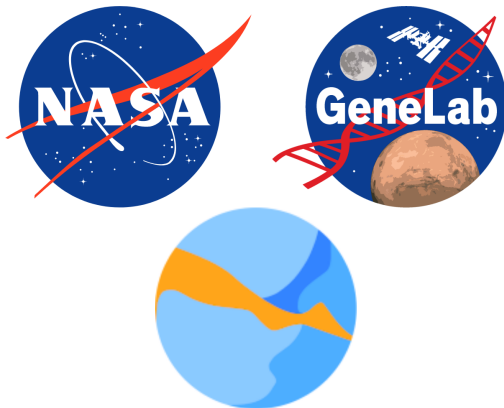
The front-end electronics are located around each double wafer, while at the bottom of the silicon planes, a 7th parallel plane with the same dimensions hosts the Read-Out Electronics board (ROE). (The figure shows the six double wafers plus electronics and—at the bottom—the ROE). The average equivalent thickness of the ROE is estimated to be 0.8 µm of glass + 0.8 µm of copper + 1 µm of silicon.



The RadLab Working Group (RLWG)

- ▶ Fostering collaboration
- ▶ Integration of new datasets
- ▶ Development of new harmonized data standards
- ▶ Guiding the development of the platform
- ▶ Establishing the use of RadLab in radiation and biology research

Thank you!



visualization.osdr.nasa.gov/radlab

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