Appendix D

Picks Quality

This algorithm automatically assigns a quality value (weight) to a P-wave previously picked, as it is described in Chapter 3 and in Antunes et al., 2020 (in the Appendix section). The code is developed in a form of a function that can be imported into a python shell, using the different input parameters described below. This code was developed to be used with SEISAN software. The code takes the "s-files" with the picking information and the respective waveforms to assign a weight value to each pick based on the SNR and uncertainty interval. It finally writes the weight value of each pick in the respective "s-file". The code outputs Fig. D.1, with statistical information about the full dataset analysed and extra information about each station analysed (number and quality of the picks).

Source code:

https://github.com/veronica-antunes/PHD_GGB/blob/master/Picks_Quality.py

Function:

assign_weight(tw_noise, tw_signal, rea_db, wav_db, plot_uncertainty = False, plot_fullwaveform = False, exclude_events = False, n_pick = 6, tw_interval = 0.7)

Parameters:

tw_noise: time window before the manual pick, representing the noise (in seconds);

tw_signal: time window after the manual pick, representing the signal (in seconds)

rea_db: SEISAN path for the s-files in the database (e.g., ".../SEISAN/REA/-DATABASE");

wav_db: SEISAN path for the waveforms in the database (e.g., ".../SEISAN/WAV/-DATABASE");

plot_uncertainty (optional): True/False. If true, plots the picks as it is exemplified in Fig.D.2 in a folder named "/figures/uncertainty". Default is False;

plot_fullwaveform (optional): True/False. If true, plots the picks as it is exemplified in Fig.D.2 in a folder named "/figures/weight". Default is False;

exclude_events (optional): True/False. Moves the s-file of an event with low number of picks (n_pick) from the database to the folder "/figures/excluded_events". Necessary if we intend to keep in the database, only events with a certain number of high quality of P picks. Default False.

n_pick (optional): Number of P-phases to be considered to remove the events when the option exclude_events is set True. All events below that number will be moved. Default 6.

tw_interval (optional): Time interval of tolerance around the manual pick to be considered as noise (in seconds). It excludes the part of the trace immediately surrounding to the pick, to consider cases where the pick was performed too late or when the signal and the noise might be mixed. Default is 0.7s.

Necessary Packages:

- Obspy;
- Matplotlib;
- Numpy;
- Math;
- Glob;
- Scipy.

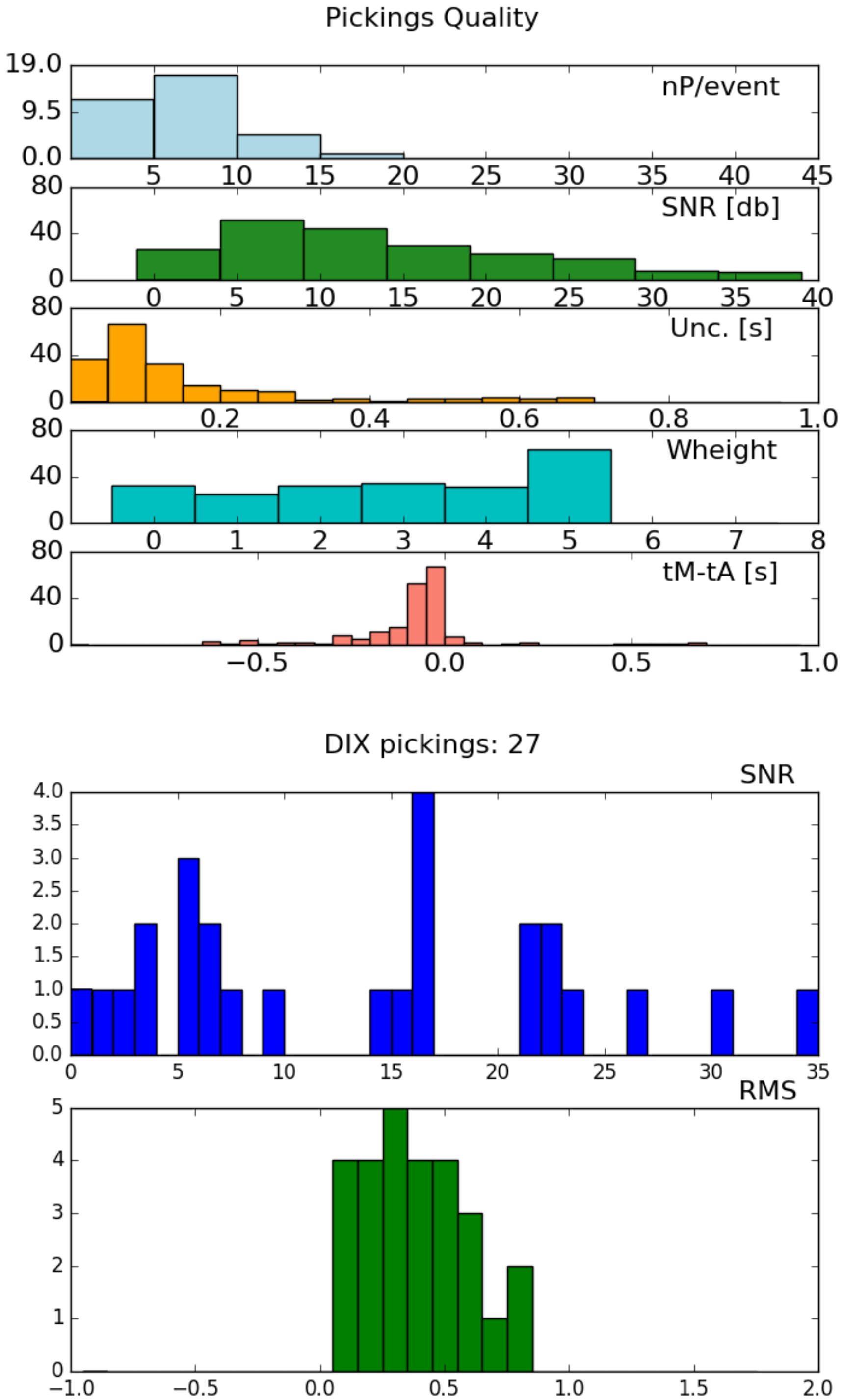
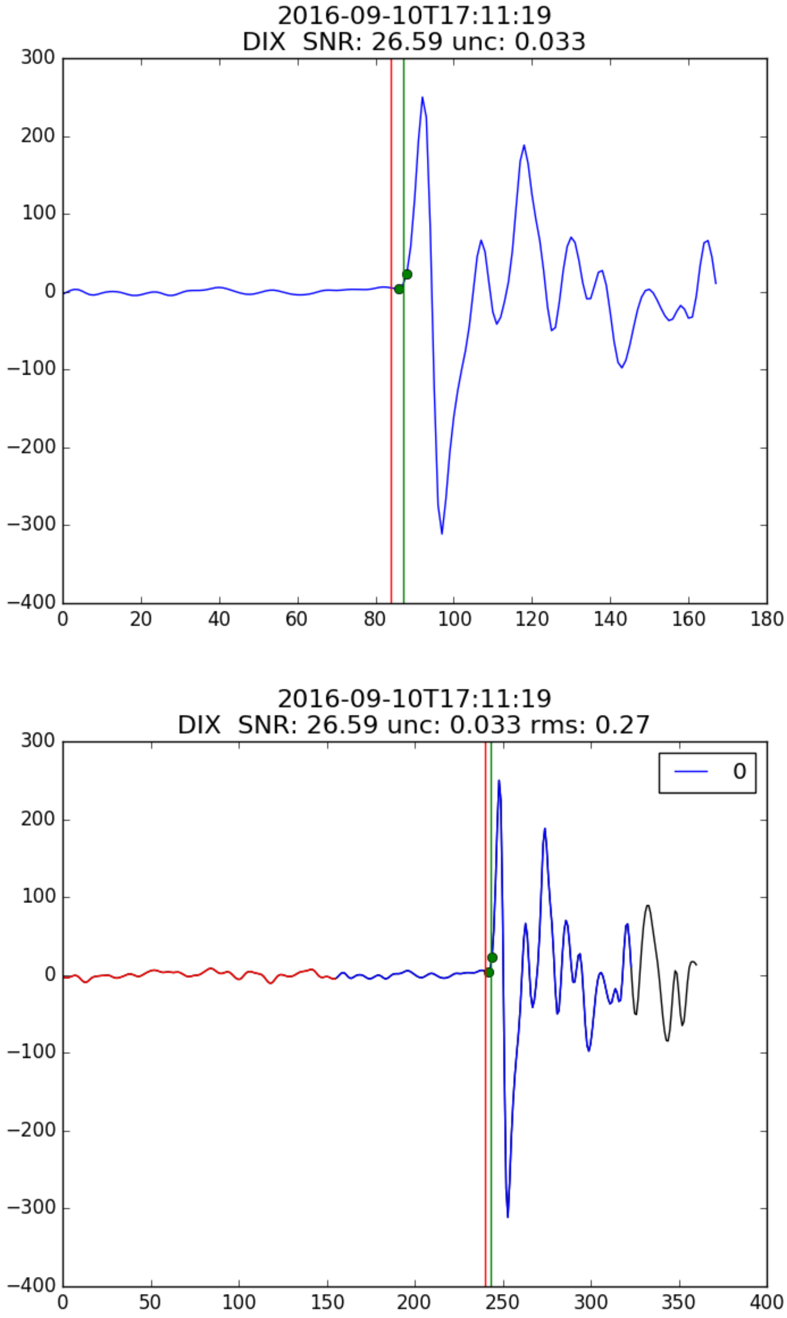


Figure D.1 – Output figures example. Upper plot: statistics for the full dataset. Bottom plot: information for station DIX (number of picks, SNR [db] and RMS [s]).



2016-09-10T17:11:19
DIX SNR: 26.59 unc: 0.033

2016-09-10T17:11:19
DIX SNR: 26.59 unc: 0.033 rms: 0.27

Figure D.2 – Output figure example if plot_uncertainty and plot_fullwaveform are set True (x axis the number of points and the y axis the amplitude in counts). Red vertical plot is the manual pick; green dots the points that define the earlier and later times to pick; green vertical line the middle point between the two dots. The uncertainty is the greater interval between these four parameters. Upper plot: interval considered for analysis of the uncertainty (where the signal and the noise might be mixed). Bottom plot: full waveform with uncertainty intervals. The blue part represents the time interval shown in the Upper plot. It has extra information about the weighting process: station, SNR, uncertainty interval and RMS value for that pick.