

PQLX Travel-Time Tables

Introduction

PQLX provides the possibility to import various travel-time tables to be used as part of the Seismic Event functionality available within the STN Viewer. Specifically, this provides the ability to plot predicted arrival times for many phases vs. a selected event and stations of data on display.

The current travel-times tables delivered with PQLX are **iasp91** and **ak135**. (Please see Buland and Kennett for details.)

The overall process involves a series of steps, detailed below, and may be generally described as:

1. Compile the source code responsible for generating the travel-time tables.
2. Generate the travel-time table(s) using the program compiled in step 1.
3. Using PQLX program **importTT**, import to PQLX the tables generated in step 2.

Step 1: Compilation

Compiling the '**ttimes**' program to generate the tables is relatively straight-forward:

1. **ttimes** source code must be compiled on the PQLX server machine
2. When executing **env/makeAll** to compile the system, additionally include the parameter **withTTimes** on the command line to force compilation of the **ttimes** program:

```
bash> env/makeAll withTTimes
```

N.B. This requires a Fortran compiler in order to succeed. The Fortran compiler used defaults to **g77**. If a different Fortran compiler is desired or needed, **gfortran** for example, it may be specified by setting the environment variable **FCMP** which will override the default setting:

```
bash> export FCMP=gfortran
```

Step 2: Generate the Travel-Time Tables

Once the system has been compiled, the travel-time tables need to be generated for importation, according to the following:

1. Execute the shell script **\$PQLXBIN/pqlxTTtable.sh**. This script will query the user for which table should be generated, **iasp91** or **ak135**. If both tables are desired for import, execute a second time to generate both.
2. Output is written to directory **\$PQLXPROD/XMLINPUT**.

N.B. - the tables generated are approximately 600Mb in size for each, please make sure enough disk space is available beforehand.

Step 3.0: Prepare Tables and Phases for Import

Once the tables have been generated, the program **importTT** is used to import the tables into PQLX itself. Usage details:

```
importTT [OPTION...] - Execute importTT

Help Options:
  -?, --help          Show help options

Execution Options:
  --modelName          Travel-Time Model Name - required
  --extractPhases     Extract Phases List - optional
```

Step 3.1: Define the Specific Phases for Import

If all phases defined in the travel-time tables generated in step 2 are needed for import, step 3.1 may be skipped; please proceed to step 3.2.

If, however, only a sub-set of all defined phases are desired to be imported, specifying the **--extractPhases** argument will *only* generate a file containing **all** phase names existing in the specified travel-time table; that is, all phase names which are available for import. The output file will be named **modelName.phases** and located in directory **\$PQLXPROD/XMLINPUT**.

For example, to generate the file of phases existing for travel-time table **ak135**:

```
bash> importTT --modelName=ak135 --extractPhases
```

To specify which phases to import, then, create a file named **modelName.head** containing the phases to import, one phase name per line, and place into directory **\$PQLXPROD/XMLINPUT**. (And a simpler way: copy the **modelName.phases** file to **modelName.head**; edit the **modelName.head** file and delete the phases not to be imported.)

Step 3.2: Import the Travel-Time Tables

To import the travel-time tables and (optionally) specific phases into PQLX, execute **importTT**, not specifying the **--extractPhases** option.

For example, to import travel-time table **ak135**:

```
bash> importTT --modelName=ak135
```

If file **\$PQLXPROD/XMLINPUT/modelName.head** exists, it will be read and its contents used to define which phases will ultimately be imported.

N.B. Once tables have been imported into PQLX, tables saved to **\$PQLXPROD/XMLINPUT** in step 2 may be deleted, as these files can be quite large.

Travel-Time Tables Details

Tables created by step 1 are generated to produce travel-times for all phases across all combinations of event depth and receiver distance, defined as:

- Source Locations: Intervals of 5 Kilometers
- Source Depth: Zero to 650 Kilometers
- Receiver Distance: Zero to 180 degrees

Predicted arrivals are interpolated between the Source location and Receiver location using the travel-time table values imported to the database.

Import of Additional Travel-Time Tables

It is also possible to upload any other specific travel-time table of interest to the user, for example, a local velocity model. Simply follow the format of the files generated by **times** (for example, the **ak135** table is named **\$PQLXPROD/XMLINPUT/ak135.tt**), name it appropriately (using your travel-time name) and upload with **importTT** as described above specifying this new model name.

PQLX Usage

When importing Seismic Event information as part of the server's normal execution (see document PQLX-7_XML_input.pdf for details), the client is now ready to plot predicted arrivals based on a selected Event, a selected travel-time table, and selected phases to plot.