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## EXOTOPO Virtual Observatory Service in VESPA

# User Manual

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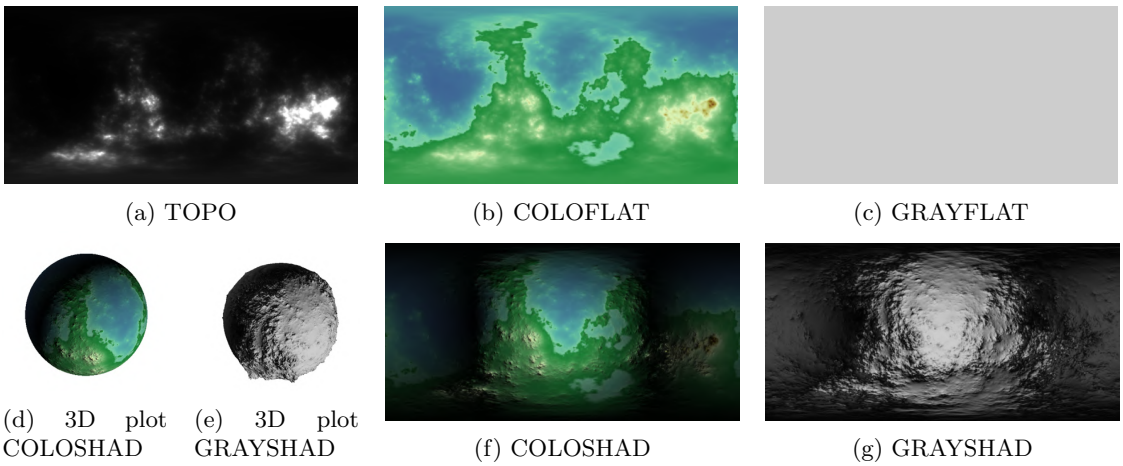
# Chapter 1

# Service EXOTOPO

The EXOTOPO Virtual Observatory service[1] 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 $\alpha$ : Degree of multifractality; $C1$ : degree of intermittency; $H$ : degree of smoothness. Additionnally 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).



(a) TOPO (b) COLOFLAT (c) GRAYFLAT

(d) 3D plot COLOSHAD (e) 3D plot GRAYSHAD (f) COLOSHAD (g) GRAYSHAD

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

[1] `http://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 tp 1.0 by step of 0.1 (10 values) |
| simu_spheric_random_seed | Random seed identifier | S07 to S17<br>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:<br>- **TOPO** : File containing topographic data<br>- {**GRAY**\|**COLO**}{**SHAD**\|**FLAT**} :<br>Texture maps for the simulated topography<br>GRAY: Uniform gray coloration<br>COLO: Earth-like colorscale<br>SHAD: with Shadows<br>FLAT: without Shadows | {TOPO}\|{{GRAY\|COLO}{SHAD\|FLAT}} |
| obs_id | {simu_spheric_random_seed}_A{simu_spheric_alpha×10}_C1{simu_spheric_c1×100}<br>_H{simu_spheric_h×10} | |
| granule_uid | Simu_spheric_{obs_id}_{granule_gid} | |

Table 1.1: Main query parameters on EXOTOPO VESPA service

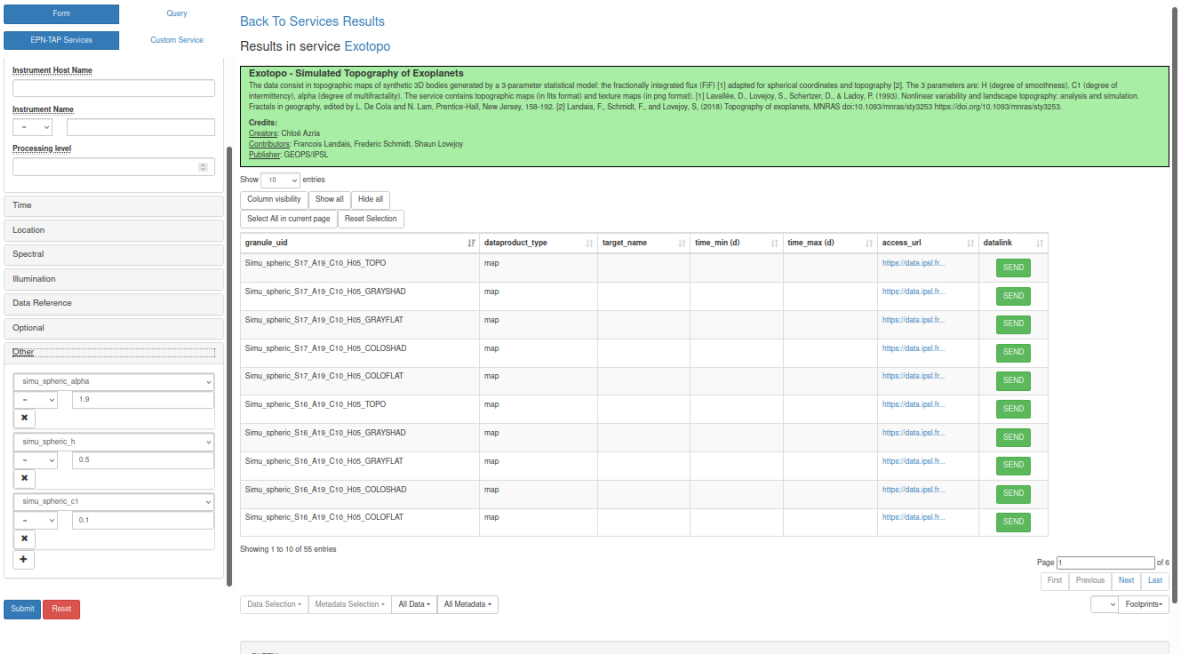
# Chapter 2

# 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.



## 2.2 Example 2 - Selecting only TOPO granules

In this example, we want to select only topographic maps (in Fits format) with for example $\alpha$ 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.