Pyroduct: The First Realistic and Parametric Lava Tube Generator for Earth, Moon, and Mars

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Software Open

Pyroduct: The First Realistic and Parametric Lava Tube Generator for Earth, Moon, and Mars

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Contributors

Data collector: Pisani, Luca[1]

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Pyroduct is a first-of-it-kind fully parametric lava tube generator that allows the user to easily produce realistic lava tube 3D models, using as an input a database of more than 90 terrestrial lava tube data, coming from 8 different regions of the World.

Countries: *Italy, Spain (Canary Islands), Portugal (Azores), United States (Oregon, New-Mexico, Hawaii), Jordan, Saudi Arabia, Japan and Australia*

The software has been developed as an easily installable plug-in for "Grasshopper", Rhinoceros 3D's Visual Programming Language.

Inside of the downloadable .rar files, two folders are contained:

- **User Objects:** the folder contains all the files to install Pyroduct on your computer.
  To do so, please follow these instructions:
  1) Initialize Rhinoceros and start Grasshopper;
  2) Open the "*User Objects*" folder and copy all the files inside;
  3) In Grasshopper, go to File > Special Folders > User Object Folder.
  4) Paste the copied files into this directory.
  5) Pyroduct should now be installed in Grasshopper, without needing to restart Rhinoceros.

  Note: *If this doesn't work, ensure the files aren't locked. To check this, right-click a file, select Properties, and*

To open these example files, either drag them on the Grasshopper canvas, or go to File > Open Document and click on the example file you would like to open.

Recommended citations:
When using Pyroduct in your works, we recommend you to reference to the following publications:

1) Romio, F. A. P. e Lobosco, G. (2025) «Pyroduct: a Parametric Lava Tube Generator (Grasshopper Plug-in)». Zenodo. doi: 10.5281/zenodo.14604787.
2) Romio, F. A. P. e Lobosco, G. (2024) «Pyroduct Digital Catalog». Zenodo. doi: 10.5281/zenodo.14535886.
3) Romio, F. A. P., Lobosco, G., Sauro, F., Pozzobon, R., & Marraffa, A. (2024, October 18). Pyroduct: a parametric tool for generating realistic 3D models of lunar and Martian lava tubes. 75th International Astronautical Congress, Milan, Italy. Available at: https://doi.org/10.5281/zenodo.14620347.

Note:
This plug-in uses a dataset of > 1000 cross-sections of terrestrial lava tubes, which the authors have digitalized from existing literature, available separately. The dataset is published under the Creative Commons BY 4.0 license. For more information and to access the dataset, visit: 10.5281/zenodo.14535886.

Files

Pyroduct Plug-in.zip

Pyroduct Plug-in.zip

- Example files
  - Pyroduct_Guide2.gh 16.4 MB
  - Pyroduct_Guide_1.gh 11.3 MB
- LICENSE.txt 19.1 kB
- README.txt 2.7 kB
- User Objects
  - Pyroduct Catalog Index.ghuser 4.7 kB
  - Pyroduct Digital Catalog.ghuser 5.4 MB
  - Pyroduct Generator.ghuser 32.2 kB
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  - Pyroduct Middle Curve.ghuser 10.7 kB
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  - Pyroduct Points Generator 1.ghuser 7.5 kB
  - Pyroduct Points Generator 2.ghuser 7.1 kB
  - Pyroduct Points Generator 3.ghuser 8.2 kB
  - Pyroduct Select Location Tools.ghuser 4.8 kB

Files (58.3 MB)

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25.1 MB

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md5:c607b2c32881fae65d0d2408342c77e0

33.2 MB

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Dataset: 10.5281/zenodo.14535885 (DOI)

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10.5281/zenodo.14860753

Version v1 Jan 6, 2025

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Keywords and subjects

lava tube generator | lava tube parametric generator | realistic lava tube generator | lava tube architecture | lunar and martian underground architecture | vulcanospeleology

Details

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Resource type

Software

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