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EXOTOPO Virtual Observatory Service in VESPA

User Manual

06/2021

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Chapter 1

Service EXOTOPO

The EXOTOPO Virtual Observatory service¹ on Virtual Solar and Planetary Access (VESPA) gives access to topographic maps of synthetic 3D bodies generated by a 3-parameter statistical model adapted for spherical coordinates and topography (*Landais et al, Topography of (exo)planets, 2019*). The EXOTOPO service aims to provide resulting maps for a selection of input parameter's values. The model's parameters are α : Degree of multifractality; $C1$: degree of intermittency; H : degree of smoothness. Additionally there is maps provided with a random seed variation, with the other parameters fixed (Earth-like combination of parameters $\alpha=1.9$, $H=0.5$ and $C1=0.1$).

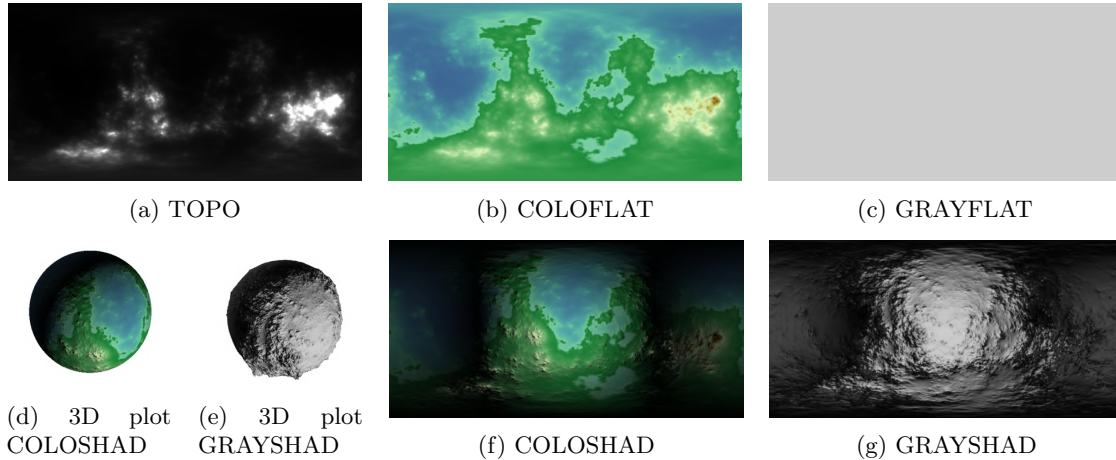


Figure 1.1: Exotopo service content

For each combination of parameters (see ranges of values in Table 1.1), the service provides a topographic map (in Fits format) and texture maps (in png format) see Figure 1.1. There is four texture maps for each topographic map : A texture with Earth-like colouration in function of altitude

¹http://vespa.obspm.fr/planetary/data/display/?&service_id=ivo://geops.ipsl/exotopo/q/epn_core&service_type=epn

(COLOFLAT); A Small-body like uniform gray texture (GRAYFLAT); These Earth and Small-body like textures with hill-shade in an arbitrarily chosen light direction (COLOSHAD and GRAYSHAD). Additionally, 3D spherical plots of topography maps with hill-shade textures are provided as Thumbnails (Earth-like) and Datalinks (Small-body).

The main research parameters of the service and its range of values, are referenced Table 1.1.

Parameter name	Content	Range of values
simu_spheric_alpha	Value of degree of multifractality of the model	$\alpha = 1.4$ to 2.0 by step of 0.1 (7 values)
simu_spheric_c1	Value of the degree of intermittency of the model	$C1$ 0 to 0.2 by step of 0.05 (5 values)
simu_spheric_h	Value of the degree of smoothness of the model	$H = 0.1$ to 1.0 by step of 0.1 (10 values)
simu_spheric_random_seed	Random seed identifier	S07 to S17 Remark: S08 to S17 granules have only one associated granule available for the set of parameters $\alpha=1.9$ $H=0.5$ $C1=0.1$ (earth-like)
granule_gid	Describe the content of the file: - TOPO : File containing topographic data - {GRAY COLO}{SHAD FLAT} : Texture maps for the simulated topography GRAY: Uniform gray coloration COLO: Earth-like colorscale SHAD: with Shadows FLAT: without Shadows	{TOPO} { GRAY COLO}{SHAD FLAT}}
obs_id	{simu_spheric_random_seed}_A{simu_spheric_alpha $\times 10$ }_C1{simu_spheric_c1 $\times 100$ }_H{simu_spheric_h $\times 10$ }	
granule_uid		Simu_spheric_{obs_id}_{granule_gid}

Table 1.1: Main query parameters on EXOTOPO VESPA service

Chapter 2

Examples

These quick examples aims to show how to select wanted subsets in EXOTOPO service using query parameters on VESPA portal.

2.1 Example 1 - Select Random Seed variation granules

To have all granules corresponding to the random seed variation cases, we have to select only granules with the fixed parameters $\alpha = 1.9$, $H = 0.5$, $C1 = 0.1$. To select these parameters, go to "Other" section at bottom left of the page, add fields, select the parameter names, fill the values and run the query. You will obtain granules with various random seed.

The screenshot shows the VESPA portal interface. On the left, the 'Other' section is expanded, showing three query parameters: `simu_spheric_alpha` with value 1.9, `simu_spheric_h` with value 0.5, and `simu_spheric_c1` with value 0.1. The main content area displays the results for the 'Exotopo - Simulated Topography of Exoplanets' service. A table lists 10 granules, each with a unique ID, data product type (map), target name, and access URI. Each row includes a 'SEND' button. The table is paginated, showing 10 of 55 entries.

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_uri	dataLink
Simu_spheric_S17_A19_C10_H05_TOPO	map				https://data.psl.fr/...	SEND
Simu_spheric_S17_A19_C10_H05_GRAYSHAD	map				https://data.psl.fr/...	SEND
Simu_spheric_S17_A19_C10_H05_GRAYFLAT	map				https://data.psl.fr/...	SEND
Simu_spheric_S17_A19_C10_H05_COLOSHAD	map				https://data.psl.fr/...	SEND
Simu_spheric_S17_A19_C10_H05_COLOFLAT	map				https://data.psl.fr/...	SEND
Simu_spheric_S16_A19_C10_H05_TOPO	map				https://data.psl.fr/...	SEND
Simu_spheric_S16_A19_C10_H05_GRAYSHAD	map				https://data.psl.fr/...	SEND
Simu_spheric_S16_A19_C10_H05_GRAYFLAT	map				https://data.psl.fr/...	SEND
Simu_spheric_S16_A19_C10_H05_COLOSHAD	map				https://data.psl.fr/...	SEND
Simu_spheric_S16_A19_C10_H05_COLOFLAT	map				https://data.psl.fr/...	SEND

2.2 Example 2 - Selecting only TOPO granules

In this example, we want to select only topographic maps (in Fits format) with for example α fixed at 1.6 . In Data Reference section, fill granule.uid field with *TOPO*; in "Other" section, select simu_spheric_alpha and inform 1.6 and you will obtain only topographic maps, for this value of alpha.

Form Query

EPN-TAP Services Custom Service

Time

Location

Spectral

Illumination

Data Reference

Granule UID

Granule GID

Obs ID

Measurement Type

Optional

Other

simu_spheric_alpha

= 1.6

Submit Reset

Results in service Exotopo

Exotopo - Simulated Topography of Exoplanets

The data consist in topographic maps of synthetic 3D bodies generated by a 3-parameter statistical model: the fractionally integrated flux (FIF) [1] adapted for spherical coordinates and topography [2]. The 3 parameters are: H (degree of smoothness), C1 (degree of intermittency), alpha (degree of multifractality). The service contains topographic maps (in fits format) and texture maps (in png format). [1] Lavalée, D., Lovejoy, S., Schertzer, D., & Ladoy, P. (1993). Nonlinear variability and landscape topography: analysis and simulation. *Fractals in geography*, edited by L. De Cola and N. Lam. Prentice-Hall, New Jersey, 158-192. [2] Landais, F., Schmidt, F., and Lovejoy, S. (2018) Topography of exoplanets, *MNRAS* doi:10.1093/mnras/sty2253 <https://doi.org/10.1093/mnras/sty2253>.

Credits:
 Creator: Chloé Azria
 Contributor: François Landais, Frederic Schmidt, Shaun Lovejoy
 Publisher: GEOPS/IPSL

Show 10 entries

Column visibility Show all Hide all

Select All in current page Reset Selection

granule_uid	dasaproduct_type	target_name	time_min (d)	time_max (d)	access_url	granule_gid	obs_id	target_class	time_sampling_step_m
Simu_spheric_S07_A16_C20_H10_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H10	exoplanet	
Simu_spheric_S07_A16_C20_H09_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H09	exoplanet	
Simu_spheric_S07_A16_C20_H08_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H08	exoplanet	
Simu_spheric_S07_A16_C20_H07_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H07	exoplanet	
Simu_spheric_S07_A16_C20_H06_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H06	exoplanet	
Simu_spheric_S07_A16_C20_H05_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H05	exoplanet	
Simu_spheric_S07_A16_C20_H04_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H04	exoplanet	
Simu_spheric_S07_A16_C20_H03_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H03	exoplanet	
Simu_spheric_S07_A16_C20_H02_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H02	exoplanet	
Simu_spheric_S07_A16_C20_H01_TOPO	map				https://data.ipsl.fr...	TOPO	S07_A16_C20_H01	exoplanet	

Showing 1 to 10 of 50 entries

Data Selection - Metadata Selection - All Data - All Metadata - Footprints