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Automatic derivation of phase-onset time uncertainties

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Measurement of phase onset times is a necessity for various types of further seismological analysis such as location determination or seismic tomography. Nowadays, non-linear approaches such as NonLinLoc (see Lomax et al. 2009) offer probabilistic assessment of location uncertainties. Most phase picking tools provide error estimation using discrete, symmetric time errors, which correspond to quality classes. Pick uncertainties determined in this manner very much depend on the analyst's experience and thus are subjective. Proposals have been made to not only determine the pick itself but estimate also the boundaries within which the phase onset is present to a predefined probability. Hence, the analyst has to pick three times which means at least three times the effort of conventional picking. Diehl et al. (2012) proposed rules for consistent phase picking which consider the properties of the waveform like dominant period of the signal and the signal to noise ratio to define the earliest and the latest possible onset times, respectively. We developed a phase picking tool called PyLoT (Python picking and Location Tool) which automatically derives an objective uncertainty of the onset time measurement performed either by an analyst or an implemented automatic phase picker. Thus, the amount of work for a consistent processing of seismic data, that is gaining asymmetric and continuous onset uncertainties along with the phase onset, does not exceed that of conventional tools.