CODA is designed, developed and maintained by BIRA
The development of the ESA Atmospheric Toolbox is primarily funded by the European Space Agency (ESA).

CODA provides a single interface to access data from a wide variety of data formats, including ASCII, binary, XML, netCDF, HDF4, HDF5, CDF, GRIB, RNEX, and SP3. This is done by using an hierarchical mapping to generic high level types for each data format. For self-describing formats such as netCDF, HDF, and GRIB, CODA will automatically construct this mapping based on the file contents itself. For raw ASCII and binary (and partially also XML) formats CODA makes use of an external format definition stored in so-called .codafile files to determine this mapping.

CODA started out as the core data access layer of BEAT (called BEAT-I), dating as far back as 2002. It is now also used to access non-atmospheric data (such as CryoSat, Swarm, Sentinel-1, and ENVISAT RA) to 2/3/2012. The software and various .codafile files can be downloaded from the CODA website: http://ecore.jpl.nasa.gov, or from GitHub: https://github.com/ecore/coda

CODA provides interfaces for reading of remote sensing data from earth observation data products in their native format. These interfaces consist of command line tools, libraries, direct interfaces to scientific applications (C, Fortran, Python, and Java).

HARP is a toolkit for reading, processing and inter-comparing satellite remote sensing data, model data, in-situ data, and ground based remote sensing data.

The main goal of HARP is to assist in the inter-comparison of datasets. By appropriately chaining calls to HARP command line tools one can pre-process two datasets such that they end up having the same temporal/spatial grid, same data format/structure, and same physical unit.

Many of the functions provided by HARP are generic, expanding the usefulness of HARP to beyond performing inter-comparisons. HARP often provides the easiest solution to importing your data.

HARP is an evolution of the old BEAT-II interface, including many of the improvements that were developed within the ESA GECA and FP7 NORDS projects. HARP is currently used as core component for the automated validation servers of the QA4ECV, CAMS, and S5P-MPC projects. The software can be downloaded from GitHub: https://github.com/aeolus-tropomi/harp

HARP variables and how they are mapped from the original format. The standard consists of a set of conventions on top of the HDF5 library – which you provide commands to the application. Having the same temporal/spatial grid, same data operations - being descriptive, but on being able to standardize automated operations on data.

The standard consists of a set of conventions on top of netCDF, HDF4, HDF5. The main aspects are naming of variables and naming/ordering of dimensions. This focus is not on being descriptive, but on being able to standardize automated operations on data.

For each conversion there is documentation that describes available HARP variables and how they are mapped from the original format.

The application uses the Python language as the means through which you provide commands to the application. The Python interfaces for CODA and HARP are included so you can directly ingest product data from within VISAN.

Ingestion routines (based on CODA) allow conversion from a wide variety of atmospheric data products to a common format. In addition, the toolbox provides a wide range of operations to perform conversions on the data such as unit conversions, quantity conversions (e.g. number density to volume mixing ratios), regridding, vertical smoothing using averaging kernels, collocation of two datasets, etc.

HARP data format standard


The standard consists of a set of conventions on top of netCDF, HDF4, HDF5. The main aspects are naming of variables and naming/ordering of dimensions. This focus is not on being descriptive, but on being able to standardize automated operations on data.

Example of how to derive/O3_column_number_density [time] from /time/vertical/10; Example of how to derive/O3_column_number_density [time] will automatically find the input variables and do “the right thing”.

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The following evolutions are planned to become available in 2019

• Addition of QDOAS as an official component to the toolbox
• A new website for the toolbox, including a forum and tutorials

CODA, HARP and VISAN are designed, developed and maintained by S&T, The Netherlands. QDOAS is designed, developed and maintained by BIRA-IASB, Belgium.

CODA and HARP

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