



# TauP Toolkit

## Flexible Seismic Travel-Time and Raypath Utilities

### Version 2.0

H. Philip Crotwell, Thomas J. Owens  
Department of Geological Sciences  
University of South Carolina  
<http://www.seis.sc.edu>  
[crotwell@seis.sc.edu](mailto:crotwell@seis.sc.edu)



Metoda podle Buland and Chapman (1983)

Předpoklady pro výpočet: sfericky  
symetricka Zeme, koule

Pro linux, mac i windows, zkousim pro linux



## Nástroje:

**taup\_time**

- počítá časy šíření

**taup\_pierce**

- počítá body průchodu rozhraními modelu a specifikovanými hloubkami

**taup\_path**

- počítá dráhu paprsku, hloubka vs. epicen.

vzdálenost

**taup\_curve**

- počítá hodochrony, čas vs. epicen. vzdálenost

**taup\_table**

- počítá časy šíření pro různé hloubky a vzdálenosti jevů

**taup\_create**

- vytvoří taup model z předloženého ASCII modelu

**Taup**

- GUI, kombinuje více nástrojů

**taup\_setsac**

- přeformátuje časy příchodů do **sac header**

**taup\_console**

- scriptování TAUP v pythonu

# TAUP\_TIME

Usage: **taup\_time** [arguments]

Arguments are:

- ph phase list** -- comma separated phase list
- pf phasefile** -- file containing phases
- mod[el] modelname** -- use velocity model "modelname" for calculations Default is iasp91.
- h depth** -- source depth in km

**Distance is given by:**

- deg degrees** -- distance in degrees
- km kilometers** -- distance in kilometers, assumes radius of earth is 6371km,

**or by giving the station and event latitude and longitude, assumes a spherical earth,**

- sta[tion] lat lon** -- sets the station latitude and longitude
- evt lat lon** -- sets the event latitude and longitude
- rayp** -- only output the ray parameter
- time** -- only output travel time
- rel phasename** -- also output relative travel time NOT IN DOCUMENTATION
- o outfile** output is redirected to "outfile"
- debug** enable debugging output
- verbose** enable verbose output
- version** print the version
- help** print this out, but you already know that!

# TAUP\_TIME

taup\_time -deg 359

Model: iasp91

| Distance<br>(deg) | Depth<br>(km) | Phase<br>Name | Travel<br>Time (s) | Ray Param<br>p (s/deg) | Takeoff<br>(deg) | Incident<br>(deg) | Purist<br>Distance | Purist<br>Name |
|-------------------|---------------|---------------|--------------------|------------------------|------------------|-------------------|--------------------|----------------|
| 1.00              | 0.0           | P             | 19.17              | 19.170                 | 89.28            | 89.28             | 1.00               | = P            |
| 1.00              | 0.0           | P             | 20.19              | 17.053                 | 62.81            | 62.81             | 1.00               | = P            |
| 1.00              | 0.0           | P             | 20.35              | 18.006                 | 69.92            | 69.92             | 1.00               | = P            |
| 1.00              | 0.0           | P             | 21.27              | 13.754                 | 45.84            | 45.84             | 1.00               | = P            |
| 1.00              | 0.0           | Pn            | 21.27              | 13.754                 | 45.84            | 45.84             | 1.00               | = Pn           |
| 1.00              | 0.0           | P             | 21.47              | 15.174                 | 52.32            | 52.32             | 1.00               | = P            |
| 1.00              | 0.0           | S             | 33.09              | 33.091                 | 89.25            | 89.25             | 1.00               | = S            |
| 1.00              | 0.0           | S             | 34.88              | 29.558                 | 63.27            | 63.27             | 1.00               | = S            |
| 1.00              | 0.0           | S             | 35.12              | 31.082                 | 69.92            | 69.92             | 1.00               | = S            |
| 1.00              | 0.0           | S             | 37.00              | 24.738                 | 48.38            | 48.38             | 1.00               | = S            |
| 1.00              | 0.0           | Sn            | 37.00              | 24.739                 | 48.38            | 48.38             | 1.00               | = Sn           |
| 1.00              | 0.0           | S             | 37.16              | 26.225                 | 52.41            | 52.41             | 1.00               | = S            |
| 1.00              | 0.0           | PcP           | 511.32             | 0.096                  | 0.29             | 0.29              | 1.00               | = PcP          |
| 1.00              | 0.0           | ScS           | 935.65             | 0.177                  | 0.31             | 0.31              | 1.00               | = ScS          |
| 1.00              | 0.0           | PKiKP         | 994.59             | 0.022                  | 0.07             | 0.07              | 1.00               | = PKiKP        |
| 1.00              | 0.0           | SKiKS         | 1418.89            | 0.025                  | 0.04             | 0.04              | 1.00               | = SKiKS        |

# TAUP\_TIME

taup\_time -ph P<sup>m</sup>P,pP,S -sta 50 12 -deg 25 -h 3 -rel P

taup\_time -ph PmP,pP,S -sta 50 12 -deg 25 -h 3 -rel P

taup\_time -ph PmP,pP,S -sta 50 12 -deg 25 -h 300 -rel P

taup\_time -ph P<sup>400</sup>P,pP,S -sta 50 12 -deg 40 -h 3 -rel P

taup\_time -ph P<sup>410</sup>P,pP,S -sta 50 12 -deg 40 -h 3 -rel P

# TAUP\_PIERCE

Usage: **taup\_pierce** [arguments]

Arguments are:

**-ph phase list** -- comma separated phase list

**-pf phasefile** -- file containing phases

**-mod[el] modelname** -- use velocity model "modelname" for calculations Default is iasp91.

**-h depth** -- source depth in km

**Distance is given by:**

**-deg degrees** -- distance in degrees

**-km kilometers** -- distance in kilometers, assumes radius of earth is 6371km,

**or by giving the station and event latitude and longitude, assumes a spherical earth,**

**-sta[tion] lat lon** -- sets the station latitude and longitude

**-evt lat lon** -- sets the event latitude and longitude

**-o outfile** output is redirected to "outfile"

**-debug** enable debugging output

**-verbose** enable verbose output

**-version** print the version

**-help** print this out, but you already know that!

SAME as for taup\_time

# TAUP\_PIERCE

New arguments:

- az azimuth** -- sets the azimuth (event to station) used to output lat and lon of pierce points if the **event lat lon** and distance are also given.  
Calculated if station and event lat and lon are given.
- baz backazimuth** -- sets the back azimuth (station to event), **needs -sta lat lon**  
**- if lat,lon is not given – only 2D task**
- rev** -- only prints underside and bottom turn points
- turn** -- only prints bottom turning points
- under** -- only prints underside reflection points
- pierce** -- adds depth for calculating pierce points
- nodiscon** -- only prints pierce points for the depths added with -pierce



# TAUP\_PIERCE

taup\_pierce -h 25 -sta 50 12 -baz 90 -deg 60 -pierce 80,136,410,478 -ph P -nodiscon

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 0.28  | 80.0  | 8.1   | 22.72 | 81.43 |
| 0.58  | 136.0 | 16.2  | 22.94 | 81.20 |
| 2.28  | 410.0 | 54.7  | 24.15 | 79.90 |
| 2.82  | 478.0 | 64.0  | 24.53 | 79.49 |
| 57.09 | 478.0 | 535.9 | 49.91 | 16.52 |
| 57.63 | 410.0 | 545.1 | 49.94 | 15.69 |
| 59.33 | 136.0 | 583.6 | 50.00 | 13.04 |
| 59.63 | 80.0  | 591.7 | 50.00 | 12.57 |

taup\_pierce -ph P^400P,pP,S -sta 50 12 -deg 40 -h 3 -rel P

# TAUP\_PATH

Usage: **taup\_path** [arguments]

Arguments are:

**-ph phase list** -- comma separated phase list

**-pf phasefile** -- file containing phases

**-mod[el] modelname** -- use velocity model "modelname" for calculations Default is iasp91.

**-h depth** -- source depth in km

**Distance is given by:**

**-deg degrees** -- distance in degrees

**-km kilometers** -- distance in kilometers, assumes radius of earth is 6371km,

**or by giving the station and event latitude and longitude, assumes a spherical earth,**

**-sta[tion] lat lon** -- sets the station latitude and longitude

**-evt lat lon** -- sets the event latitude and longitude

**-o outfile** output is redirected to "outfile"

**-debug** enable debugging output

**-verbose** enable verbose output

**-version** print the version

**-help** print this out, but you already know that!

SAME as for taup\_time

# TAUP\_PATH

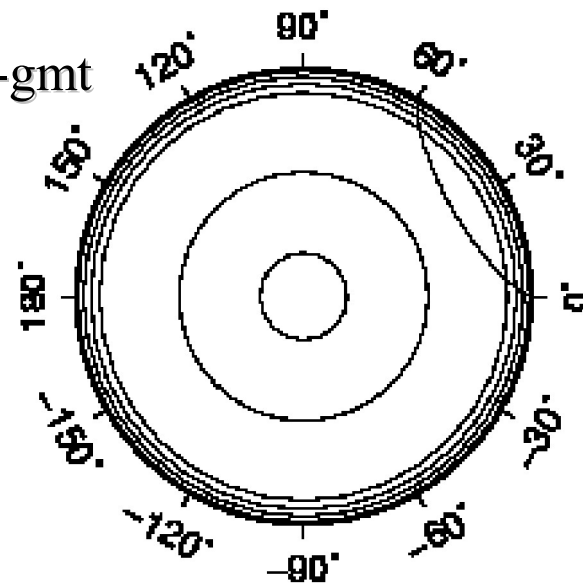
New arguments:

**-gmt** -- outputs path as a complete GMT script.

Example:

```
taup_path -mod iasp91 -h 550 -deg 74 -ph S,ScS,sS,sScS -gmt  
sh taup_path.gmt  
gs taup_path.ps
```

```
taup_path -mod iasp91 -h 550 -ph P,pP -deg 70 -gmt
```



# TAUP\_CURVE

Usage: **taup\_curve** [arguments]

Arguments are:

- ph phase list** -- comma separated phase list
- pf phasefile** -- file containing phases
- mod[el] modelname** -- use velocity model "modelname" for calculations Default is iasp91.
- h depth** -- source depth in km
- gmt** -- outputs path as a complete GMT script
- o outfile** output is redirected to "outfile"
- debug** enable debugging output
- verbose** enable verbose output
- version** print the version
- help** print this out

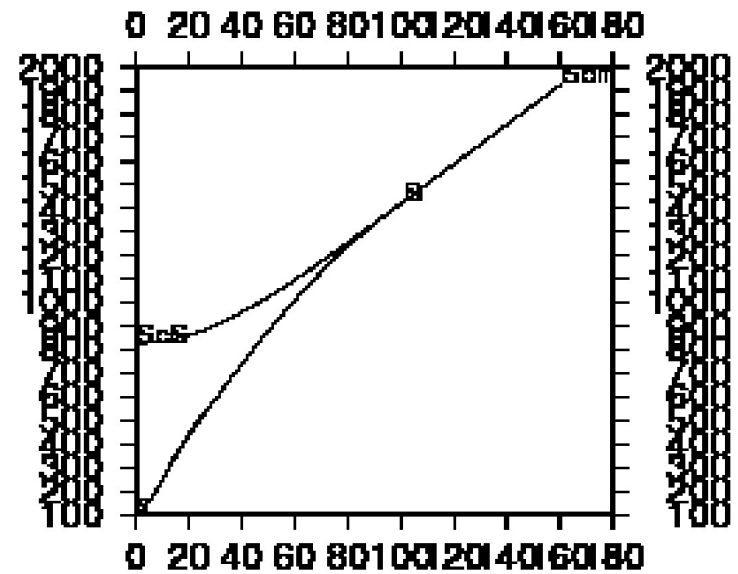
New arguments:

- reddeg velocity** -- outputs curves with a reducing velocity (deg/sec)
- redkm velocity** -- outputs curves with a reducing velocity (km/sec)

# TAUP\_CURVE

```
taup curve -mod prem -h 500 -ph s,S,ScS,Sdiff -gmt  
sh taup_curve.gmt  
ghostview taup_curve.ps
```

prem



# TAUP\_TABLE

- creates an ASCII table of arrival times for a range of depths and distances. Its main use is for generating travel time tables for earthquake location programs such as LOCSAT

Usage: **taup\_curve** [arguments]

Arguments are:

- ph phase list** -- comma separated phase list
- pf phasefile** -- file containing phases
- mod[el] modelname** -- use velocity model "modelname" for calculations Default is iasp91.
- o outfile** output is redirected to "outfile"
- debug** enable debugging output
- verbose** enable verbose output
- version** print the version
- help** print this out

New arguments:

- header filename** -- reads depth and distance spacing data from a LOCSAT style file.
- generic** -- outputs a "generic" ascii table
- locsats** -- outputs a "locsats" style ascii table

## Questions

What is the setting of default velocity models in TAUP?

`/home/hanak/TAUP/TauP-  
2.0/src/main/resources/edu/sc/seis/TauP/StdModels`