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VCD : Venus Climate Database
Virtual Observatory service in VESPA

User Manual

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This document aims to explain quickly how the service VCD on VESPA is build and how to interrogate it on VESPA query interface. It will detail the most useful query criteria of the service and the data content.

Chapter 1

Service content

The Virtual Observatory access to the Venus Climate Database (VCD)[1] is an alternative way to use the VCD in selecting sets of profiles matching queries. It give access to the simulated profiles of various parameters in Venus atmosphere in VOtable[2] format for 92 points of altitude between 0 and 349.5 km (altitude from Venus areoid). Those profiles depends on local time, latitude, longitude and the scenario of the database. These input parameters have been sampled (see Table 1.1) to be integrated on a VESPA service.

1.1 Venus Climate Database

VCD scenarios implemented in the VESPA service are characterized by a set of meaningful cloud albedo and solar conditions.

Five combinations of cloud albedo and solar flux are provided:

- MeanCloudAlbedo_AveEUV : Standard cloud albedo Scenario, solar EUV average conditions
- MeanCloudAlbedo_MinEUV : Standard cloud albedo Scenario, solar EUV minimum conditions
- MeanCloudAlbedo_MaxEUV : Standard cloud albedo Scenario, solar EUV maximum conditions
- LowCloudAlbedo_aveEUV : Low cloud albedo Scenario, solar EUV average conditions
- HighCloudAlbedo_aveEUV : High cloud albedo Scenario, solar EUV average conditions

See the VCD 1.1 user manual[3] and the webpage dedicated to the project[4] for more information.

[1] http://vespa.obspm.fr/planetary/data/display/?&service_id=ivo://lmd.jussieu/vcd/q/epn_core&service_type=epn
[2] VOTable Standard Format Definition : `https://www.ivoa.net/documents/VOTable/`
[3] `http://www-venus.lmd.jussieu.fr/documentation/user_manual_vcd.pdf`
[4] `http://www-venus.lmd.jussieu.fr`

Parameter name	Content	Range of values
solar_conditions	EUV conditions of the VCD scenario	Maximum | Average | Minimum
cloud_albedo	Cloud Albedo conditions of the VCD scenario	Low | High | Standard
granule_gid	VCD scenario	MeanCloudAlbedo_AveEUV | MeanCloudAlbedo_MaxEUV | MeanCloudAlbedo_MinEUV | HighCloudAlbedo_aveEUV | LowCloudAlbedo_aveEUV
local_time_{min|max}	Local time in hours	From 0 to 24 by step of 1 h
c1_{min|max}	Longitude in degrees	From 0 to 360 by step of 4°
c2_{min|max}	Latitude in degrees	From -90 to 90 by step of 2°
c3_{min|max}	{min|max} altitude above areoid in the profile (km)	c3_min=0 and c3_max=349.5 km
obs_id	H{local_time}_LAT{c2}_LON{c1}	
granule_uid	{granule_gid}_{obs_id}	

Table 1.1: Principal research parameters on VCD service

1.2 Parameter description

The VCD VO service for VESPA is searchable using query parameters. Main query parameters of the service are reported Table 1.1 and corresponds to the VCD inputs. Each granule of the service links to a VOtable file containing the profile of numerous VCD outputs.

Altitude :
Altitude above the reference sphere (km)
Altitude above the local surface (km)
Radial Distance from center of the planet (km)
Altitude of the surface withrespect to the reference sphere (km)
Temperature/Pressure :
Atmospheric Temperature (K)
RMS day to day variability of Atmospheric Temperature (K)
RMS V-hourly variability of the Atmospheric Temperature (K)
Surface Temperature (K)
RMS day to day variability of the Venus Surface Temperature (K)
RMS V-hourly variability of the Venus Surface Temperature (K)
Atmospheric Pressure (Pa)
RMS day to day variability of the Surface Pressure (Pa)
RMS V-hourly variability of the Atmospheric Pressure (Pa)
Surface Pressure (high resolution) (Pa)
RMS day to day variations of Surface Pressure (Pa)
RMS V-hourly variability of the Surface Pressure (Pa)
Winds :
Zonal component of wind (positive if westward) (m/s)
RMS day to day variability of Zonal component of wind (positive if westward) (m/s)
RMS V-hourly variability of the Zonal component of wind (positive if westward) (m/s)
Meridional component of wind (positive if northward) (m/s)
RMS day to day variations of Meridional component of wind (positive if northward) (m/s)
RMS V-hourly variability of the Meridional component of wind (positive if northward) (m/s)
Vertical component of wind (positive if upward) (m/s)
RMS day to day variability of the Vertical component of wind (positive if upward) (m/s)
RMS V-hourly variability of the Vertical component of wind (positive if upward) (m/s)

Table 1.2: Content of the profiles provided in the VOTables of the VCD service 1/2

Composition :
Atmospheric Density (kg.m-3)
RMS day to day variation of density (kg.m-3)
RMS V-hourly variability of the density (kg.m-3)
Carbon Dioxide Volume Mixing Ratio (mol_co2/mol_air)
Carbon monoxide Volume Mixing Ratio (mol_CO/mol_air)
Dioxygen Volume Mixing Ratio (mol_O2/mol_air)
Oxygen Volume Mixing Ratio (mol_O/mol_air)
Hydrogen Volume Mixing Ratio (mol_H/mol_air)
Dihydrogen Volume Mixing Ratio (mol_H2/mol_air)
H2O Volume Mixing Ratio (mol_H2O/mol_air)
SO2 Volume Mixing Ratio (mol_SO2/mol_air)
SO Volume Mixing Ratio (mol_SO/mol_air)
OCS Volume Mixing Ratio (mol_OCS/mol_air)
O3 Volume Mixing Ratio (mol_O3/mol_air)
HCl Volume Mixing Ratio (mol_HCl/mol_air)
N2 Volume Mixing Ratio (mol_N2/mol_air)
He Volume Mixing Ratio (mol_He/mol_air)
VIRA temperature at the same location, -999 if outside VIRA tabulated range (K)
VIRA pressure at the same location, -999 if outside VIRA tabulated range (Pa)
VIRA density at the same location, -999 if outside VIRA tabulated range (kg.m-3)
Carbon dioxide column (kg.m-2)
Carbon monoxide column (kg.m-2)
Dioxygen column (kg.m-2)
Oxygen column (kg.m-2)
Hydrogen column (kg.m-2)
Dihydrogen column (kg.m-2)
H2O column (kg.m-2)
SO2 column (kg.m-2)
SO column (kg.m-2)
OCS column (kg.m-2)
Ozone column (kg.m-2)
HCl column (kg.m-2)
N2 column (kg.m-2)
Helium column (kg.m-2)
Other :
Short wavelength (Visible) entering net solar flux net flux at given altitude, positive downward (W.m-2)
Long wavelength (Infrared) outgoing net flux at given altitude, positive upward (W.m-2)
Atmospheric scale height at given altitude (m)
Atmospheric mean molar mass at given altitude (g.mol-1)
Sound_speed (m.s-1)
Gas_constant_r (J.K-1.kg-1)
Atmospheric heat capacity Cp (J.K-1.kg-1)
Atmospheric specific heat ratio
Atmospheric viscosity estimation (Pa.s)
Net Solar Flux (SW) received at the top of the atmosphere, positive downward (W.m-2)
Vertically integrated O2 nightglow (delta emission) (MR - Mega Rayleigh)

Table 1.3: Content of the profiles provided in the VOTables of the VCD service 2/2
Parameters which do not change with altitude (Surface Pressure, Surface Temperature, RMS Surface Pressure, RMS Surface Temperature, species column, etc) are provided as *param* tags of the VOTable. Other parameters are provided as *field* tags.