NFO Web Service VelociTrack

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Quality Assurance Link

http://fridge.ingv.it/docs/API_prototype_documentation_NFO_QA.pdf

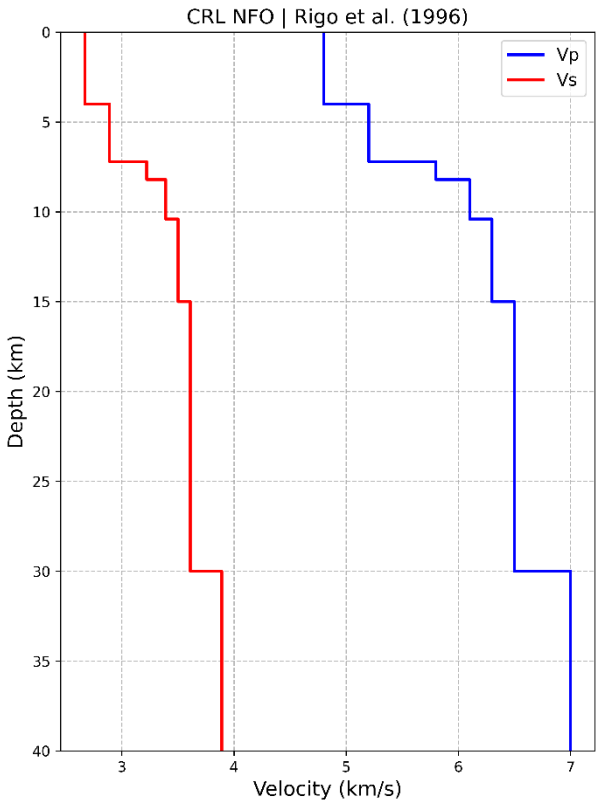
About this document

This document shows the usage basics to query and get (GET method) 1D and 3D seismic velocity models from the VelociTrack database through a REST Web API.

This API consists of a list of request definitions that are passed to a web server over HTTPS to return a formatted output (such as VELEST, pipe-delimited text, CSV or GeoJSON) usable for scientific analysis of depth-velocity relationships for P-wave and S-wave velocities.

The web server performs input parameters validation. In case of validation success, it responds with the requested data format; otherwise, it returns a JSON object with the validation errors.

The output can be accessed in machine-actionable formats (e.g., CSV and GeoJSON) to other webservices or scientific software, for integration with more advanced usages like graphic representations or velocity modelling.



The V_p and V_s 1D velocity models of Rigo et al. (1996) for the Corinth Rift Laboratory (CRL) NFO. Two of the models available in VelociTrack. V_s obtained using V_p and a V_p/V_s of 1.80.

Description of the VelociTrack service

Web service endpoints:

For 1D models: https://velmod.geol.uoa.gr/1d/{?author, nfo, format, limit, offset}

For 3D models: https://velmod.geol.uoa.gr/3d/{?wave_type, author, nfo, include_r, format, limit, offset}

For retrieving all available authors: https://velmod.geol.uoa.gr/authors

For retrieving all available NFO names: https://velmod.geol.uoa.gr/nfos

For retrieving all available bibliographical references: https://velmod.geol.uoa.gr/bibrefs

API docs: https://velmod.geol.uoa.gr/docs

This is a service that allows the retrieval of 1D and 3D velocity models for P-wave and S-wave velocities.

Input parameters thus allow to constrain the specific models that will be extracted, namely the author or reference, the network or organization identifier, wave types, output formats, and pagination limits for large datasets.

/1d/ PARAMETERS

author

description: Author name to filter by.
meaning: The specific author or reference of the velocity model to extract.
standard reference: string
measure unit: N/A
priority: mandatory
default value: no default value due to priority
validity range: any valid string mapped to the database (see /authors endpoint)

nfo

description: NFO name to filter by.
meaning: The specific NFO of the velocity model to extract.
standard reference: string
measure unit: N/A
priority: mandatory
default value: no default value due to priority
validity range: any valid string mapped to the database (see /nfos endpoint)

format

description: Output format for the requested velocity model.
meaning: Data format in which the velocity models are returned.
standard reference: string
measure unit: N/A
priority: optional
default value: “velest”
validity range: text, velest, csv

limit

description: Maximum number of records to return.
meaning: Used for pagination when dealing with large datasets to restrict the output size.
standard reference: integer
measure unit: pure number
priority: optional
default value: 10,000
validity range: [1, 10,000]

offset

description: Number of records to skip.
meaning: Used for pagination to skip a specific number of records before starting to return the dataset.
standard reference: integer
measure unit: pure number
priority: optional
default value: 0
validity range: ≥0

/1d/ OUTPUT

Format: "velest"
Exports in the style of the VELEST velocity modelling software. Includes a header with the reference. Damping factor is not available (1.0 as a placeholder). Velocities are in km/s and depths in km.

Example:

Request URL:

https://velmod.geol.uoa.gr/1d/?author=Rigo_et_al_1996&nfo=CRL&format=velest&limit=10000&offset=0

```
1D CRL Rigo, A., Lyon-Caen, H., Armijo, R., Deschamps, A., Hatzfeld, D., Makropoulos, K., Papadimitriou, P., & Kassaras, I. (1996). A microseismic study in the western part of the Gulf of Corinth (Greece): Implications for large-scale normal faulting mechanisms. Geophysical Journal International, 126(3), 663688. https://doi.org/10.1111/j.1365-246X.1996.tb04697.x
 8      vel,depth,vdamp,phase (f5.2,5x,f7.2,2x,f7.3,3x,a1)
 4.80     -3.00  001.000        P-VELOCITY MODEL
 4.80      0.00  001.000
 5.20      4.00  001.000
 5.80      7.20  001.000
 6.10      8.20  001.000
 6.30     10.40  001.000
 6.50     15.00  001.000
 7.00     30.00  001.000
 8
 2.67     -3.00  001.000        S-VELOCITY MODEL
 2.67      0.00  001.000
```

```
 2.89     4.00  001.000
 3.22     7.20  001.000
 3.39     8.20  001.000
 3.50    10.40  001.000
 3.61    15.00  001.000
 3.89    30.00  001.000
```

Format: "text"

Exports in a tabular pipe-delimited format. Includes columns with the NFO and Author references, as well as a layer identification number (Layer). Velocities are in km/s and depths in km.

Example:

Request URL:

https://velmod.geol.uoa.gr/1d/?author=Rigo_et_al_1996&nfo=CRL&format=text&limit=10000&offset=0

```
Model|Type|NFO|Author|Layer|Velocity|Depth
1D|Vp|CRL|Rigo_et_al_1996|1|4.80|-3.00
1D|Vp|CRL|Rigo_et_al_1996|2|4.80|0.00
1D|Vp|CRL|Rigo_et_al_1996|3|5.20|4.00
1D|Vp|CRL|Rigo_et_al_1996|4|5.80|7.20
1D|Vp|CRL|Rigo_et_al_1996|5|6.10|8.20
1D|Vp|CRL|Rigo_et_al_1996|6|6.30|10.40
1D|Vp|CRL|Rigo_et_al_1996|7|6.50|15.00
1D|Vp|CRL|Rigo_et_al_1996|8|7.00|30.00
1D|Vs|CRL|Rigo_et_al_1996|1|2.67|-3.00
1D|Vs|CRL|Rigo_et_al_1996|2|2.67|0.00
1D|Vs|CRL|Rigo_et_al_1996|3|2.89|4.00
1D|Vs|CRL|Rigo_et_al_1996|4|3.22|7.20
1D|Vs|CRL|Rigo_et_al_1996|5|3.39|8.20
1D|Vs|CRL|Rigo_et_al_1996|6|3.50|10.40
1D|Vs|CRL|Rigo_et_al_1996|7|3.61|15.00
1D|Vs|CRL|Rigo_et_al_1996|8|3.89|30.00
```

Format: "csv"

Exports in a tabular comma-separated format. Includes columns with the NFO and Author references, as well as a layer identification number (Layer). Velocities are in km/s and depths in km.

Example:

Request URL:

https://velmod.geol.uoa.gr/1d/?author=Rigo_et_al_1996&nfo=CRL&format=csv&limit=10000&offset=0

```
Model,Type,NFO,Author,Layer,Velocity,Depth
1D,Vp,CRL,Rigo_et_al_1996,1,4.80,-3.00
1D,Vp,CRL,Rigo_et_al_1996,2,4.80,0.00
```

```
1D,Vp,CRL,Rigo_et_al_1996,3,5.20,4.00
1D,Vp,CRL,Rigo_et_al_1996,4,5.80,7.20
1D,Vp,CRL,Rigo_et_al_1996,5,6.10,8.20
1D,Vp,CRL,Rigo_et_al_1996,6,6.30,10.40
1D,Vp,CRL,Rigo_et_al_1996,7,6.50,15.00
1D,Vp,CRL,Rigo_et_al_1996,8,7.00,30.00
1D,Vs,CRL,Rigo_et_al_1996,1,2.67,-3.00
1D,Vs,CRL,Rigo_et_al_1996,2,2.67,0.00
1D,Vs,CRL,Rigo_et_al_1996,3,2.89,4.00
1D,Vs,CRL,Rigo_et_al_1996,4,3.22,7.20
1D,Vs,CRL,Rigo_et_al_1996,5,3.39,8.20
1D,Vs,CRL,Rigo_et_al_1996,6,3.50,10.40
1D,Vs,CRL,Rigo_et_al_1996,7,3.61,15.00
1D,Vs,CRL,Rigo_et_al_1996,8,3.89,30.00
```

/3d/ PARAMETERS

author

description: Author name to filter by.
meaning: The specific author or reference of the velocity model to extract.
standard reference: string
measure unit: N/A
priority: mandatory
default value: no default value due to priority
validity range: any valid string mapped to the database (see /authors endpoint)

nfo

description: NFO name to filter by.
meaning: The specific NFO of the velocity model to extract.
standard reference: string
measure unit: N/A
priority: optional
default value: null
validity range: any valid string mapped to the database (see /nfos endpoint)

format

description: Output format for the requested velocity model.
meaning: Data format in which the velocity models are returned.
standard reference: string
measure unit: N/A
priority: optional
default value: "text"
validity range: text, csv, geojson

wave_type

description: Seismic wave type.
meaning: Specifies whether to query P-wave or S-wave 3D velocity models, or Vp/Vs ratio model.
standard reference: string
measure unit: N/A
priority: mandatory
default value: no default value due to priority
validity range: VP, VS, VPVS

include_r

description: Include R column in output.
meaning: Determines whether the R column is appended to the 3D model tabular output.
standard reference: boolean
measure unit: true / false
priority: optional
default value: false
validity range: true, false

limit

description: Maximum number of records to return.
meaning: Used for pagination when dealing with large datasets to restrict the output size.
standard reference: integer
measure unit: pure number
priority: optional
default value: 100,000
validity range: [1, 100,000]

offset

description: Number of records to skip.
meaning: Used for pagination to skip a specific number of records before starting to return the dataset.
standard reference: integer
measure unit: pure number
priority: optional
default value: 0
validity range: ≥0

/3d/ OUTPUT

Format: "text"
Exports in a tabular pipe-delimited format. Includes columns with the NFO and Author references, as well as a layer identification number (Layer). Velocities are in km/s and depths in km. Longitude and latitude (in decimal degrees) follow the WGS84 coordinate system.

Example (*sample is limited to 10 entries for demonstration purposes*):

Request URL:

https://velmod.geol.uoa.gr/3d/?wave_type=VP&author=Karakonstantis_2017&include_r=false&format=text&limit=10&offset=0

```
# Showing 1-10 of 9550 records (limit=10, offset=0)
Model|NFO|Author|Longitude|Latitude|Depth|Vp
3D|CRL|Karakonstantis_2017|21.4|37.8|15.0|6.430309
3D|CRL|Karakonstantis_2017|21.4|37.83|15.0|6.315933
3D|CRL|Karakonstantis_2017|21.4|37.83|30.0|6.886472
3D|CRL|Karakonstantis_2017|21.4|37.83|40.0|7.768187
3D|CRL|Karakonstantis_2017|21.4|37.86|15.0|6.311861
3D|CRL|Karakonstantis_2017|21.4|37.86|30.0|6.867631
3D|CRL|Karakonstantis_2017|21.4|37.86|40.0|7.799082
3D|CRL|Karakonstantis_2017|21.4|37.89|15.0|6.338948
3D|CRL|Karakonstantis_2017|21.4|37.89|30.0|6.871551
3D|CRL|Karakonstantis_2017|21.4|37.89|40.0|7.817749
```

Format: "csv"
Exports in a comma-separated format. Includes columns with the NFO and Author references, as well as a layer identification number (Layer). Velocities are in km/s and depths in km. Longitude and latitude (in decimal degrees) follow the WGS84 coordinate system.

Example (*sample is limited to 10 entries for demonstration purposes*):

Request URL:

https://velmod.geol.uoa.gr/3d/?wave_type=VP&author=Karakonstantis_2017&include_r=false&format=csv&limit=10&offset=0

```
# Showing 1-10 of 9550 records (limit=10, offset=0)
Model,NFO,Author,Longitude,Latitude,Depth,Vp
3D,CRL,Karakonstantis_2017,21.4,37.8,15.0,6.430309
3D,CRL,Karakonstantis_2017,21.4,37.83,15.0,6.315933
3D,CRL,Karakonstantis_2017,21.4,37.83,30.0,6.886472
3D,CRL,Karakonstantis_2017,21.4,37.83,40.0,7.768187
3D,CRL,Karakonstantis_2017,21.4,37.86,15.0,6.311861
3D,CRL,Karakonstantis_2017,21.4,37.86,30.0,6.867631
3D,CRL,Karakonstantis_2017,21.4,37.86,40.0,7.799082
3D,CRL,Karakonstantis_2017,21.4,37.89,15.0,6.338948
3D,CRL,Karakonstantis_2017,21.4,37.89,30.0,6.871551
3D,CRL,Karakonstantis_2017,21.4,37.89,40.0,7.817749
```

Format: "geojson"
Exports as a GeoJSON FeatureCollection. Includes a metadata object with the NFO, Author, and bibliographic references, alongside pagination details. Velocities (in feature properties) are in km/s and depths in km. Longitude and latitude (in decimal degrees) follow the WGS84 coordinate system.
Example (*sample is limited to 3 entries for demonstration purposes*):

Request URL:

https://velmod.geol.uoa.gr/3d/?wave_type=VP&author=Karakonstantis_2017&include_r=false&format=geojson&limit=10&offset=0


```
{
  "type": "FeatureCollection",
  "metadata": {
    "model": "3D",
    "wave_type": "VP",
    "nfo": "CRL",
    "author": "Karakonstantis_2017",
    "bibref": "Karakonstantis A (2017) 3-D simulation of crust and upper mantle structure in the broader Hellenic area through Seismic Tomography. Dissertation, National and Kapodistrian University of Athens.",
    "total_count": 9550,
    "offset": 0,
    "limit": 3,
    "returned": 3,
    "skipped_invalid": 0
```

```
  },
  "features": [
   {
    "type": "Feature",
    "geometry": {
     "type": "Point",
     "coordinates": [
      21.4,
      37.8
     ]
    },
    "properties": {
     "depth": 15,
     "vp": 6.430309
    }
   },
   {
    "type": "Feature",
    "geometry": {
     "type": "Point",
     "coordinates": [
      21.4,
      37.83
     ]
    },
    "properties": {
     "depth": 15,
     "vp": 6.315933
    }
   },
   {
    "type": "Feature",
    "geometry": {
     "type": "Point",
     "coordinates": [
      21.4,
      37.83
     ]
    },
    "properties": {
     "depth": 30,
     "vp": 6.886472
    }
   }
  ]
}
```

/authors PARAMETERS

No parameters.

/authors OUTPUT

Returns a simple list of references that are currently available through VelociTrack.

Example:

```
Bagh_et_al_2025
Bressan_et_al_2003
Chiaraluce_et_al_2007
DeLandro_et_al_2022_1D
Di_Stefano_et_al_2014
Karakonstantis_2017
Magrin_Rossi_2020
Matrullo_et_al_2013
Petrescu_et_al_2024
Rigo_et_al_1996
Sadeghi-Bagherabadi_et_al_2021
```

/nfos PARAMETERS

No parameters.

/nfos OUTPUT

Returns a simple list of NFO names that are currently available through VelociTrack.

Example:

```
CRL
IRPINIA
NITRO
TABOO
VRANCEA
```

/bibrefs PARAMETERS

No parameters.

/bibrefs OUTPUT

Returns all author-to-bibref mappings in pipe-delimited format.

Example:

Author | Bibref
Bagh_et_al_2025 | Bagh, S., Di Stefano, R., Gualandi, A., Pantaleo, D., Calamita, C., Ladina, C., Marzorati, S., Chiaraluce, L., 2025. Insights into a low angle normal fault from a 10-year-long high-resolution earthquake catalog: The Alto Tiberina fault case study (Northern Apennines, Italy). J. Geophys. Res. Solid Earth, 130, e2024JB029853. https://doi.org/10.1029/2024JB029853
Bressan_et_al_2003 | Bressan, G., Bragato, P. L., and Venturini, C.: Stress and strain tensors based on focal mechanisms in the seismotectonic framework of the Friuli–Venezia Giulia region (north-eastern Italy), Bull. Seism. Soc. Am., 93, 1280–1297, https://doi.org/10.1785/0120020058, 2003.
Chiaraluce_et_al_2007 | Chiaraluce, L., Chiarabba, C., Collettini, C., Piccinini, D., Cocco, M., 2007. Architecture and mechanics of an active low-angle normal fault: Alto Tiberina Fault, northern Apennines, Italy, J. Geophys. Res., 112, B10310. https://doi.org/10.1029/2007JB005015
DeLandro_et_al_2022_1D | De Landro, G., Amoroso, O., Russo, G., D'Agostino, N., Esposito, R., Emolo, A., Zollo, A., 2022. Decade-long monitoring of seismic velocity changes at the Irpinia fault system (southern Italy) reveals pore pressure pulsations. Sci. Rep. 12, 1247. https://doi.org/10.1038/s41598-022-05365-x
Di_Stefano_et_al_2014 | Di Stefano, R., Chiaraluce, L., Valoroso, L., Waldhauser, F., Lattore, D., Piccinini, D., Tinti, E., 2014. An automatic modular procedure to generate high-resolution earthquake catalogues: application to the Alto Tiberina Near Fault Observatory (TABOO), Italy., AGU Fall Meeting.
Kapetanidis_et_al_2015 | V. Kapetanidis, A. Deschamps, P. Papadimitriou, E. Matrullo, A. Karakonstantis, G. Bozionelos, G. Kaviris, A. Serpetsidaki, H. Lyon-Caen, N. Voulgaris, P. Bernard, E. Sokos, K. Makropoulos, The 2013 earthquake swarm in Helike, Greece: seismic activity at the root of old normal faults, Geophysical Journal International, Volume 202, Issue 3, September 2015, Pages 2044–2073, https://doi.org/10.1093/gji/ggv249
Karakonstantis_2017 | Karakonstantis A (2017) 3-D simulation of crust and upper mantle structure in the broader Hellenic area through Seismic Tomography. Dissertation, National and Kapodistrian University of Athens.
Magrin_Rossi_2020 | Magrin A and Rossi G (2020) Deriving a New Crustal Model of Northern Adria: The Northern Adria Crust (NAC) Model. Front. Earth Sci. 8:89. doi: 10.3389/feart.2020.00089
Matrullo_et_al_2013 | Matrullo, E., De Matteis, R., Satriano, C., Amoroso, O., Zollo, A., 2013. An improved 1-D seismic velocity model for seismological studies in the Campania–Lucania region (Southern Italy). Geophys. J. Int. 195, 460–473. https://doi.org/10.1093/gji/ggt224
Petrescu_et_al_2024 | Petrescu, L., Borleanu, F., Kastle, E., Stephenson, R., Placinta, A. and Liashchuk, O.I., 2024. Seismic structure of the Eastern European crust and upper mantle from probabilistic ambient noise tomography. Gondwana Research, 125, pp.390-405.
Rigo_et_al_1996 | Rigo, A., Lyon-Caen, H., Armijo, R., Deschamps, A., Hatzfeld, D., Makropoulos, K., Papadimitriou, P., & Kassaras, I. (1996). A microseismic study in the western part of the Gulf of Corinth (Greece): Implications for large-scale normal faulting mechanisms. Geophysical Journal International, 126(3), 663–688. https://doi.org/10.1111/j.1365-246X.1996.tb04697.x

Sadeghi-Bagherabadi_et_al_2021 | Sadeghi-Bagherabadi, A., Vuan, A., Aoudia, A., Parolai, S., 2021. High-Resolution Crustal S-wave Velocity Model and Moho Geometry Beneath the Southeastern Alps: New Insights From the SWATH-D Experiment. Front. Earth Sci. 9. https://doi.org/10.3389/feart.2021.641113