

SAC Command Reference Manual: SSS

SAC Users Guide Commands: A - Z Functional Subprocesses: SPE SSS SAC/IRIS

TRAVELTIME

SUMMARY

Computes traveltimes of selected phases for pre-defined velocity models Can be called only from within the SSS subprocess.

SYNTAX

```
TRAVELTIME {MODEL string} , {VERBOSE ON |OFF|} , {DEPTH-M ON [OFF]} ,
           {PICKS number} , {PHASE phase list}
```

INPUT

MODEL: IASP91 [default], AK135

VERBOSE: Prints out pick times for phases relative to origin time and relative to first-point time (B).

DEPTH-M: Default units for EVDP as of v101.5 are KM, but earlier versions had a default of meters for EVDP and that is what RDSEED uses

Picks: If the number is n, the first phase will be at T_n in the header

PHASE: List of phases for which times are picked and displayed

DEFAULT VALUES: MODEL iasp91 PICKS 0 PHASE P S P_n P_g S_n S_g

DESCRIPTION

All waveforms in memory must have event and station locations defined as well as the origin time.

This command calculates traveltimes using the iaspei-tau procedures developed for models IASP91 or AK135. For more information on this package, go to the iaspei-tau link at URL <<http://www.iris.edu/software/downloads/processing/>>. The phase picks are stored in the SAC header for all files in memory in header variables T_n, where n is in the range 0 to 9. The times are calculated relative to the origin time (O) but the T_n times are relative to the first-point time (B). The resulting traveltimes curves can be plotted on top of a record section plot using the [PLOTRECORDSECTION](#) command. If n and the number of phases are such that the phase list runs about T₉, those extra phases are not plotted or recorded in the header, but curves will be displayed with the

PLOTRECORDSECTION command if the TTIME option is turned on.

The traveltime tables used to calculate the stored radian–distance measure (GCARC). (GCARC is calculated from the event and station latitude and longitudes using spherical–triangle geometry after converting geographic latitudes to geocentric.) Older versions of TRAVELTIME allowed the use of DIST, which is the epicentral distance in kilometers based on Rudoe's method to calculate the geodesic (shortest) distance between two points on an elliptical Earth and is relevant for surface waves but not body waves.

EXAMPLES

A regional event using the default phases:

```
SAC> fg seismo
SAC> sss
Signal Stacking Subprocess.
SAC/SSS> traveltime picks 0 model ak135 verbose
traveltime: depth: 15.000000
traveltime: error finding phase P
traveltime: error finding phase S
traveltime: setting phase Pn      at 10.464321 s [ t
traveltime: setting phase Pg      at 22.904724 s [ t
traveltime: setting phase Sn      at 50.047722 s [ t
traveltime: setting phase Sg      at 66.414337 s [ t
SAC/SSS> qs
SAC> lh AMARKER TOMARKER T1MARKER T2MARKER T3MARKER
AMARKER = 10.464                      TOMARKER = 10.
T1MARKER = 22.905                    (Pg)      T2MARKER = 50.
T3MARKER = 66.414                    (Sg)
SAC> write seismo-picks.z
SAC>
```

For regional events the first arrival are Pn or Pg, so by the convention used here used here that there is no "P" arrival. We see that the already defined A is at Pn. The file written to seismo-picks.z will have T0 through T3 in the header, and a call to [PLOT1](#) will show labeled vertical lines at the calculated times.

For historical reason, the units for EVDP were meters, and SAC waveforms produced by RDSEED have EVDP in meters. In v101.5, the default for EVDP is kilometers, but as many waveforms have EVDP in meters, we introduced the command option DEPTH-M which if set to ON means the input EVDP for all files in memory have EVDP in meters. In the next example, the SAC files had been extracted from a SEED volume using RDSEED, so EVDEP is in meters:

```
SAC> r 2008.052.14.16.03.0000.XC.OR075.00.LHZ.M.SAC
SAC> lh evdp
evdp = 6.700000e+03
SAC> ch evdp (0.001 * &1, evdp&)
SAC> sss
```

```
Signal Stacking Subprocess.  
SAC/SSS> traveltime depth-m  
traveltime: depth: 6.700000 km  
SAC/SSS> qs  
SAC> lh t0marker t1marker t2marker t3marker  
t0marker = 61.48          (Pn)          t1marker = 76.413  
t2marker = 109.66       (Sn)          t3marker = 132.11  
SAC> ch evdp (0.001 * &1, evdp&)  
SAC> setbb station &1, KSTNM&  
SAC> write %station%.z  
SAC>
```

Note that even though verbose was not turned on, the depth in km used is printed out. This is a safeguard to assure that one has made the correct assumption about the EVDP units. The saved file, OR075.z, will have evdp in kilometers and annotated picks at the times for Pn, Pg, Sn, and Sg. (One could have done the chnhdr command before going into SSS and then not turned depth-m on.)

Note that phase names are case sensitive.

See Commands

[PLOTRECORDSECTION](#)

LATEST REVISION

July, 2011 (Version 101.5)

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