Open Data Interface ODI

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ODI

- ESTEC/Contract No. 21964/08/NL/AT
- KO in October 2008
- End in March/April 2010

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Background

- Create a common database to hold data from:
  - ✦ SAAPS
  - ✦ SEDAT
  - ✦ SPENVIS
- Compliant with CDF/ISTP/PRBEM.
- Update SAAPS/SEDAT/SPENVIS to access data from the common database.
- Shall be possible to ingest data in both text format and CDF format.

Software

- MySQL database engine
- (My)SQL and PHP for database maintenance
- CDF
- WGet for data download
- Cron for automatic processing
- Unix shell scripts

ODI

- Java (SAAPS)
- IDL (SEDAT, SPENVIS)

SAAPS/SEDAT/SPENVIS

Common Data Format (CDF)

"... is a self-describing data format for the storage and manipulation of scalar and multidimensional data in a platform- and discipline-independent fashion."

cdf.gsfc.nasa.gov/

ISTP defines a set of required and optional attributes.

PRBEM adds a set of variables.

Global attributes

```
! Skeleton table for the "SREMRosetta_PACC_20090101.cdf" CDF.
! Generated: Wednesday, 18-Feb-2009 09:48:17
! CDF created/modified by CDF V2.7.2
! Skeleton table created by CDF V3.2.4

#header

                      CDF NAME: SREMRosetta_PACC_20090101.cdf
                 DATA ENCODING: IBMPC
                      MAJORITY: ROW
                        FORMAT: SINGLE

! Variables  G.Attributes  V.Attributes  Records  Dims  Sizes
! ---------  ------------  ------------  -------  ----  -----
    0/12           13             13        0/z      0


#GLOBALattributes

! Attribute          Entry       Data
! Name               Number      Type       Value
! ---------          ------      ----       -----

  "Project"             1:    CDF_CHAR     { "SREM aboard Rosetta" } .

  "Source_name"         1:    CDF_CHAR     { "Rosetta" } .

  "Discipline"          1:    CDF_CHAR     { "Space " -
                                             "Physics>Interplanetary " -
                                             "Science" } .

  "Data_type"           1:    CDF_CHAR     { "PACC>Processed " -
                                             "Accumulation Data" } .

  "Descriptor"          1:    CDF_CHAR     { "SREM>Standard Radiation " -
                                             "Environment Monitor" } .
```

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CDF (cont.)

```
! Variable          Data      Number                    Record   Dimension
! Name              Type      Elements  Dims  Sizes     Variance Variances
! --------          ----      --------  ----  -----     -------- ---------

  "label_COUNTERS"
                    CDF_CHAR      3       1     15         F         T

  ! Attribute       Data
  ! Name            Type        Value
  ! --------        ----        -----

    "FIELDNAME"     CDF_CHAR    { "SREM counter label" }
    "VAR_TYPE"      CDF_CHAR    { "metadata" }
    "CATDESC"       CDF_CHAR    { "SREM counter label" } .

  ! NRV values follow...

    [1] = { "TC1" }
    [2] = { "S12" }
    [3] = { "S13" }
    [4] = { "S14" }
    [5] = { "S15" }
    [6] = { "TC2" }
    [7] = { "S25" }
    [8] = { "C1 " }
    [9] = { "C2 " }
    [10] = { "C3 " }
    [11] = { "C4 " }
    [12] = { "TC3" }
    [13] = { "S32" }
    [14] = { "S33" }
    [15] = { "S34" }
```

Metadata variable

Variable attributes

```
! Variable          Data      Number                    Record   Dimension
! Name              Type      Elements  Dims  Sizes     Variance Variances
! --------          ----      --------  ----  -----     -------- ---------

  "EPOCH"           CDF_EPOCH     1       0               T

  ! Attribute       Data
  ! Name            Type        Value
  ! --------        ----        -----

    "FIELDNAME"     CDF_CHAR    { "Time since 0 AD of accumulation" }
    "VALIDMIN"      CDF_EPOCH   { 01-Oct-2001 00:00:00.000 }
    "VALIDMAX"      CDF_EPOCH   { 01-Jan-2010 00:00:00.000 }
    "LABLAXIS"      CDF_CHAR    { "Epoch" }
    "UNITS"         CDF_CHAR    { "ms" }
    "FILLVAL"       CDF_DOUBLE  { -1.0e+31 }
    "VAR_TYPE"      CDF_CHAR    { "support_data" }
    "DICT_KEY"      CDF_CHAR    { "time>epoch" }
    "SCALETYP"      CDF_CHAR    { "linear" }
    "MONOTON"       CDF_CHAR    { "INCREASE" }
    "CATDESC"       CDF_CHAR    { "Accumulation interval centered epoch" } .
```

Support data variable

Variable attributes

```
! Variable          Data      Number                    Record   Dimension
! Name              Type      Elements  Dims  Sizes     Variance Variances
! --------          ----      --------  ----  -----     -------- ---------

  "COUNTRATE"       CDF_DOUBLE    1       1     15         T         T

  ! Attribute       Data
  ! Name            Type        Value
  ! --------        ----        -----

    "FIELDNAME"     CDF_CHAR    { "SREM deadtime corrected count rates" }
    "VALIDMIN"      CDF_DOUBLE  { 0.0 }
    "VALIDMAX"      CDF_DOUBLE  { 4.29497e+09 }
    "LABLAXIS"      CDF_CHAR    { "Count rate" }
    "UNITS"         CDF_CHAR    { "1/sec" }
    "FILLVAL"       CDF_DOUBLE  { -1.0e+31 }
    "VAR_TYPE"      CDF_CHAR    { "data" }
    "DICT_KEY"      CDF_CHAR    { "particle_flux>number" }
    "SCALETYP"      CDF_CHAR    { "linear" }
    "CATDESC"       CDF_CHAR    { "SREM deadtime corrected count rates" }
    "DEPEND_0"      CDF_CHAR    { "EPOCH" }
    "DEPEND_1"      CDF_CHAR    { "label_COUNTERS" } .
```

Data variable

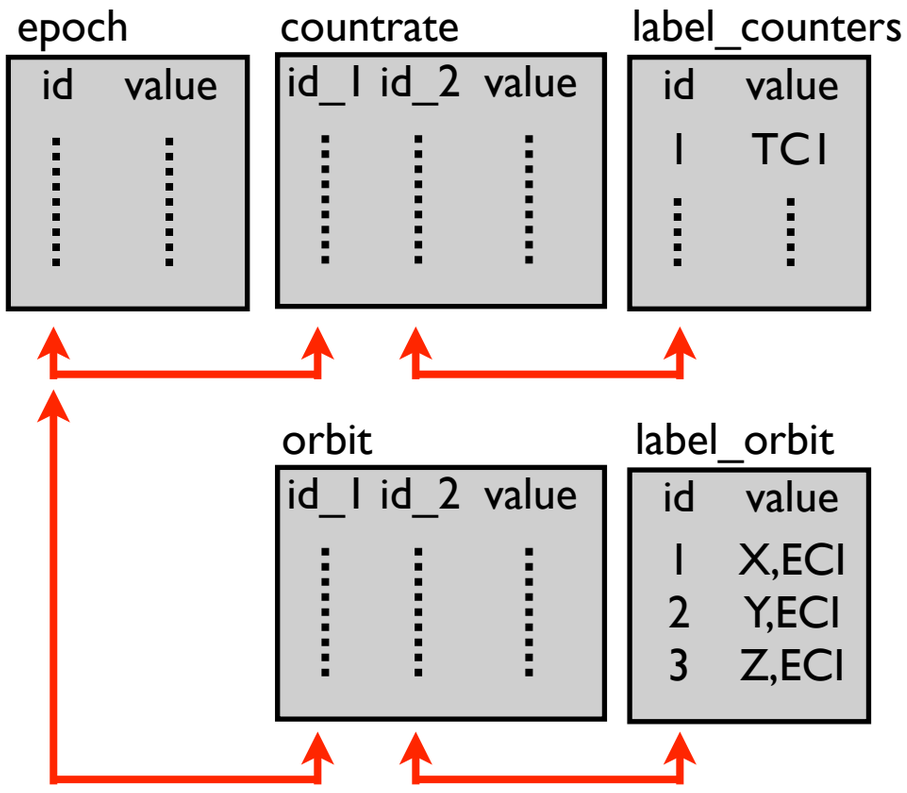
Variable attributes

But ISTP says "FIELDNAM" not "FIELDNAME"

CDF multi-dim variables to SQL tables

Multi-table approach

- Each CDF variable gets one table.
- Relations between tables using SQL keys based on the CDF dependencies.

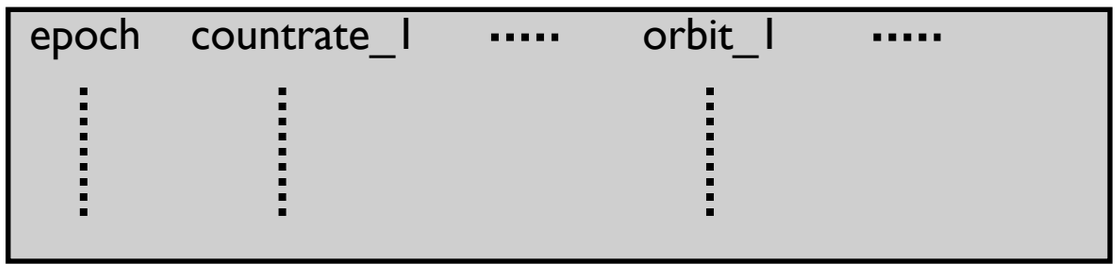


+Can store all types of CDF data sets.

- Complex
- Performance?

Multi-column approach

- The "data" is stored in one SQL table per CDF data set.
- "Epoch" is a key variable.
- Each CDF "data" variable element gets one column.



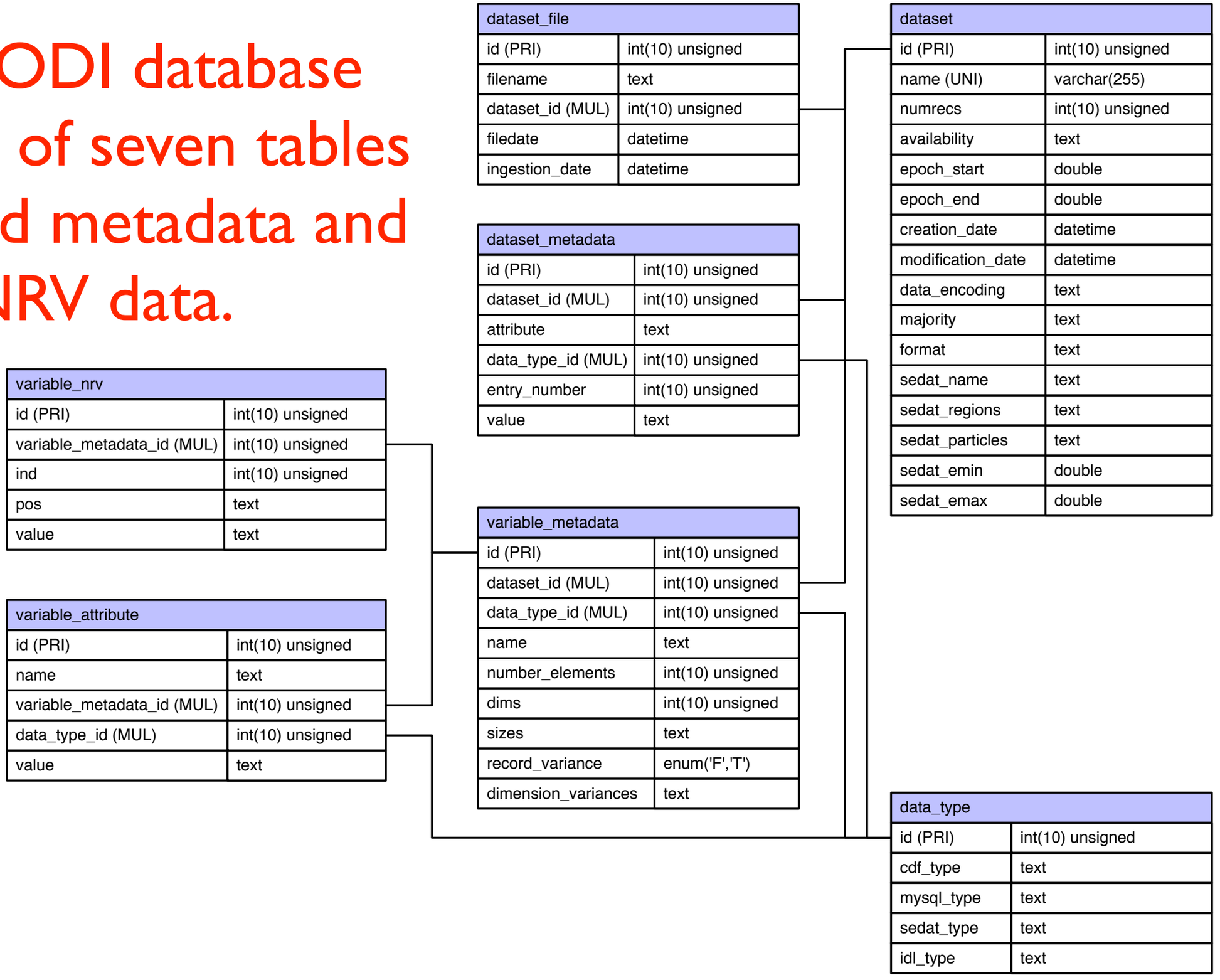
+Simple table structure.

+Close resemblance to other data sets in table format.

- Metadata must be constant.

Database structure

Core ODI database consists of seven tables that hold metadata and NRV data.



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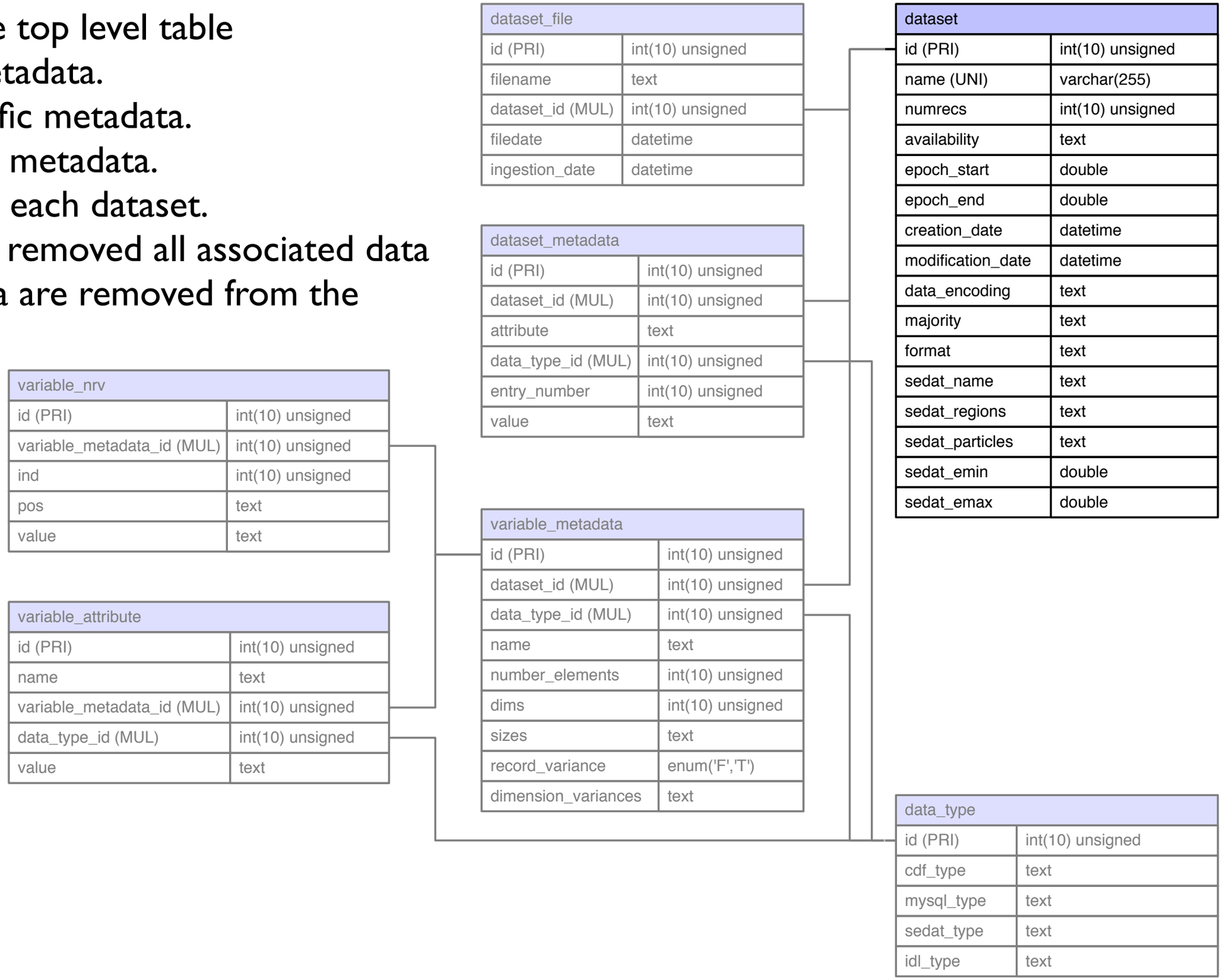
Dataset meta-metadata

- dataset is the top level table
- All global metadata.
- SEDAT specific metadata.
- CDF specific metadata.
- One row for each dataset.
- If one row is removed all associated data and metadata are removed from the other tables.



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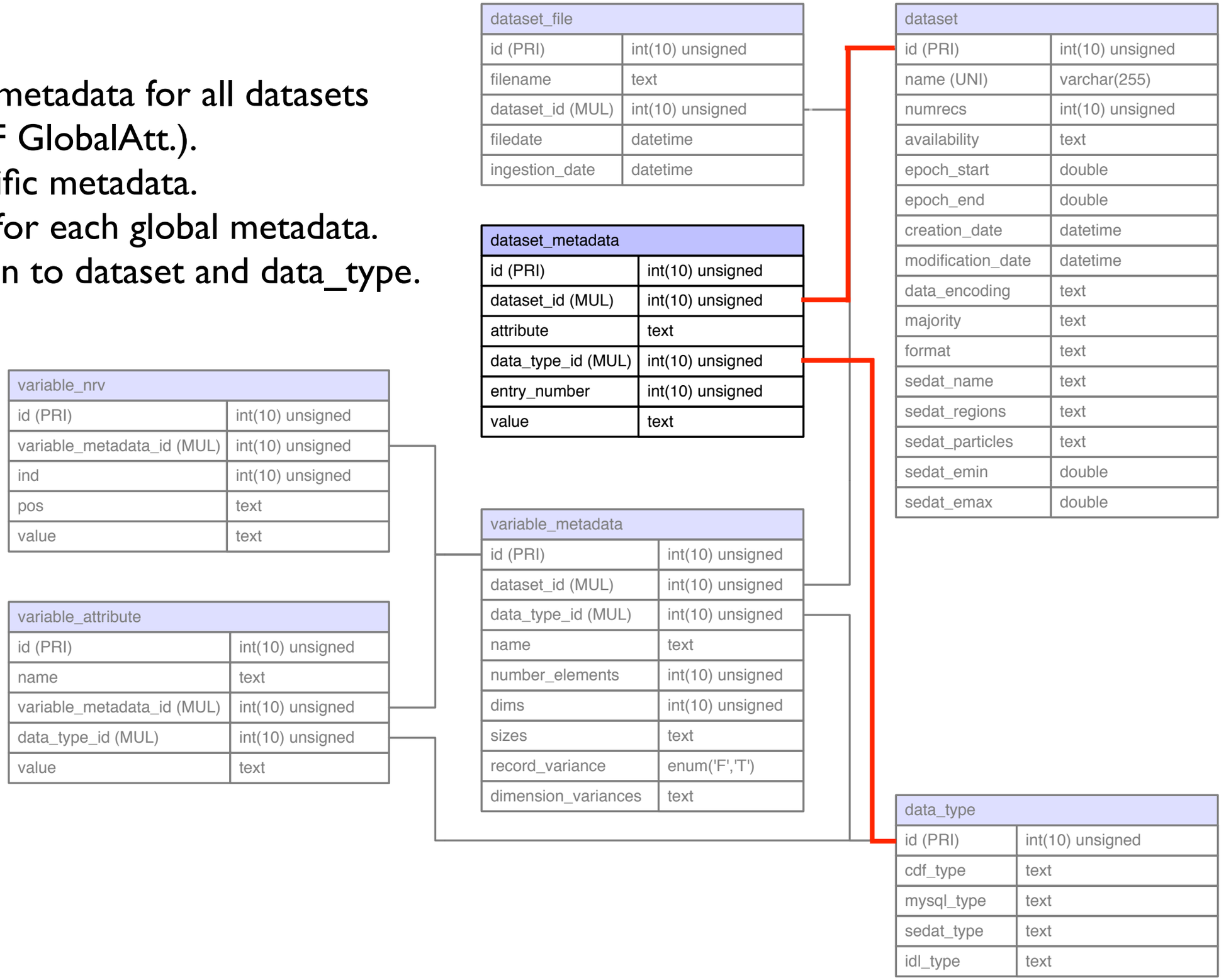
Dataset Metadata

- All global metadata for all datasets (cmp. CDF GlobalAtt.).
- CDF specific metadata.
- One row for each global metadata.
- Association to dataset and data_type.



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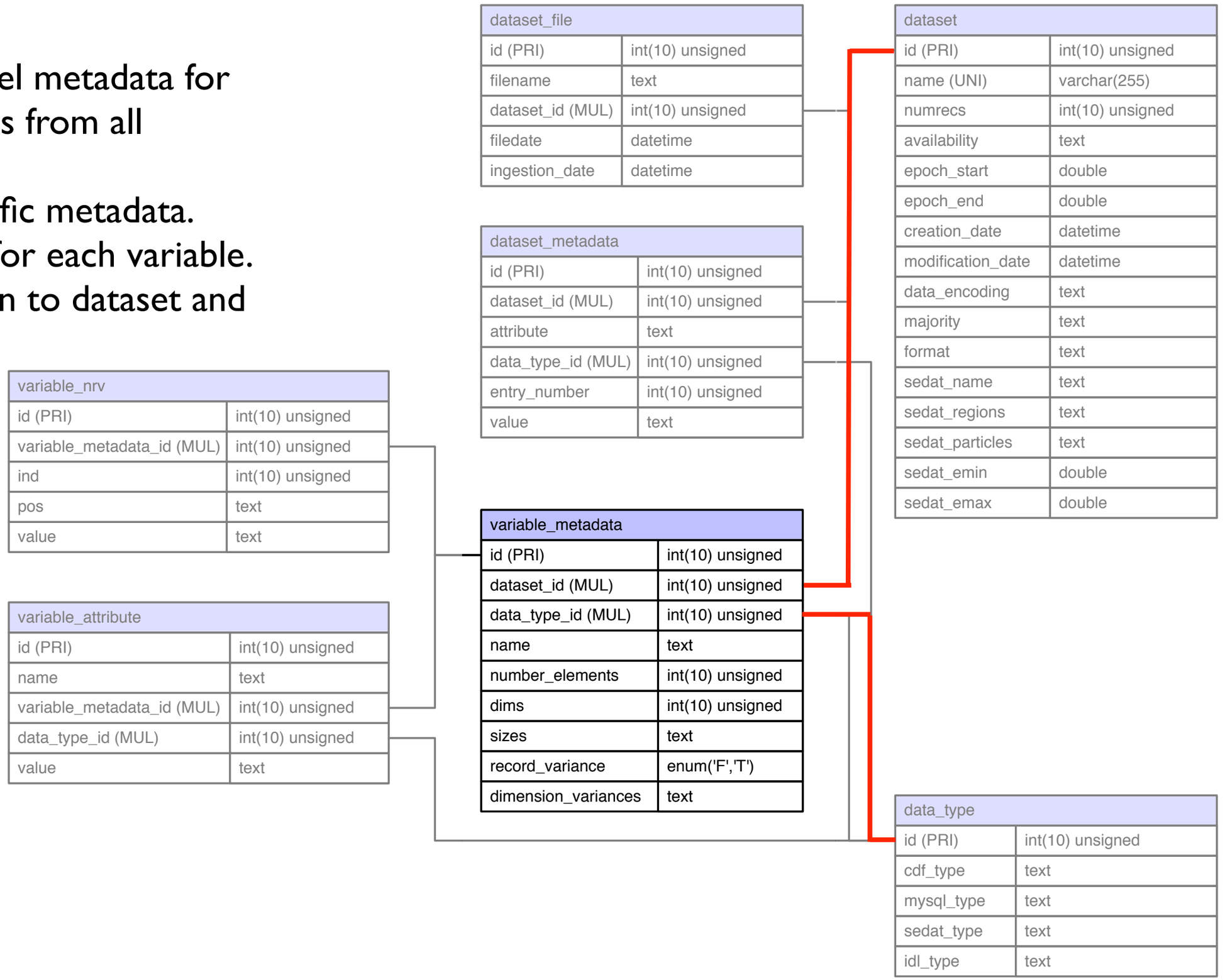
Variable Metadata

- All top level metadata for all variables from all datasets.
- CDF specific metadata.
- One row for each variable.
- Association to dataset and data_type.



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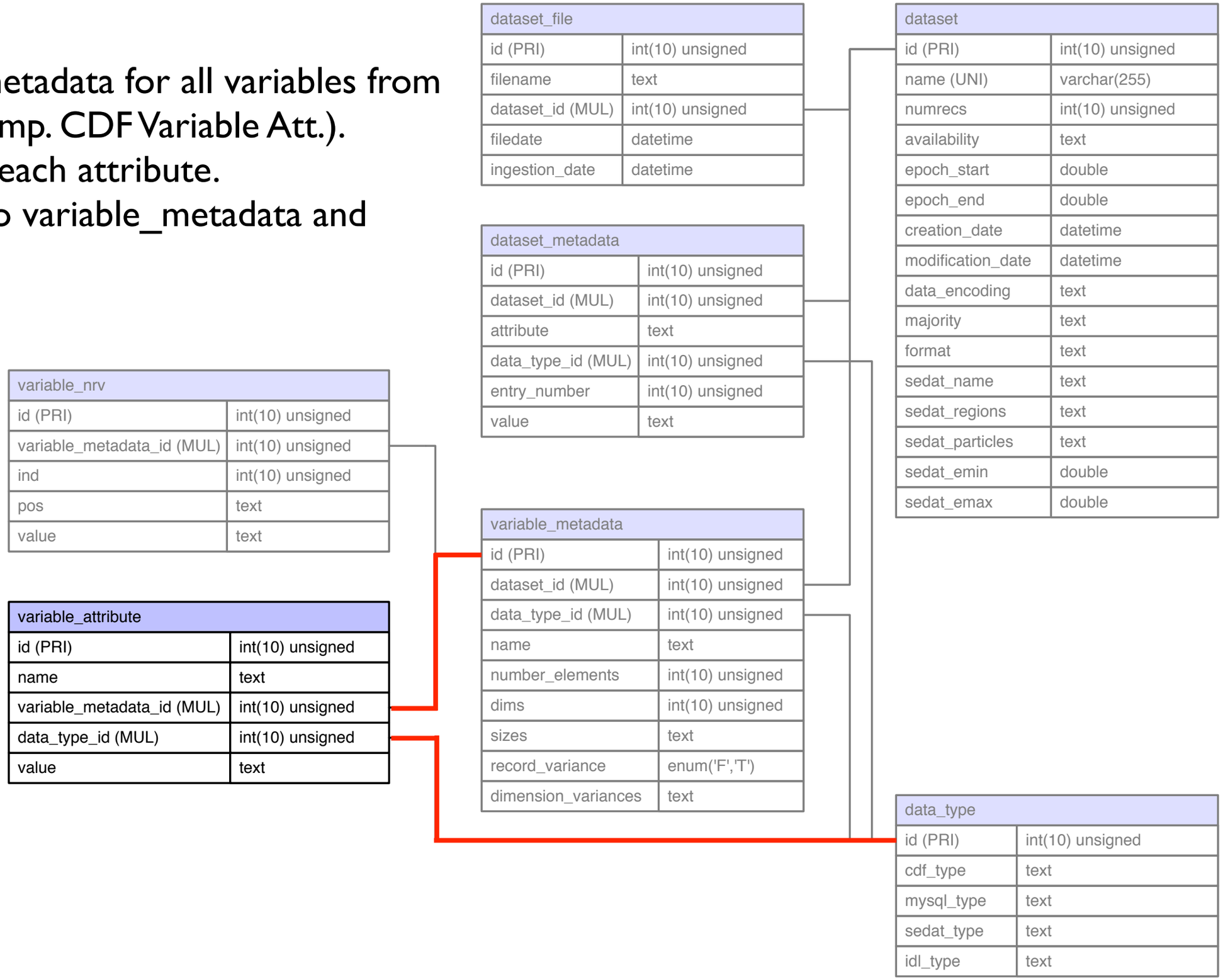
Variable Attribute

- All detailed metadata for all variables from all datasets (cmp. CDF Variable Att.).
- One row for each attribute.
- Association to variable_metadata and data_type.



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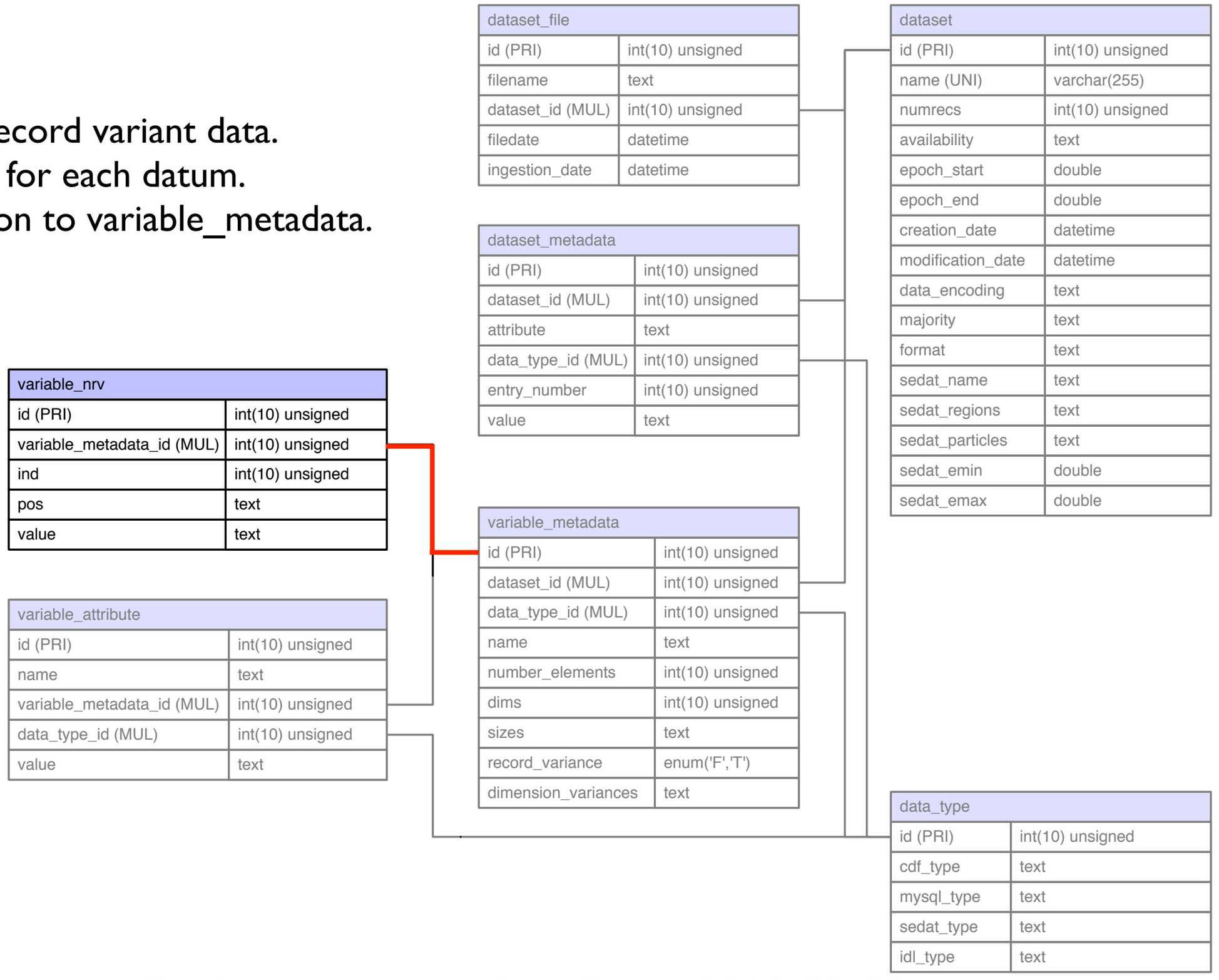
Non-record variant data

- All non-record variant data.
- One row for each datum.
- Association to variable_metadata.



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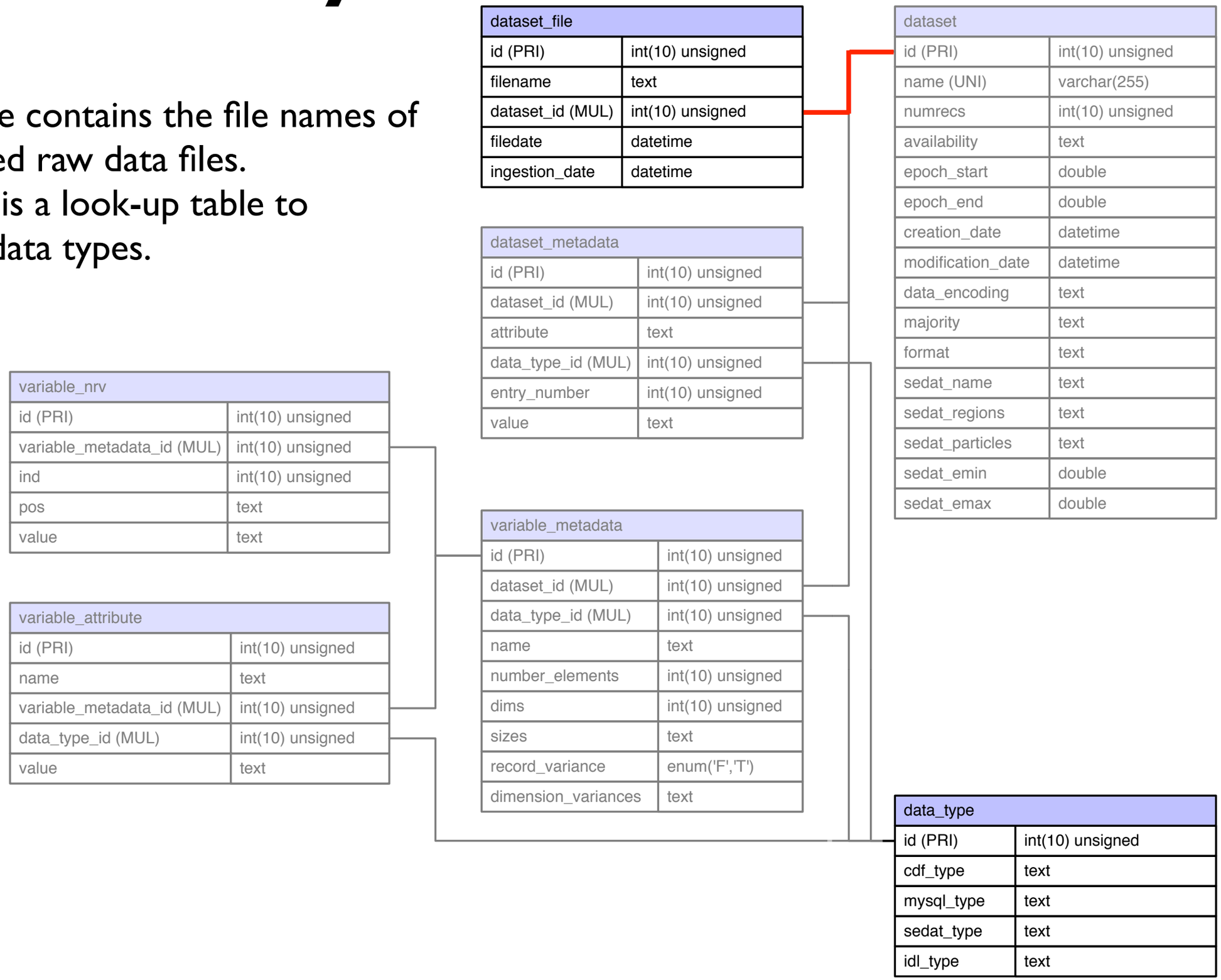
ODI system tables

- dataset_file contains the file names of the ingested raw data files.
- data_type is a look-up table to associate data types.



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Populating ODI: metadata

- Dataset definition file (DDF) = datasets.txt.
- Skeleton file following CDF/ISTP (*.skt).
- If CDF file then also settings file (*.set).

```
#ace_mfi_h1;;;                  ACE/MFI/;;;          ac_h1_mfi_%.cdf;;;
ACE;;;          satellite;;; MFI;;;       ACE_MFI_h1.skt;;;          generic;;;
public;;;  ACE_MFI_H1;;;         i;;;  o;;;    0;;;     1e2
#ace_swe_h0;;;                  ACE/SWE/;;;          ac_h0_swe_%.cdf;;;
ACE;;;          satellite;;; SWE;;;       ACE_SWE_h0.skt;;;          generic;;;
public;;;  ACE_SWE_H0;;;         i;;;  o;;;    0;;;     1e4
#imp8_cpme_330s_electrons;;; IMP8/CPME/;;;          e_330s_%.txt%;;;
IMP8;;;         satellite;;; CPME;;;      CPME_330s_electrons.skt;;; IMP8_CPME;;;
public;;;  IMP8_CPME_E_330s;;;   i;;;  e;;;    2.2e5;;; 2.5e6
#imp8_cpme_330s_helium;;;    IMP8/CPME/;;;          he_330s_%.txt%;;;
IMP8;;;         satellite;;; CPME;;;      CPME_330s_helium.skt;;;    IMP8_CPME;;;
public;;;  IMP8_CPME_A_330s;;;   i;;;  a;;;    5.9e5;;; 5.2e7
```

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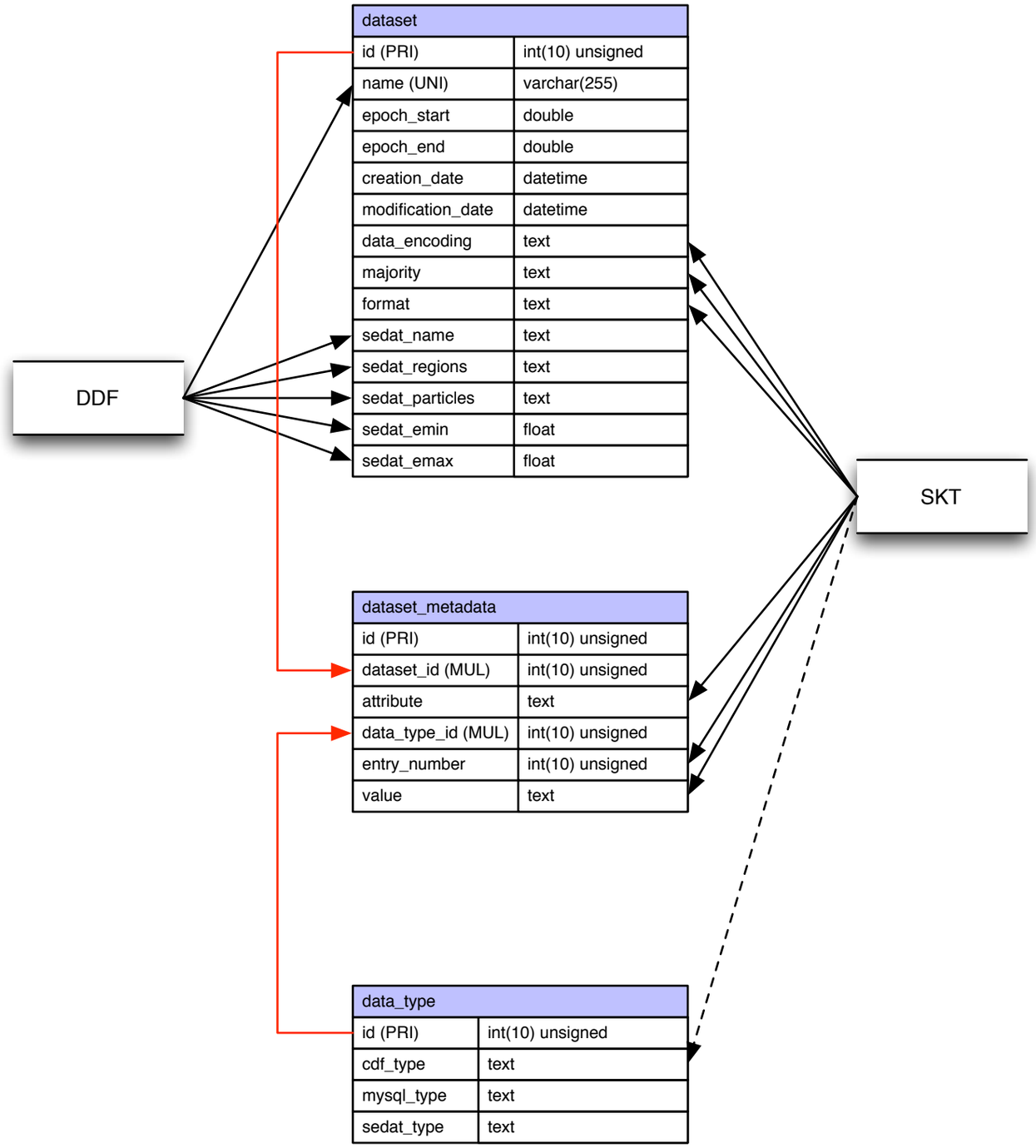
Dataset metadata



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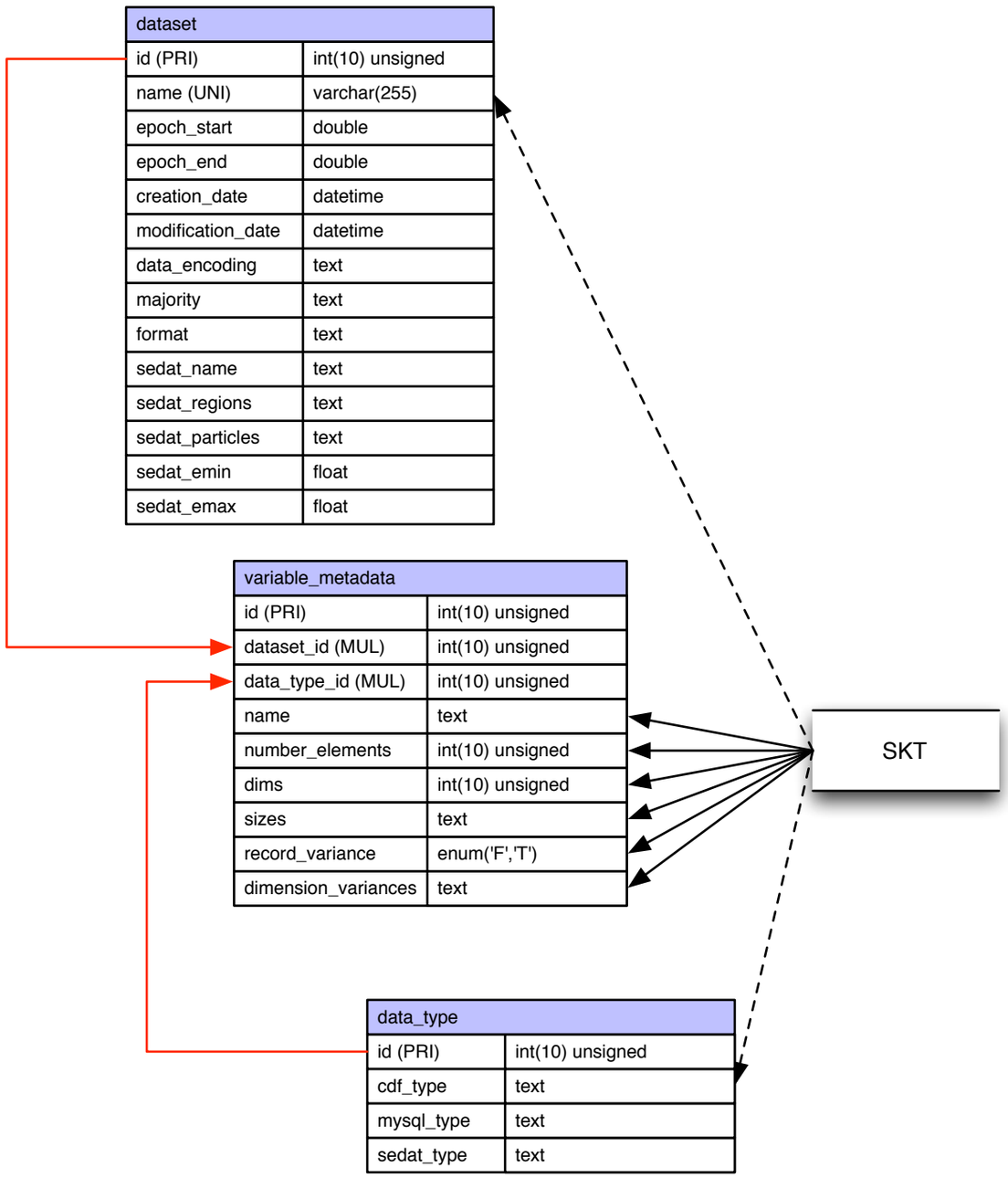
Variable metadata



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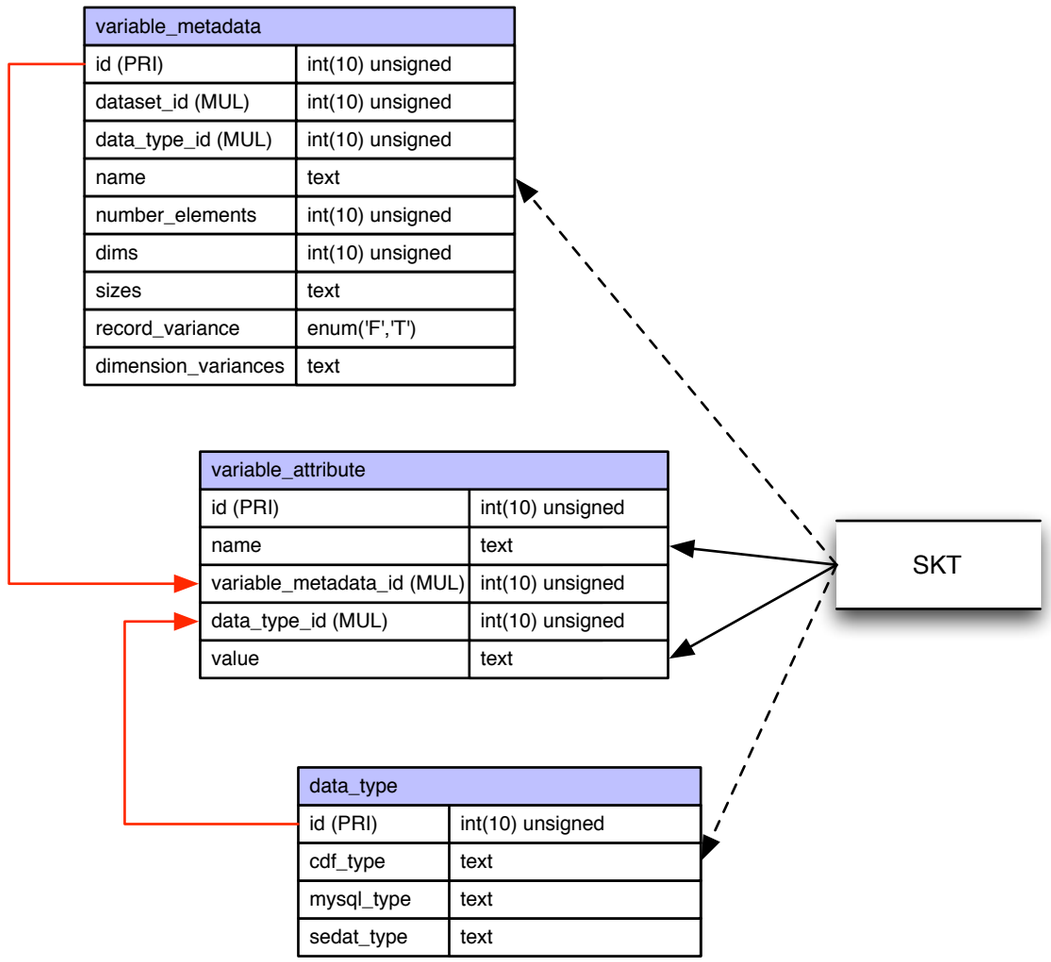
Variable attributes



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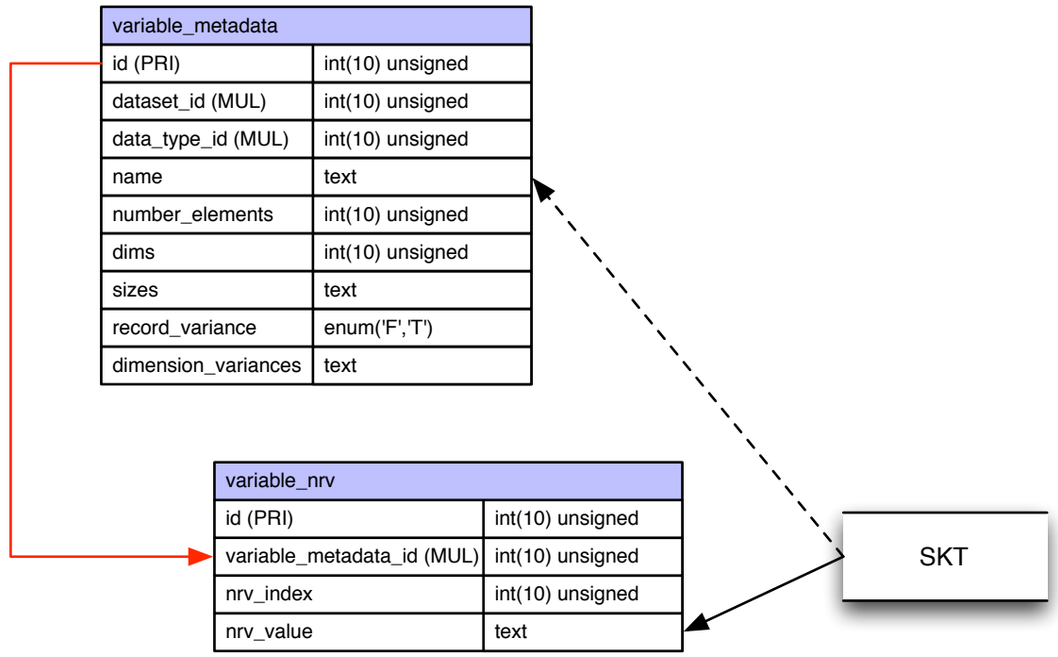
NRV Values



Note:

- The NRV data are associated with a NRV variable.
- A record variant variable may have a dependency with a NRV variable.

Table holding data: dataset_*

dataset	
id (PRI)	int(10) unsigned
name (UNI)	varchar(255)
epoch_start	double
epoch_end	double
creation_date	datetime
modification_date	datetime
data_encoding	text
majority	text
format	text
sedat_name	text
sedat_regions	text
sedat_particles	text
sedat_emin	double
sedat_emax	double

variable_metadata	
id (PRI)	int(10) unsigned
dataset_id (MUL)	int(10) unsigned
data_type_id (MUL)	int(10) unsigned
name	text
number_elements	int(10) unsigned
dims	int(10) unsigned
sizes	text
record_variance	enum('F','T')
dimension_variances	text

data_type	
id (PRI)	int(10) unsigned
cdf_type	text
mysql_type	text
sedat_type	text
idl_type	text

Get all variables with record_variance=True (except epoch)

For each variable:

If dims=0 => name

If dims=1 => name_i

If dims=2 => name_i_j

Majority

The columns will have the same order as in the skeleton file.

```
mysql> select name from dataset limit 3;
+-----------------------+
| name                  |
+-----------------------+
| dataset_ace_mfi_h1    |
| dataset_ace_swe_h0    |
| dataset_ampte_uks_elx |
+-----------------------+
3 rows in set (0.00 sec)
```

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Populating ODI: data

- Ingesting CDF data is straightforward and the odi.library.php handles this.
- To ingesting text data a custom parsing script must be added.

Text parsing script

$ODI_HOME/parsers/functions/

CDF parsing script

```
windsurf:functions peter$ pwd
/Users/peter/Documents/ESA_ODI/odi/parsers/functions
windsurf:functions peter$ ls
ACE_MAG_1m.php  Dst.php         IMP8_CRNC.php   KpAp.php          generic.php
ACE_MFI_h1.php  GOES_SEM.php    ISEE1_MEPI.php  Meteosat_SEM.php
AZUR_EI_88.php  IMP8_CPME.php   ISEE2_KED.php   SSN_1m.php
```

```
<?php

function parse_ACE_MFI_h1($rname, $fid, $sk_file) {

    $result = parse_generic($rname, $fid, $sk_file);

    exec("mv load.tmp load_old.tmp");

    exec('awk \'FS="," {print
$1","$2"","$3","$5","$8","$9","$10","$11","$12","$13","$14","$17","$18","$19","$20","$21
","$22","$23}\' load_old.tmp > load.tmp');

    return $result;
}

?>
```

Automatic download

```
# Do not install this file directly using crontab as
# the environment variables will not be expanded correctly.
# Use instead cronjobs_install.php.

# * * * * *  command to be executed
# | | | | |
# | | | | +----- day of week (0 - 6) (Sunday=0)
# | | | +------- month (1 - 12)
# | | +--------- day of month (1 - 31)
# | +----------- hour (0 - 23)
# +------------- min (0 - 59)

# Download Dst final the first of every month.
* * 1 * * source $HOME/.profile; cd $ODI_HOME/parsers/download/; ./wget_index_Dst.sh > /dev/null

# Ingest Dst every 10 minutes.
*/10 * * * * source $HOME/.profile; cd $ODI_HOME/parsers/; ./populate.php index_dst > /dev/null

# Ingest Kp every hour.
*/60 * * * * source $HOME/.profile; cd $ODI_HOME/parsers/; ./populate.php index_kpap_3h > /dev/null
```

Download monitoring

SREM Data Status

Dataset	ODI Table	NumRec	Start date			End Date	
GioveB_SREM_PACC	(dataset_gioveb_srem_pacc)	571137	2008-05-06	21:59:19.000	=>	2010-01-23	23:58:43.000
HERSCHEL_SREM_PACC	(dataset_herschel_srem_pacc)	401698	2009-05-14	14:40:37.931	=>	2010-01-26	18:32:56.893
INTEGRAL_IREM_PACC	(dataset_integral_irem_pacc)	3576640	2002-10-17	19:28:16.205	=>	2010-01-27	05:08:41.805
PLANCK_SREM_PACC	(dataset_planck_srem_pacc)	398359	2009-05-14	15:08:54.876	=>	2010-01-26	21:26:17.792
PROBA1_SREM_PACC	(dataset_proba1_srem_pacc)	5655786	2001-10-29	11:25:01.050	=>	2010-01-11	10:14:55.250
ROSETTA_SREM_PACC	(dataset_rosetta_srem_pacc)	475344	2004-10-21	20:01:27.313	=>	2010-01-01	19:23:08.798

SREM Data Files Ingested:

Filename	file date	Ingestion Date
IREM_PACC_20100125.cdf.gz	2010-01-26 03:22:18	2010-01-27 10:23:58
IREM_PACC_20100126.cdf.gz	2010-01-27 02:21:35	2010-01-27 10:23:59
IREM_PACC_20100127.cdf.gz	2010-01-27 09:08:31	2010-01-27 10:24:00
SREMGIOVEB_PACC_20100121.cdf.gz	2010-01-26 12:35:49	2010-01-27 10:24:11
SREMGIOVEB_PACC_20100122.cdf.gz	2010-01-27 12:35:33	2010-01-27 10:24:12
SREMGIOVEB_PACC_20100123.cdf.gz	2010-01-27 12:35:46	2010-01-27 10:24:13
SREMHerschel_PACC_20100124.cdf.gz	2010-01-26 03:12:02	2010-01-27 10:23:44
SREMHerschel_PACC_20100124.cdf.gz	2010-01-26 03:12:02	2010-01-27 10:23:49
SREMHerschel_PACC_20100125.cdf.gz	2010-01-27 03:11:17	2010-01-27 10:23:46
SREMHerschel_PACC_20100125.cdf.gz	2010-01-27 03:11:17	2010-01-27 10:23:49
SREMHerschel_PACC_20100126.cdf.gz	2010-01-27 03:11:30	2010-01-27 10:23:47
SREMHerschel_PACC_20100126.cdf.gz	2010-01-27 03:11:30	2010-01-27 10:23:49
SREMPlanck_PACC_20100124.cdf.gz	2010-01-26 03:22:24	2010-01-27 10:23:50
SREMPlanck_PACC_20100124.cdf.gz	2010-01-26 03:22:24	2010-01-27 10:23:54
SREMPlanck_PACC_20100125.cdf.gz	2010-01-27 03:21:15	2010-01-27 10:23:51
SREMPlanck_PACC_20100125.cdf.gz	2010-01-27 03:21:15	2010-01-27 10:23:55
SREMPlanck_PACC_20100126.cdf.gz	2010-01-27 03:21:28	2010-01-27 10:23:53
SREMPlanck_PACC_20100126.cdf.gz	2010-01-27 03:21:28	2010-01-27 10:23:55
SREMRosetta_PACC_20100101.cdf.gz	2010-01-27 03:07:51	2010-01-27 10:24:17

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Interfaces to ODI

- Java
- PHP
- IDL
- Matlab

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PHP interface

```
#!/usr/bin/php
<?php
/**
* Test the odi_read_data function.
*
* @author Peter Wintoft <peter@lund.irf.se>
* @version 1.0
*/


require_once($_SERVER["ODI_HOME"].'/lib/odi.library.php');

$dataset = "xmm_rm";
$epoch_start = "2009-05-30 00:00:00.000";
$epoch_end = "2009-05-30 00:00:59.999";
$max_num = 10;

$x = odi_read_data($dataset,$epoch_start,$epoch_end,$max_num,"epoch","position","fpio");

print_r($x);



?>
```

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Command line tools

`check_skeleton.php`	Check that listed and defined variables match.
`delete_dataset.php`	Delete a dataset and all associated data.
`export_build_xml.php`	Create XML file used to export data.
`export_to_xml.php`	Export data to XML file.
`show_datasets.php`	List all datasets and epoch ranges.
`show_updates.php`	List all datasets that have been updated during a given epoch range.
`show_metadata.php`	Show all metadata for a given dataset.

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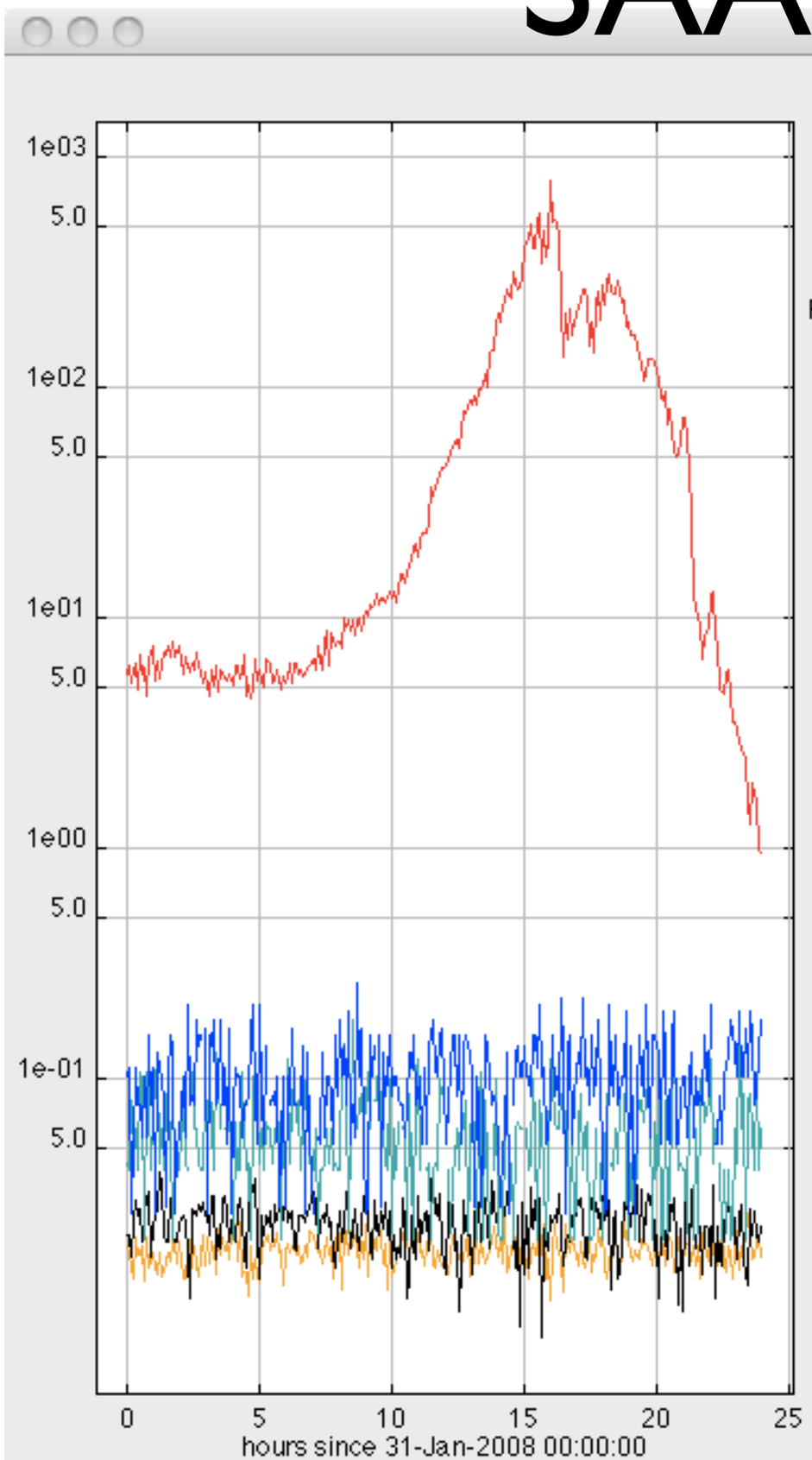
SAAPS 2.0 (ODI)



FPDO (0.8 - 4.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (4.0 - 9.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (9.0 - 15.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (15.0 - 40.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (40.0 - 80.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (80.0 - 165.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)
FPDO (165.0 - 500.0 MeV proton flux (uncorrected)) (cm^-2 s^-1 sr^-1 MeV^-1)

SAAPS
- Database Module
- Analysis Module
- Prediction Module
- Help
- Quit All

Data Plotter
- Data Plotter
- Anomaly Plotter
- Find Best Prediction Model
- Superposed Epoch Analysis
- Electron Fluence Levels
- Sum Kp Level
- Help
- Quit

Data Plotter

	Start	End (incl)
GOES_G11_1		
GOES_A12_5		
GOES_G12_1		
GOES_G12_5	2008	2008
GOES_H12_5		
GOES_I12_5	01	01
GOES_Z12_5		
GOES_G11_5		
GOES_H11_5	31	31
UARS_PEM		

Show MetaData | Get Data

X Axis Data	Y Axis Data
Time	B_meas_vec (Earthward Magnetic
Position (Xgeo)	B_meas_vec (Eastward Magnetic
Position (Ygeo)	B_meas
Position (Zgeo)	FEIO
B_Calc	FPDO (0.8 - 4.0 MeV proton flux
B_Eq	FPDO (4.0 - 9.0 MeV proton flux
I	FPDO (9.0 - 15.0 MeV proton flux
L	FPDO (15.0 - 40.0 MeV proton flux
L_star	FPDO (40.0 - 80.0 MeV proton flux
MLT	FPDO (80.0 - 165.0 MeV proton flux
Alpha	FPDO (165.0 - 500.0 MeV proton

Plot | Help | Quit

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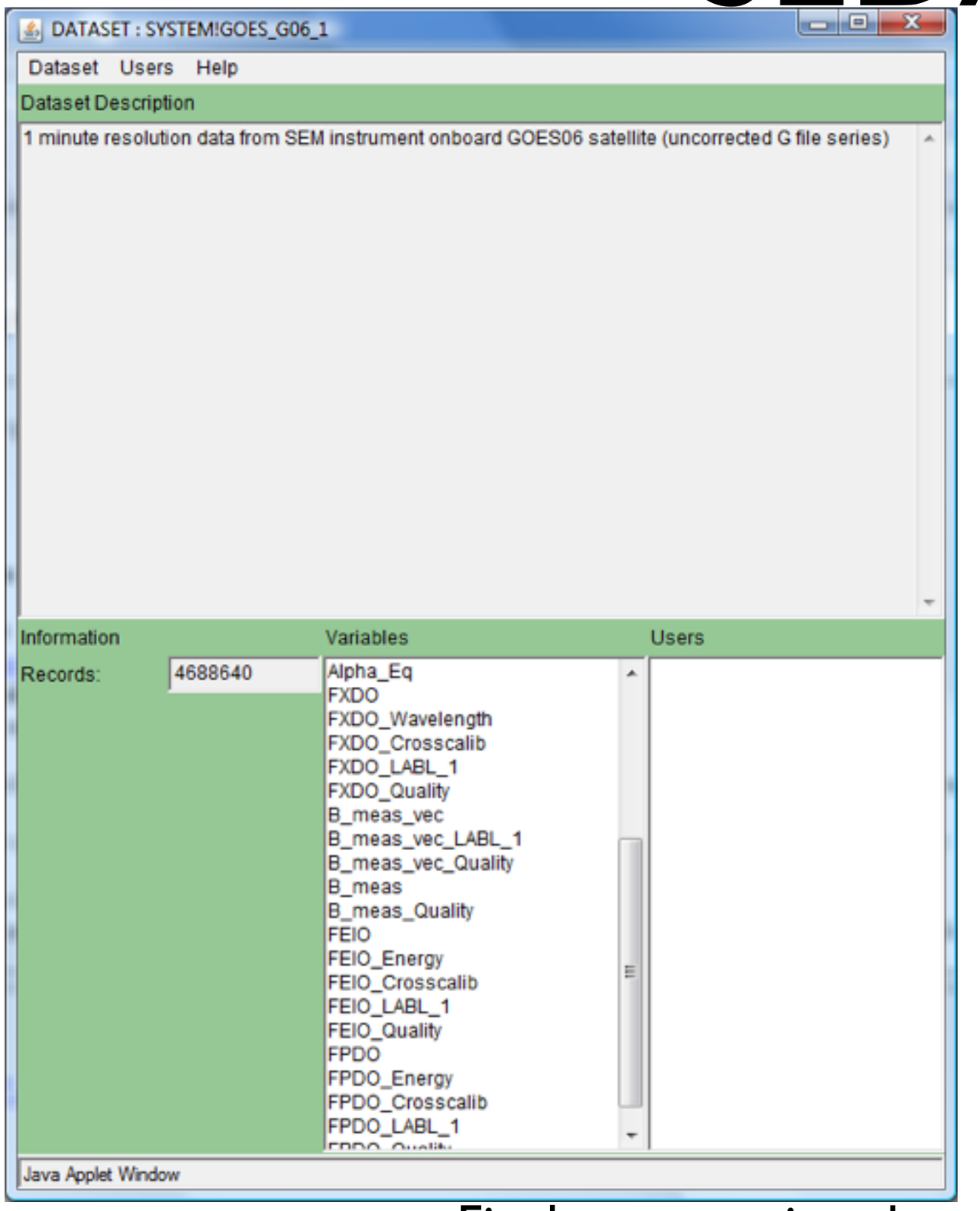
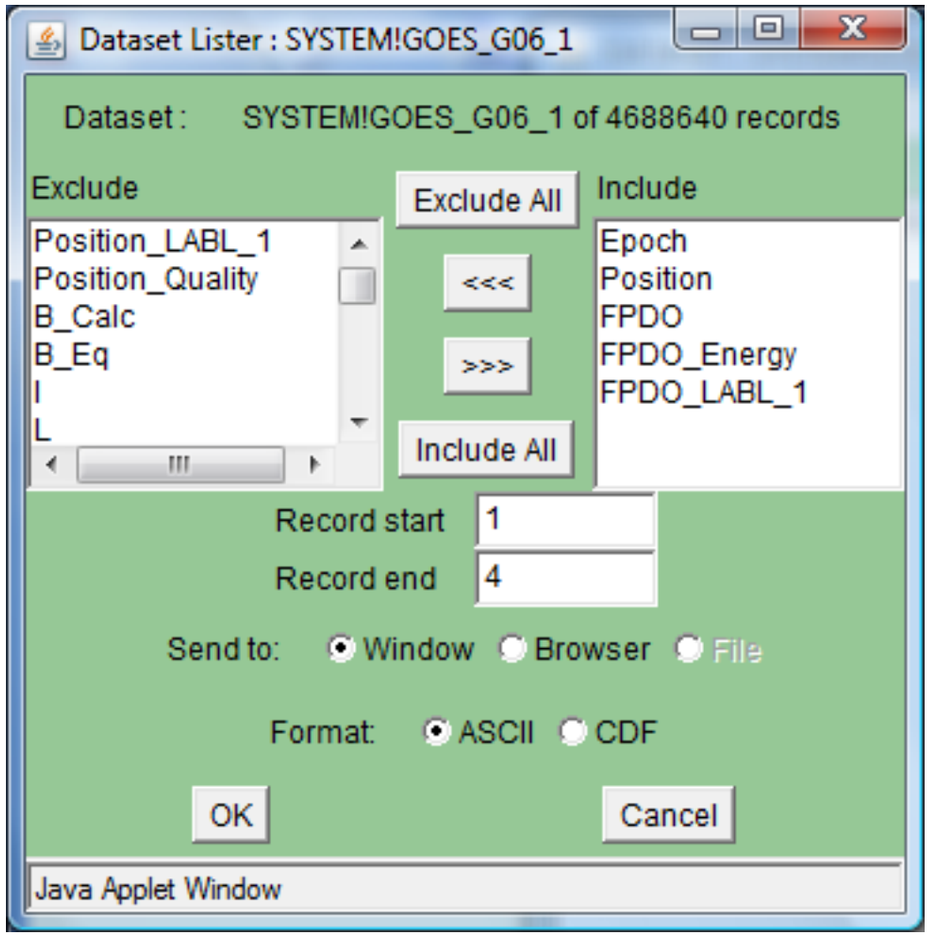
SEDAT





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SEDAT

Listing : SYSTEM!GOES_G06_1

```
# NRV (non-record varying variables):          2
FPDO_Energy               R E16.6      MeV                    2:x  7x  2 :     6.000000E-01     4.200000E+00     4.200000E+00     8.70000
FPDO_LABL_1               C A43                               1:x  7 :   0.6 -   4.2 MeV proton flux (uncorrected)   4.2 -   8.7 MeV prot
# RV (record varying variables):          3
Epoch                     D F21.4      ms                     1:x  1
Position                  R E16.6      km                     1:x  3
FPDO                      R E16.6      cm^-2 s^-1 sr^-1 MeV   1:x  7
#         1 :   62672140800000.0000 :    -1.303160E+04     4.010710E+04     0.000000E+00 :     1.100000E+02     1.620000E-01     0.00000
#         2 :   62672140860000.0000 :    -1.303160E+04     4.010710E+04     0.000000E+00 :     1.200000E+02     2.160000E-01     1.68000
#         3 :   62672140920000.0000 :    -1.303160E+04     4.010710E+04     0.000000E+00 :     1.040000E+02     1.620000E-01     0.00000
#         4 :   62672140980000.0000 :    -1.303160E+04     4.010710E+04     0.000000E+00 :     1.110000E+02     2.160000E-01     0.00000
```

OK

Java Applet Window

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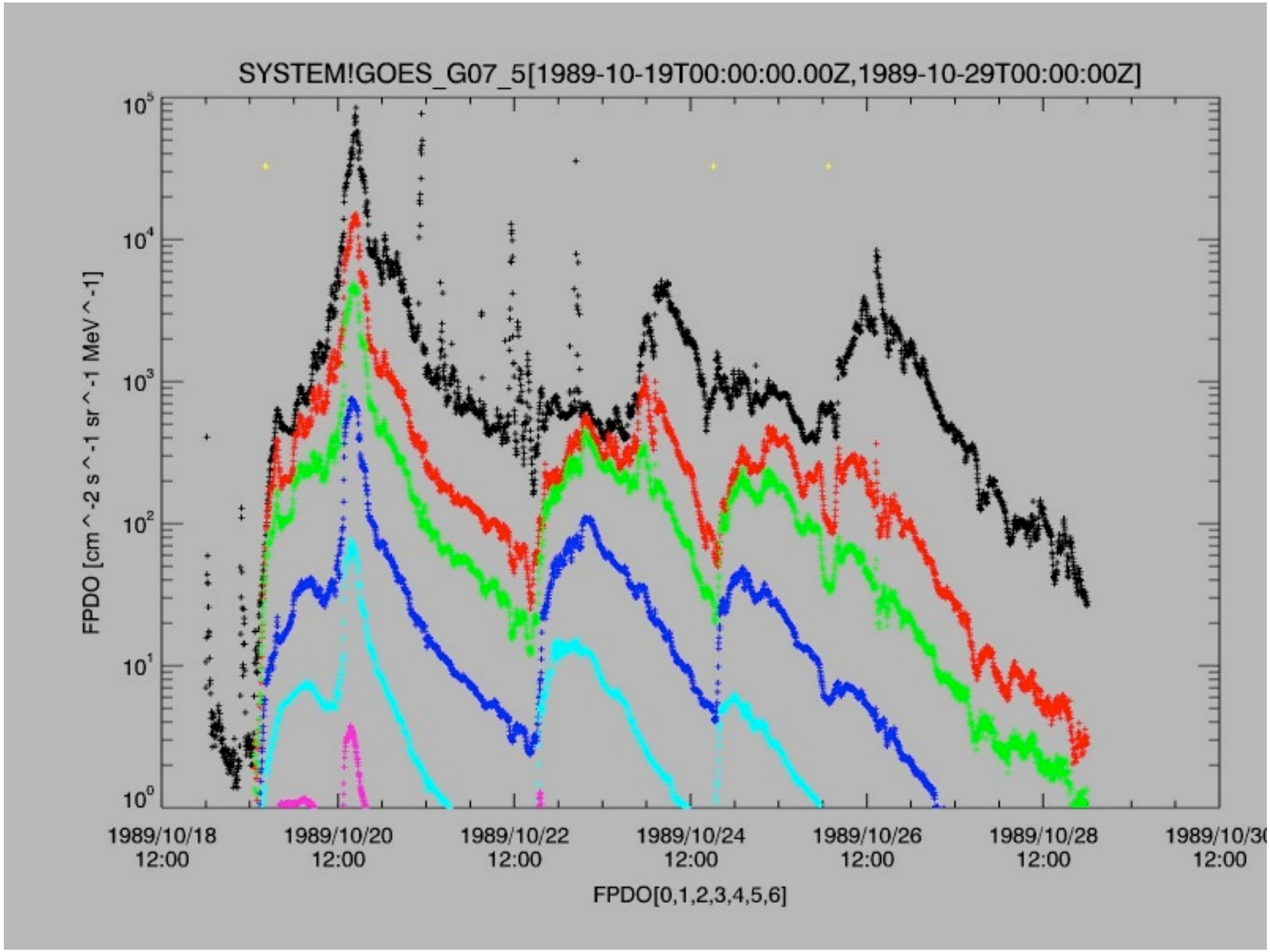
SEDAT



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SPENVIS

Databases - Mozilla Firefox

http://localhost/spenvis/htbin/spenvis.exe/TTT?%23waitWhileRunning(packages.html)

UP

SPENVIS DEVELOPER Project: TTT

Data base interface

Dataset selection

Output

Help

Available data sets

Magnetospheric and solar indices			
	Dataset	**Start Time**	**End Time**
◉	DST	1957-01-01 00:00:00.000	2009-11-30 23:00:00.000
◉	KPAP_1d	1932-01-01 00:00:00.000	2009-09-30 00:00:00.000
◉	KPAP_3h	1932-01-01 00:00:00.000	2009-11-12 06:00:00.000
◉	OMNI2	1963-01-01 00:00:00.000	2009-06-30 23:00:00.000
◉	SSN_1m	1902-01-01 00:00:00.000	2009-09-01 00:00:00.000
Satellite data			
	Dataset	**Start Time**	**End Time**
◉	AMPTE-UKS	1984-08-25 12:43:30.000	1985-01-15 07:59:30.000
◉	AZUR_EI-88	1969-11-16 13:26:53.376	1970-03-06 13:17:54.592
◉	Equator_S_AUX	1997-12-16 11:25:30.000	1998-04-30 01:51:30.000
◉	Equator_S_EPI	1997-12-16 16:16:30.000	1998-04-30 01:55:30.000

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www.lund.irf.se/odi/

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Example

```
mysql> select id,name,sedat_name,numrecs from dataset limit 10;
+----+-------------------------+----------------+----------+
| id | name                    | sedat_name     | numrecs  |
+----+-------------------------+----------------+----------+
|  3 | dataset_ns41_bdd2r      | NS41_BDD2R     |   784186 |
| 17 | dataset_xmm_rm          | XMM_RM         | 11274592 |
| 23 | dataset_index_omni2     | OMNI2          |   411564 |
| 40 | dataset_equator_s_aux   | Equator_S_AUX  |    88923 |
| 41 | dataset_equator_s_epi   | Equator_S_EPI  |    43862 |
| 42 | dataset_equator_s_mam   | Equator_S_MAM  |    72659 |
| 64 | dataset_goes_sem_g05_5  | GOES_G05_5     |   131040 |
| 65 | dataset_goes_sem_a05_5  | GOES_A05_5     |   131040 |
| 66 | dataset_goes_sem_z05_5  | GOES_Z05_5     |   131040 |
| 67 | dataset_goes_sem_i05_5  | GOES_I05_5     |   131040 |
+----+-------------------------+----------------+----------+
10 rows in set (0.00 sec)
```

Example

```
mysql> select count(id) from
dataset;
+------------+
| count(id) |
+------------+
|         87 |
+------------+
1 row in set (0.00 sec)

mysql> select count(id) from
dataset_metadata;
+------------+
| count(id) |
+------------+
|       3042 |
+------------+
1 row in set (0.01 sec)
```

```
mysql> select count(id) from
variable_metadata;
+------------+
| count(id) |
+------------+
|       2284 |
+------------+
1 row in set (0.00 sec)

mysql> select count(id) from
variable_attribute;
+------------+
| count(id) |
+------------+
|      30197 |
+------------+
1 row in set (0.02 sec)
```

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Example

```
mysql> select * from variable_nrv limit 10;
+----+-----------------------+-----+-----+----------------------+
| id | variable_metadata_id | ind  | pos  | value                |
+----+-----------------------+-----+-----+----------------------+
|  1 |                    11 |    1 | 1    | Xgeo                 |
|  2 |                    11 |    2 | 2    | Ygeo                 |
|  3 |                    11 |    3 | 3    | Zgeo                 |
|  4 |                    22 |    1 | 1,1  | 1.300                |
|  5 |                    22 |    2 | 1,2  | 5.300                |
|  6 |                    23 |    1 | 1    | 1.3 - 5.3 MeV        |
|  7 |                    25 |    1 | 1    | 1.0                  |
|  8 |                    27 |    1 | 1    | 1.18                 |
|  9 |                    27 |    2 | 2    | 1.66                 |
| 10 |                    27 |    3 | 3    | 2.29                 |
+----+-----------------------+-----+-----+----------------------+
10 rows in set (0.02 sec)
```

Example

```
mysql> select id from dataset where sedat_name="GOES_G12_5";
+-----+
| id  |
+-----+
| 126 |
+-----+
1 row in set (0.00 sec)
```

```
mysql> select attribute,substr(value,1,30) from dataset_metadata
left join dataset on dataset_metadata.dataset_id=dataset.id where
sedat_name="GOES_G12_5";
+------------------------------+--------------------------------+
| attribute                    | substr(value,1,30)             |
+------------------------------+--------------------------------+
| platform                     | GOES12                         |
| platform_type                | satellite                      |
| instrument                   | SEM                            |
| Acknowledgement              | For terms and conditions for t |
| ADID_ref                     | NSSD0241                       |
| Data_type                    | K0>Key Parameter               |
| Data_version                 | 1                              |
| Descriptor                   | SEM>Space Environment Monitor  |
| Discipline                   | Space Physics>Magnetospheric S |
             ...                              ...
| Source_name                  | GOES_12>Geostationary Operatio |
| TEXT                         | The Geostationary Operational  |
| TEXT                         | http://goes.ngdc.noaa.gov/data |
| Time_resolution              | 300 seconds                    |
| TITLE                        | GOES12 5 minute G files        |
| Validate                     |                                |
+------------------------------+--------------------------------+
34 rows in set (0.00 sec)
```

Example

```
mysql> select vm.id,vm.name,vm.dims,vm.sizes from variable_metadata
as vm left join dataset on vm.dataset_id=dataset.id where
sedat_name="GOES_G12_5";
+------+---------------------+------+--------+
| id   | name                | dims | sizes  |
+------+---------------------+------+--------+
| 2908 | Epoch               |    0 |        |
| 2909 | Position            |    1 | 3      |
| 2910 | Position_LABL_1     |    1 | 3      |
| 2911 | Position_Quality    |    0 |        |
| 2912 | B_Calc              |    0 |        |
| 2913 | B_Eq                |    0 |        |
  ...          ...             ...    ...
| 2935 | FPDO                |    1 | 7      |
| 2936 | FPDO_Energy         |    2 | 7,2    |
| 2937 | FPDO_Crosscalib     |    1 | 7      |
| 2938 | FPDO_LABL_1         |    1 | 7      |
| 2939 | FPDO_Quality        |    1 | 7      |
+------+---------------------+------+--------+
32 rows in set (0.00 sec)
```

Example

```
mysql> select va.name,va.value from variable_attribute as va left join variable_metadata as
vm on va.variable_metadata_id=vm.id left join dataset on vm.dataset_id=dataset.id where
sedat_name="GOES_G12_5" and vm.name="FPDO";
+--------------+-----------------------------------------------------------------+
| name         | value                                                           |
+--------------+-----------------------------------------------------------------+
| AVG_TYPE     | standard                                                        |
| CATDESC      | Omnidirectional Differential Proton Flux                        |
| DEPEND_0     | Epoch                                                           |
| DEPEND_1     | FPDO_Energy                                                     |
| DICT_KEY     | particle_flux>Proton                                            |
| DISPLAY_TYPE | time_series                                                     |
| FIELDNAM     | FPDO                                                            |
| FILLVAL      | 3.27e+4                                                         |
| FORMAT       | E15.6                                                           |
| LABL_PTR_1   | FPDO_LABL_1                                                     |
| QUALITY_VAR  | FPDO_Quality                                                    |
| SCALETYP     | log                                                             |
| SI_conversion | 6.242e+16>m^-2 s^-1 sr^-1 J^-1                                 |
| UNITS        | cm^-2 s^-1 sr^-1 MeV^-1                                         |
| VALIDMIN     | 0.0                                                             |
| VALIDMAX     | 1.0e+6                                                          |
| VAR_NOTES    | P1, P2, P3, P4, P5, P6, P7 channels combined into one variable  |
| VAR_TYPE     | data                                                            |
+--------------+-----------------------------------------------------------------+
18 rows in set (0.00 sec)
```

Example

```
mysql> select @var:=va.value from variable_attribute as va left join variable_metadata as
vm on va.variable_metadata_id=vm.id left join dataset on vm.dataset_id=dataset.id where
sedat_name="GOES_G12_5" and vm.name="FPDO" and va.name="LABL_PTR_1";

+----------------+
| @var:=va.value |
+----------------+
| FPDO_LABL_1    |
+----------------+
1 row in set (0.00 sec)

mysql> select nrv.value from variable_nrv as nrv left join variable_metadata as vm on
nrv.variable_metadata_id=vm.id left join dataset on vm.dataset_id=dataset.id where
sedat_name="GOES_G12_5" and vm.name=@var;

+-------------------------------------------+
| value                                     |
+-------------------------------------------+
|   0.8 -   4.0 MeV proton flux (uncorrected) |
|   4.0 -   9.0 MeV proton flux (uncorrected) |
|   9.0 -  15.0 MeV proton flux (uncorrected) |
|  15.0 -  40.0 MeV proton flux (uncorrected) |
|  40.0 -  80.0 MeV proton flux (uncorrected) |
|  80.0 - 165.0 MeV proton flux (uncorrected) |
| 165.0 - 500.0 MeV proton flux (uncorrected) |
+-------------------------------------------+
7 rows in set (0.04 sec)
```