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VirES for Aeolus - Virtual Research Environment (VRE)
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Overview

• Introduction to VirES for Aeolus Service
• Virtual Research Environment (VRE)
  • Architecture
  • Documentation
  • Advantages
• Data access example
VirES for Aeolus

• Web client accessible with any modern browser to directly visualize and interact with ESA's Earth Explorer Aeolus wind profiling mission
  
  https://aeolus.services

• Service provided by ESA, implemented and operated by EOX

• Collaboration between experts in the field and project partners DLR and DoRIT and service developer EOX to understand and provide functions relevant to users

• Service has been actively further developed and improved since the Aeolus launch August 2018 in close collaboration with its users and project partners

• Access open to the public
VirES for Aeolus
VirES for Aeolus – Virtual Research Environment (VRE)

- Extension of service done in collaboration with DLR and LMU
- JupyterLab environment in the cloud, “Batteries included” providing:
  - Software packages and dependencies
  - Configuration for data access
  - Storage and computing resources
  - Extensive example resources and documentation
- Python client using machine 2 machine (M2M) interface:
  - Easy direct access to Aeolus data
  - API allowing selection of specific parameters and application of filters
  - Retrieval of data in known easy to work formats (pandas.DataFrame/xarray.Dataset/netCDF)
VirES for Aeolus - Architecture

Virtual Research Environment for Aeolus [Aeolus-VRE]

https://vre.aeolus.services

https://notebooks.aeolus.services
Available documentation

Comprehensive examples describing how to manipulate and analyze Aeolus data [https://notebooks.aeolus.services](https://notebooks.aeolus.services)
Examples for retrieval, data interaction and plotting of multiple product types
Further analysis demos, e.g.: example showing data interaction for long time periods
VRE Advantages

- Pre-configured workspace (installed libraries, configured environment, …)
  - No need to setup development environment
  - Collaboration simplified, shared code runs equally on each VRE instance
  - Provided storage and computing resources
  - Can be accessed from multiple user machines (without need of migrating development environment)
  - VRE workspace can still be further customized if required
- Convenient and efficient access to Aeolus data
  - Up to date synchronization with ADDF
  - Data can be directly retrieved in easy to work formats
  - No need to track and download latest versions of data
VRE Advantages

- Documentation (Notebook examples)
  - Greatly reduce learning curve for newcomers
  - Quick start using example as starting point and modifying to suit your needs
  - Learning how others interact with data
  - Living document allowing integration of inputs from community
Minimalist data access example

```python
# Import client for easy of access to Aeolus data
from viresclient import AeolusRequest

# Create request object
request = AeolusRequest()

# Set collection you are interested in
request.set_collection('ALD_U_N_1B')

# Set fields you are interested in
request.set_fields(observation_fields=['rayleigh_HLOS_windspeed'])

# Request data for time period you are interested in
data = request.get_between(
    start_time="2020-11-02T06:09:58Z",
    end_time="2020-11-02T07:38:34Z",
    filetype="nc"
)
```
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Working with returned data

```python
[5]: xd = data.as_xarray()

[6]: xd

xarray.Dataset

Dimensions:  (observation: 443, array_24: 24)
Coordinates: (0)
Data variables:

  rayleigh_HLOS... (observation, array_24) float64 ...

Attributes:

  Sources: ['AE_OPER_ALD_U_N_1B_20201102T053023039_005435994_012723_0001', '1B11', 'ADM_L1bP/07.09'], ['AE_OPER_ALD_U_N_1B_20201102T070035026_005424000_012724_0001', '1B11', 'ADM_L1bP/07.09'])
```
Plotting data

```python
[7]: xd['rayleigh_H10S_wind_speed'].plot_pcolormesh(
    x='observation',
    yincrease=False,
    robust=True,
    figsize=(18,4)
).figure.show()
```
Summary

• Thank you for your time and collaboration
• Visit https://notebooks.aeolus.services where great examples are provided showcasing the capabilities of the VRE or…
• Go directly to https://vre.aeolus.services to start using the VRE (examples can directly be loaded from the launcher)
• For questions, feedback, or interest in providing example notebooks find me in the now starting poster session or contact me under daniel.santillan@eox.at