

The background of the slide is a photograph of a large, rugged mountain peak. The mountain has a steep, rocky face with several horizontal layers of rock visible. Patches of snow are scattered across the mountain's surface, particularly in the crevices and along the ridges. The sky is a clear, pale blue. The overall scene is one of natural grandeur and beauty.

OlyMPUS: OntoLogY-based Metadata Portal for Unified Semantics

A Collaborative Effort

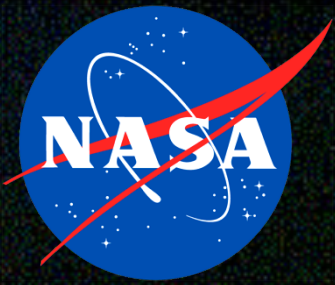
Atmospheric Science Data Center

National Center for Climate Simulation

CERES Science Team

NASA Advanced Supercomputing

Jonathan Gleason and Beth Huffer, PI's



Team Members

Project Manager

Michelle Bishop

Co-Investigators

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Mark McInerney, NCCS

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Piyush Mehrotra, NAS

Marc Cotnoir, NAS

Pam Mlynczak, CERES

Development Team

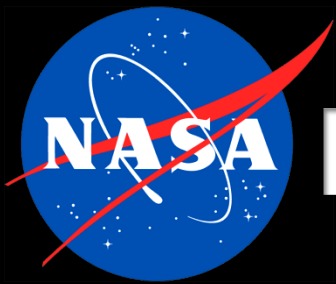
Ryan Spaulding

Jeremy Vickery

Sheffan Chan

Tyler Bristow

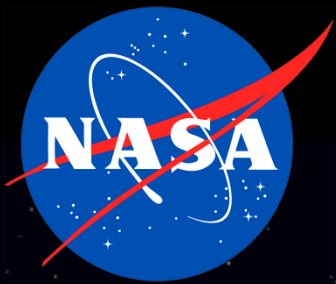
Michael Linsinbigler



Earth Science Objective

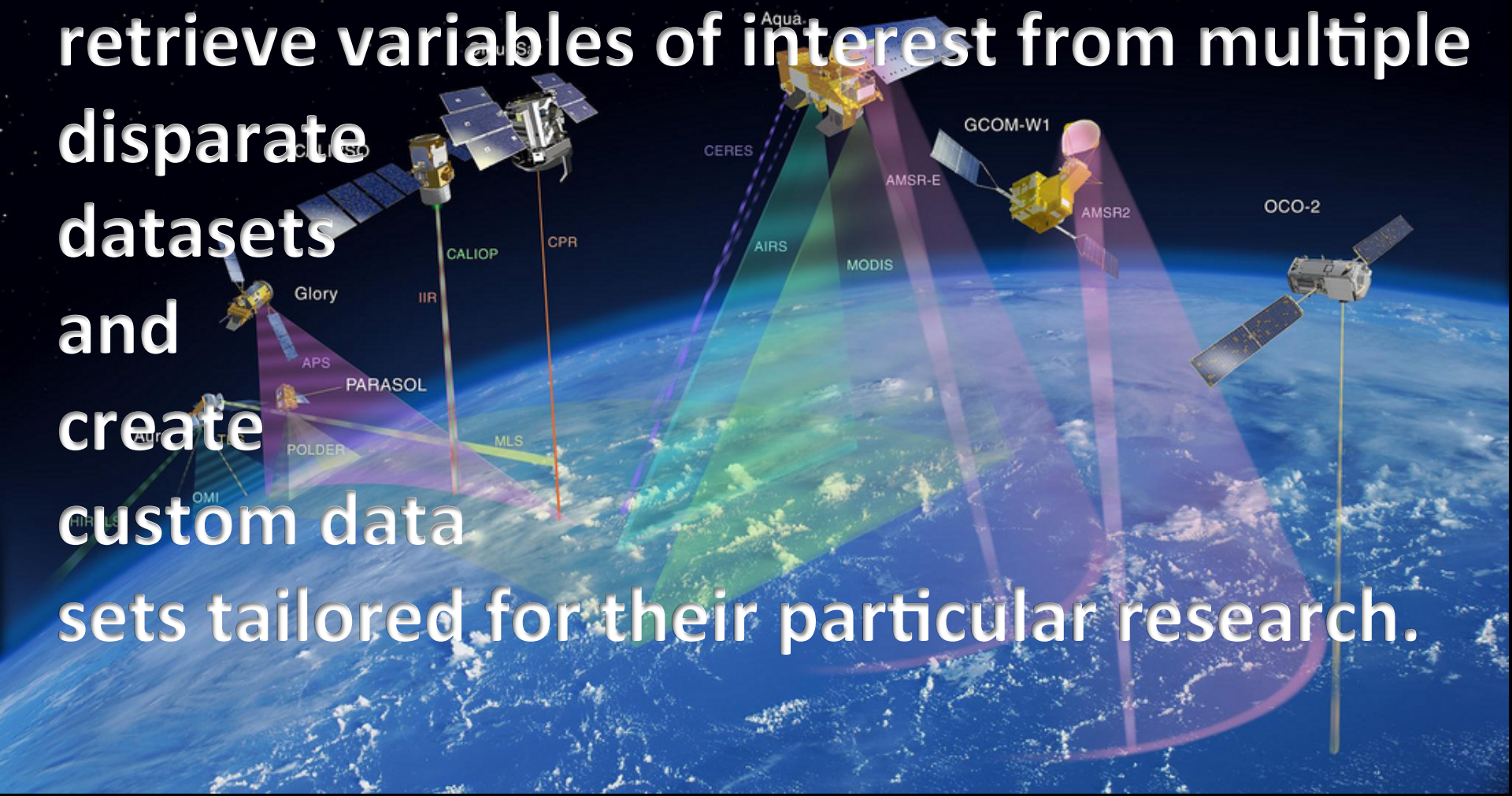
Promote data-exploiting research and applications that facilitate climate modeling, accelerated use of NASA data, and operational research synthesis of NASA Earth Science observations

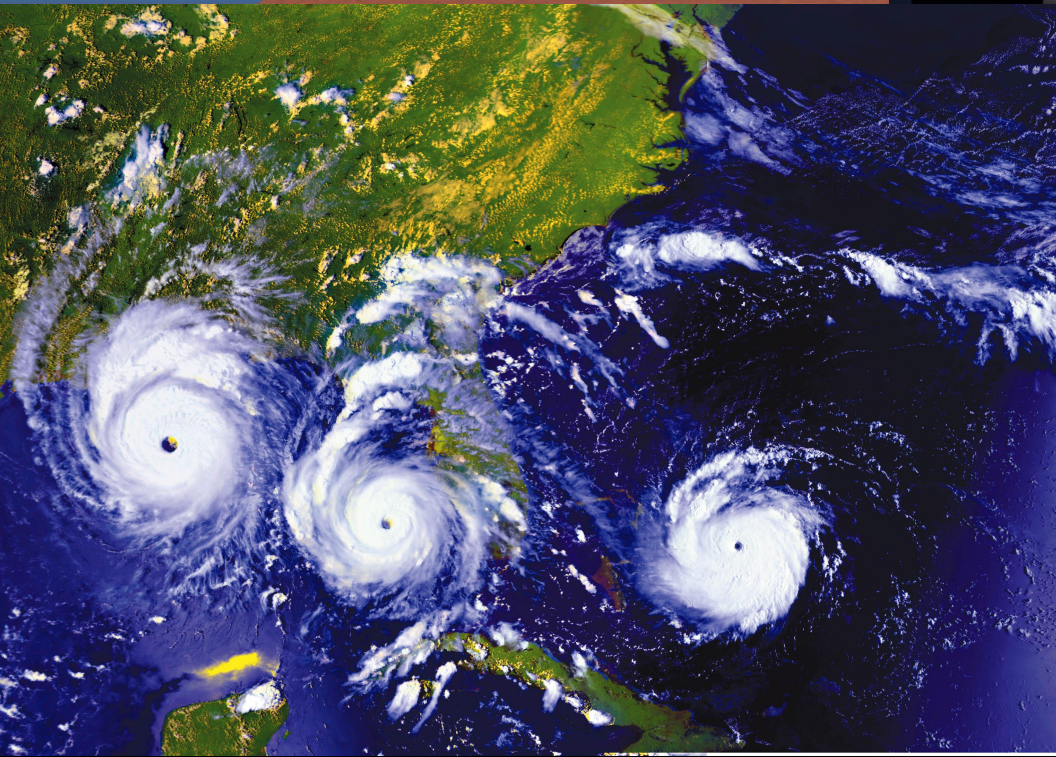
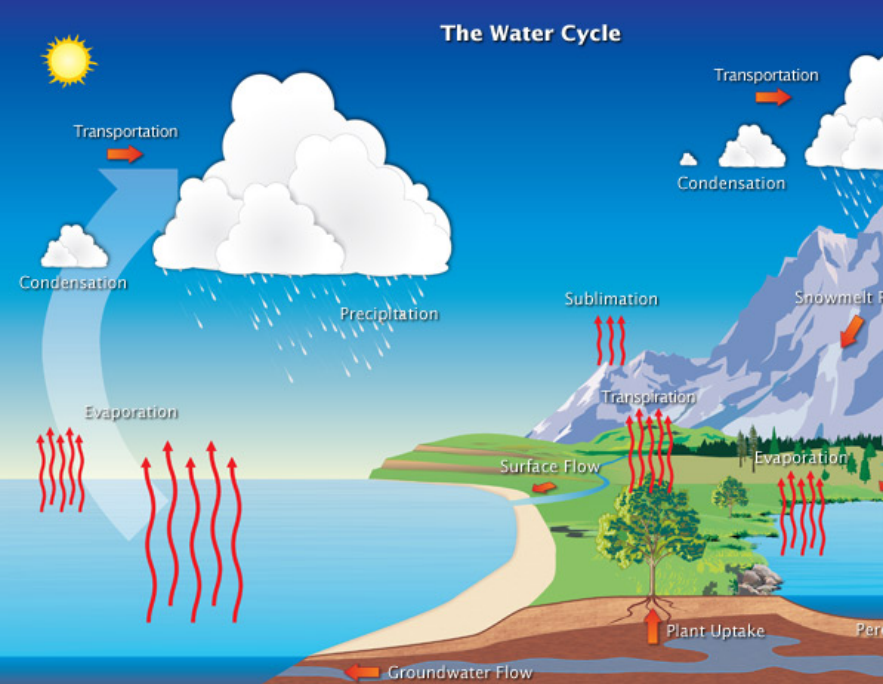
A central image showing a pair of hands holding a glowing globe. The globe is covered in a blue grid pattern, with green landmasses visible. The hands are positioned at the bottom, with fingers spread, supporting the globe from below. The background is a dark blue gradient.



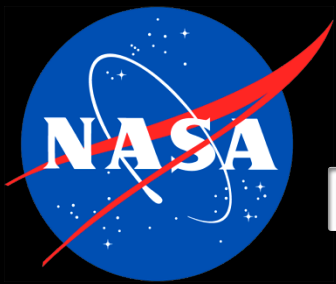
How can we do that?

Enable researchers to seamlessly find and retrieve variables of interest from multiple disparate datasets and create custom data sets tailored for their particular research.





**NASA data products
are critical to a
variety of research
disciplines, but they
are under-utilized**



OlyMPUS: A Data Discovery, Data Delivery and Metadata Provisioning Platform



National Aeronautics and Space Administration
Goddard Space Flight Center

[CISTO](#) | [Sciences and Exploration](#)



HOME DATA TOOLBOX

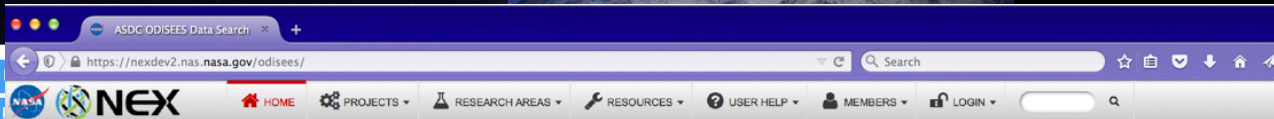
- ▶ Aerosols-Optical Properties
- ▶ Aerosol Physical Properties
- ▶ Atmospheric Chemistry
- ▶ Clouds-Optical Properties
- ▶ Clouds-Physical Properties
- ▶ Cloud Radiative Effects
- ▶ Earth Surface
- ▶ Hydrology
- ▶ Meteorology
- ▶ Radiation
- ▶ Snow and Ice

Home



ASDC ODISEES
DATA PORTAL

Atmospheric
Science
Data Center



- ▶ Aerosols-Optical Properties
- ▶ Aerosol Physical Properties
- ▶ Atmospheric Chemistry
- ▶ Clouds-Optical Properties
- ▶ Clouds-Physical Properties
- ▶ Cloud Radiative Effects
- ▶ Earth Surface
- ▶ Hydrology
- ▶ Meteorology
- ▶ Radiation
- ▶ Snow and Ice

Clear

- ▶ Aerosols
- ▶ Atmospheric Chemistry
- ▶ Clouds-Optical Properties
- ▶ Clouds-Physical Properties
- ▶ Cloud Radiative Effects
- ▶ Cryosphere
- ▶ Earth Surface
- ▶ Hydrology
- ▶ Meteorology
- ▶ Radiation Budget

Clear

Welcome to the Ontology-Driven Interactive Search Environment for Earth Science (ODISEES). Users can query the ASDC semantic metadata repository for information about and access to select archived data and climate model outputs. No prior knowledge of the ontology, or the data vocabulary is required.

To begin, select a category. Or, visit the [help page](#).

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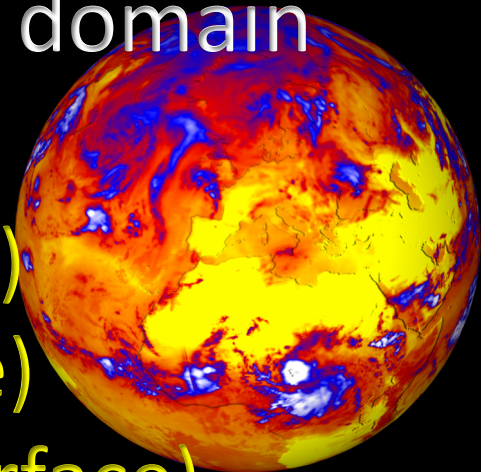
Privacy Policy and Notices
Terms and Conditions

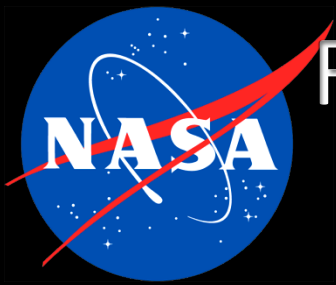
Responsible NASA official: Ramakrishna



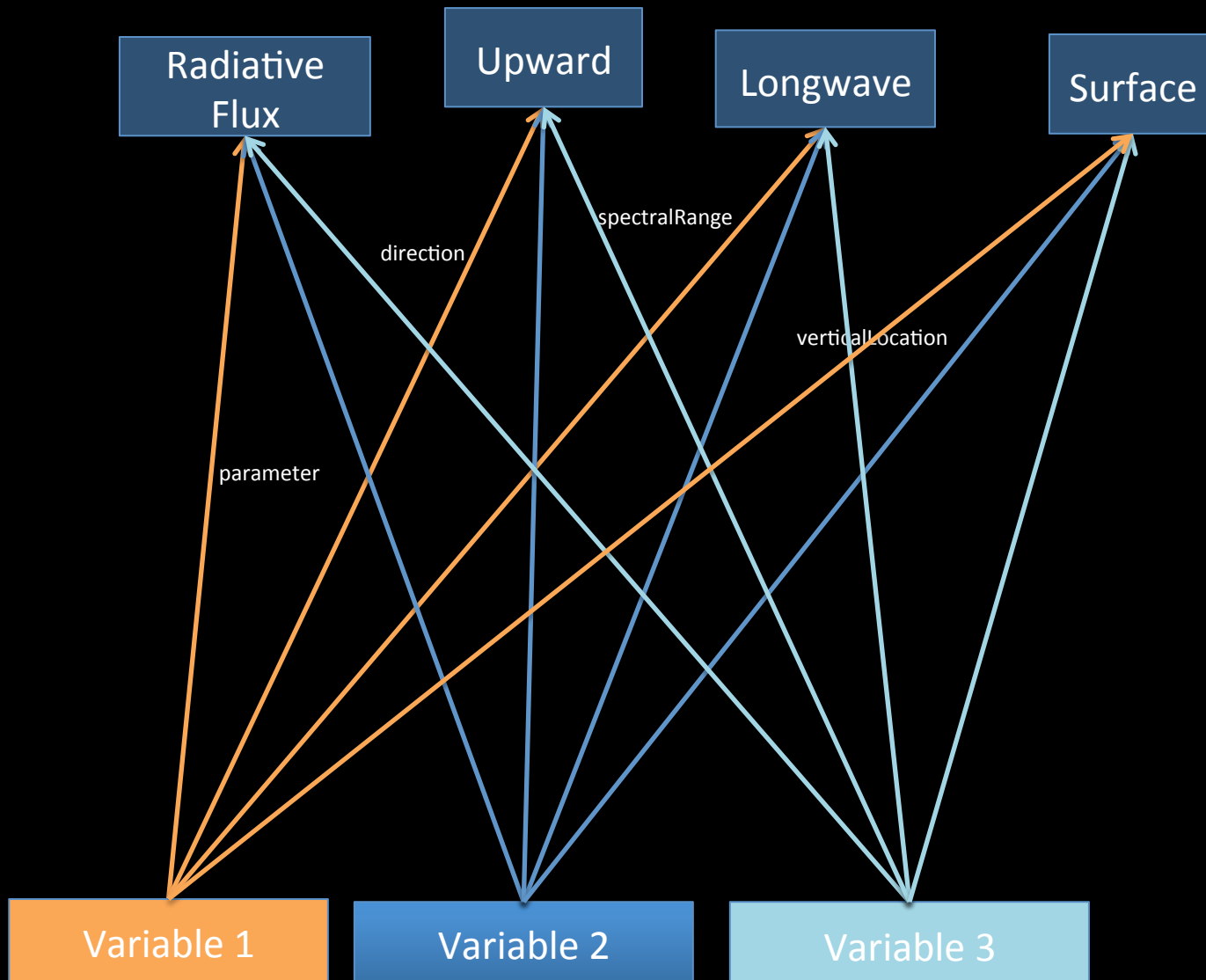
Each variable type in a data set is described in detail in a formal language representing the Earth science domain

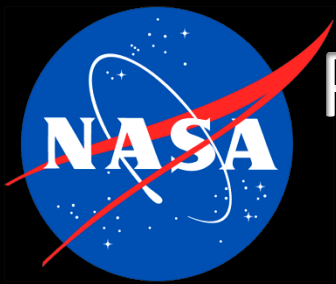
(parameter v1 RadiativeFlux)
(spectralRange v1 Longwave)
(verticalLocation v1 EarthSurface)
(direction v1 Upward)
(dataSource v1 Satellite)
(spatialResolution v1 1x1GridCell)
(temporalResolution v1 OneMonth)



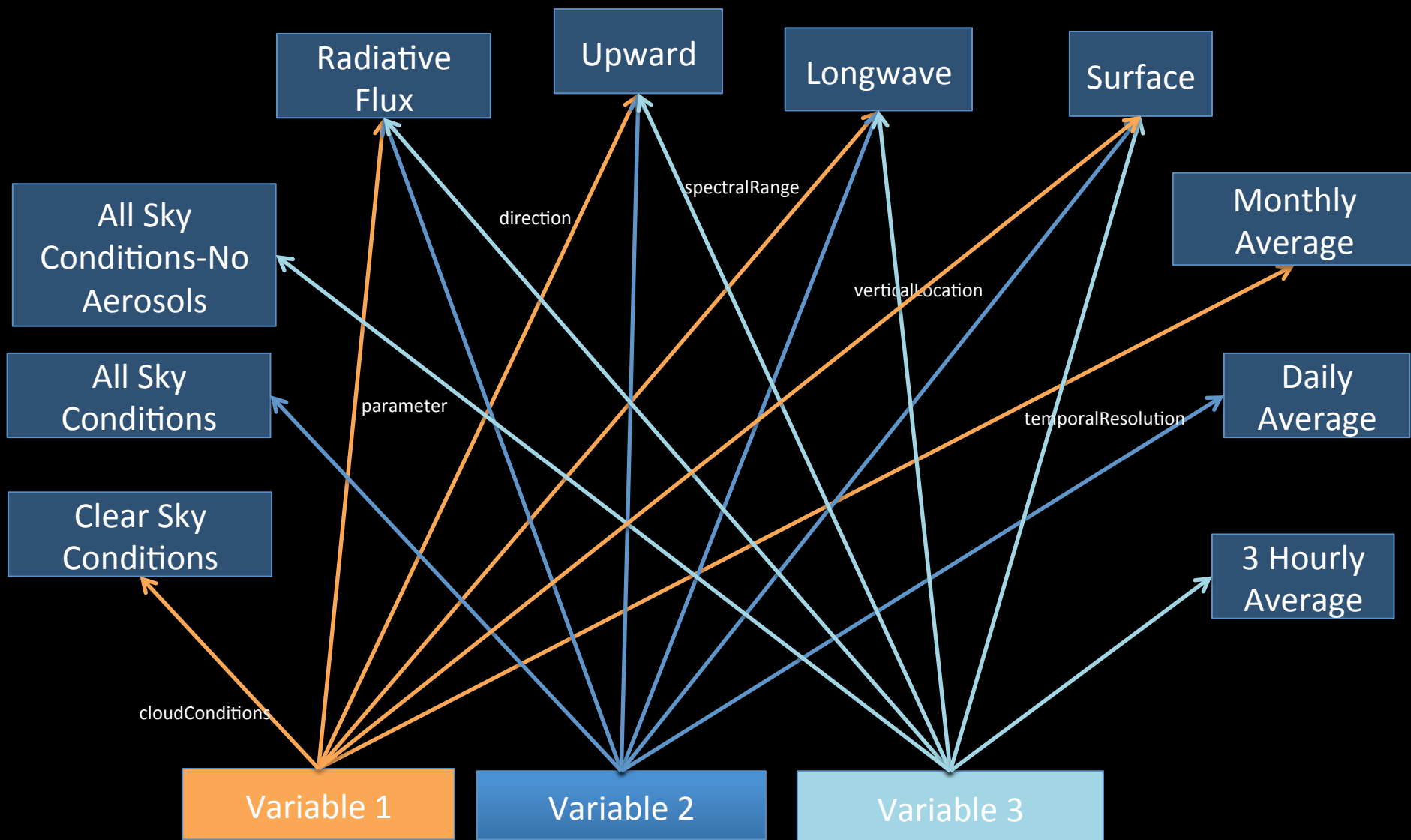


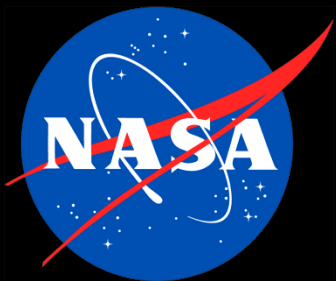
Formal descriptions of variables map similar variables to one another





Prospective data users can also see how similar variables differ





Users can find all the variables that satisfy some custom-defined set of criteria



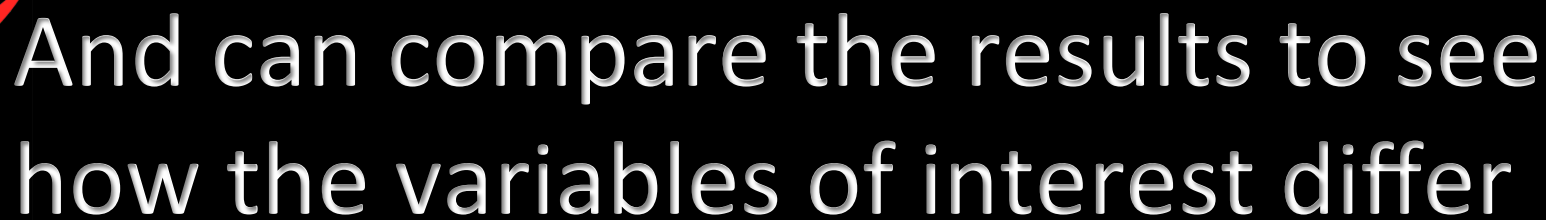
- ▶ Aerosols-Optical Properties
- ▶ Aerosol Physical Properties
- ▶ Atmospheric Chemistry
- ▶ Clouds-Optical Properties
- ▶ Clouds-Physical Properties
- ▶ Cloud Radiative Effects
- ▶ Earth Surface
- ▶ Hydrology
- ▶ Meteorology

- ▼ Radiation
- Temporal Resolution**
- ☒ Monthly (64)
- Cloud Conditions**
- ☒ Clear Sky (64)
- Direction**
- ☒ Upward (64)
- Spatial Resolution Type (Horizontal)**
- ☒ Grid Cell (64)
- Spectral Range**
- ☒ Longwave (from 4 μm) (64)

- ▶ Snow and Ice

Variable	Description	Project
▶ CSULF_TOA (2)	Clear sky upward long wave flux at top of atm	Japanese 25-year Reanalysis Project (JRA 25)
▶ Clear sky upward longwave flux (2)	Clear sky upward longwave flux	CFSR
▶ LWTUPCLR (1)	Longwave upward flux at the top of the atmosphere - clear sky conditions	MERRA
▶ LW TOA Flux Clear-Sky (4)	Longwave upward flux at the top of the atmosphere Clear-Sky	CERES Experiment
▶ Longwave flux (36)	Longwave flux	CERES Experiment
▶ Tuned Clear-Sky LW Up (4)	Tuned Clear-Sky Longwave Flux Upward	CERES Experiment
▶ Untuned Clear Sky LW Surface Up (4)	Untuned Clear Sky Longwave upward flux at the surface	CERES Experiment
▶ Untuned Clear Sky LW TOA Up (4)	Untuned Clear Sky Longwave upward flux at the top of the atmosphere	CERES Experiment
▶ rlutcs (5)	TOA Outgoing Clear-Sky Longwave Radiation	ana4mips-MERRA ana4mips-ECMWF ana4mips CFSR ana4mips-JRA 25 obs4mips-CERES
▶ sfc_lw_up_clr_mon (1)	Surface Longwave Flux Up - Clear Sky (Monthly)	CERES Experiment
▶ toa_lw_clr_mon (1)	TOA Longwave Flux Down - Clear Sky (Monthly)	CERES Experiment

undefined

[illegible]



ASDC ODISEE Data Search

https://nexus2.nsl.nasa.gov/odisees/

HOME PROJECTS RESEARCH AREAS RESOURCES USER HELP MEMBERS LOGIN

Search

ASDC ODISEE Data Search

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Aerosols
 Atmospheric Chemistry
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 Clouds-Physical Properties
 Cloud Radiative Effects
 Cryosphere
 Earth Surface
 Hydrology
 Meteorology
 Radiation Budget

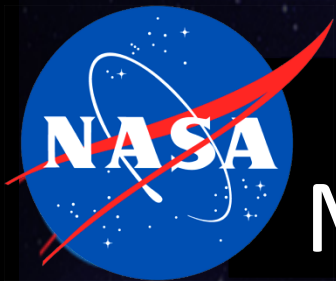
Clear

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Responsible NASA official: R...

[illegible]



OlyMPUS

Metadata Portal

► Update an existing data set

► Register a new data set

Clear

Register a new data set with ODISEES:

Enter the name of the data set to register below.

Dataset name:

Submit



Dataset ID

CER_NPP_NewV1

Data Source



Satellite



Reanalysis

OlyMPUS prompts users for basic information and uses information already in the repository to run inference rules that help guide the user experience and generate new metadata



Dataset ID

CER_NPP_NewV1

Project

☐

CALIPSO

☒

CERES

☐

ISCPP

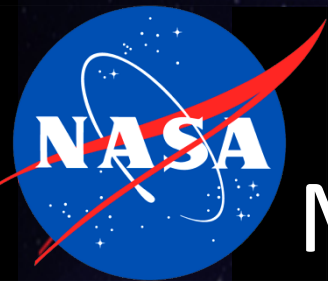
Knowing that the data product is the output of satellite observations helps OlyMPUS limit the options offered in the project pick list



Knowing what project a data set is produced by helps OlyMPUS generate metadata for it

```
(=> (and
      (instanceOf ?set1 DataProduct)
      (project ?set1 ?project)
      (relationship ?set1 ?thing)
      (instanceOf ?set2 DataProduct
      (project ?set2 ?project))
      (possible (relationship ?set2 ?thing))))
```

If 2 data products are from the same project, then relationships that hold them might also hold for the other



OLYMPUS

M

Dataset

We can generate metadata for a new data set that is similar to metadata for an earlier data set from the same project, and prompt the user to select all those that apply

Principal Investigator Norman Loeb

Archive Center

ASDC

Instrument



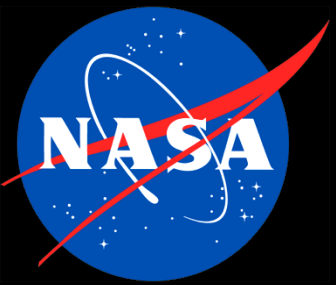
CERES FM5



CERES FM4



CERES FM3



We can generate metadata about the platform from information we already have about the instrument

(=>

(and

(instanceOf ?set1 DataProduct)

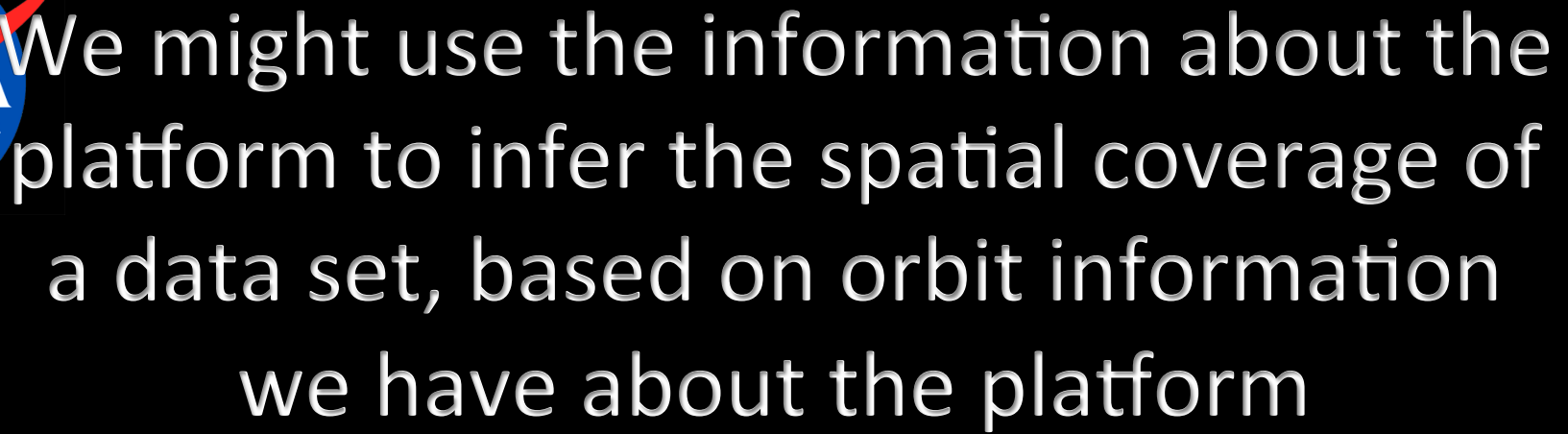
(instrument ?set1 ?instrument)

(platform ?instrument ?platform))

(platform ?set1 ?platform))



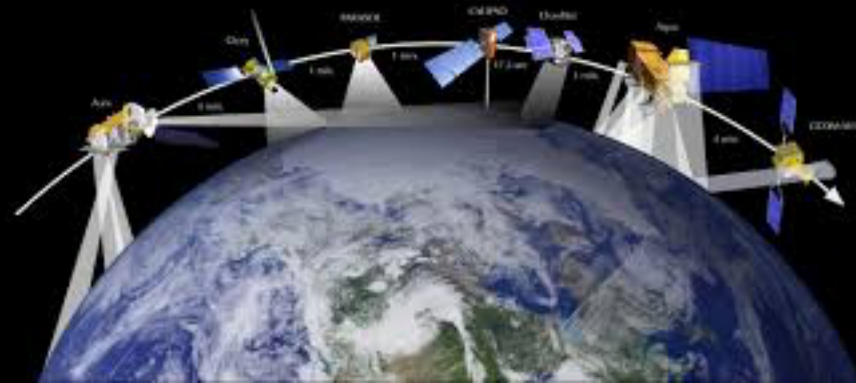
If a data set is produced from an instrument installed on a platform, then
assert that the data set has the same platform

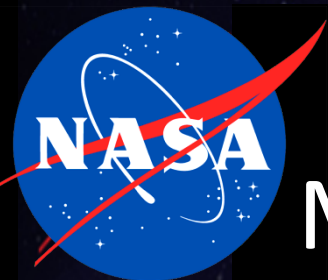


(and

```
(platform ?set ?satellite)
(orbitType ?satellite PolarOrbit))
(spatialCoverage ?set Global))
```

If a data set platform is a satellite in a polar orbit, then the data set's spatial coverage is global





OlyMPUS

M

Whenever possible, we'll extract information from existing resources. For instance, we can get information about variables from HDF files

Dataset ID

Instrument

Spatial Coverage

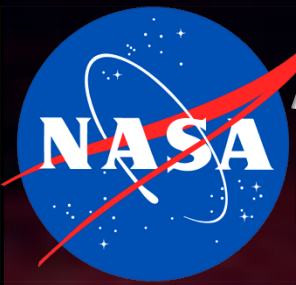
Variables

☒ SW_TOA_Flux_Total-Sky

☒ LW_TOA_Flux_Total-Sky

☒ Liquid Water Path

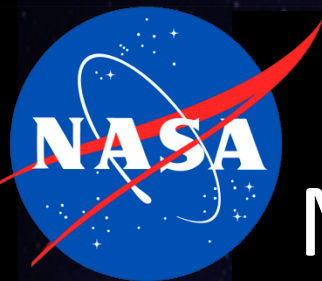
☒ Tuned_Clear_Sky_LW_Up



And again, we'll try to autogenerate as much information as possible about the variables with a combination of user input, existing knowledge, and inference rules

```
(=>  
  (and  
    (category ?var ?cat)  
    (subClass ?parameter ?cat))  
  (possible (parameter ?var ?parameter)))
```

Prompt the user to indicate the category a variable falls into, then list the set of science parameters that are subclasses of that category



OlyMPUS

Metadata Portal

Variable Name

Tuned_Clear_Sky_LW_Up

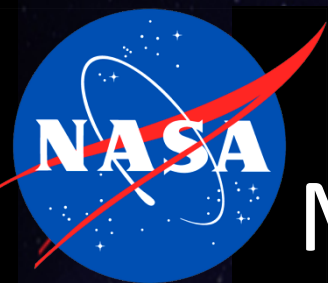
Science Parameter

☐ Radiance

☒ Radiative Flux

☐ Emissivity

We don't need to show users a list of all possible science parameter values – just those that are in the selected category



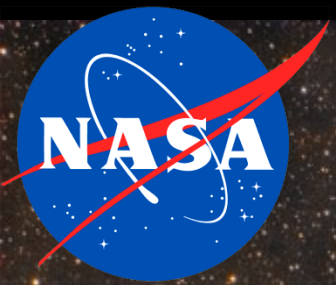
Olympus

Metadata

Ultimately, the metadata records needed to run ODISEES are generated through a combination of automation and human input that inflicts minimal pain on the human while ensuring a high degree of accuracy and consistency

Dataset ID	CER_N
Principal Investigator	Norma
Archive Center	ASDC
Instrument	CERES
Platform	Suomi
Spatial Coverage	Global
Variables	SW_T

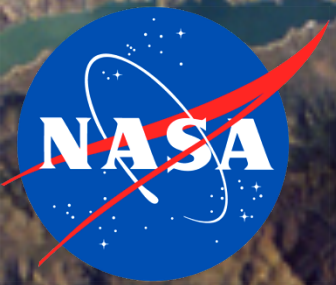
Parameter	Radiative Flux
Spectral Range	Shortwave
LW_TOA_Flux_Total_Sky	
Category	Radiation
Parameter	Radiative Flux
Spectral Range	Longwave



OlyMPUS PROJECT GOALS

Data Discovery and Access:

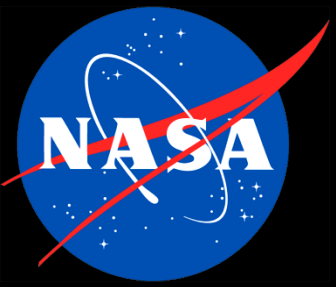
- ODISEES will be operational at the ASDC, the NCCS and the NEX
- Users will be able to find and subset CERES and MERRA data with a mouse click
- NEX users will be able to add that data to the NEX file system on Pleiades and the NEX Sandbox



OlyMPUS PROJECT GOALS

Metadata Provisioning:

- Will be integrated with ODISEES instances at the NEX, the ASDC and the NCCS
- Will be accessible to registered beta users with account authentication
- Will produce metadata as accurate or more accurate than metadata created manually



Thank you

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Jonathan Gleason

jonathan.l.gleason@nasa.gov