Estimation of the MT using the first inputs of the P wave

The calculation of the moment of the seismic tensor by the method of the first inputs of the P wave is a copy of the hybridmt-v1.2.2 algorithm. MT calculates based on the displacement of the vertical components of the first inputs of wave P. At the same time, it calculates solutions: full, trace null and double couple. MT counts only from the vertical components of the signal.

P-wave first entry counting is selected by the meaning of the Old method option (3 - Fig. 26). Then, in the seismogram window (5 - Fig. 26), pairs of vertical velocity and displacement seismograms are displayed for stations with marked P or Pg waves on the Z component and with the exit and ascent angles calculated for these waves. Checking Apply Incid. (4 - Fig. 26) Causes displacements on the vertical component to be divided by the cosine of the ascent angle when calculating the displacement tensor. With surface stations and an inaccurate velocity model, often giving values of ascent angles close to 90°, this can greatly overestimate displacement values.

For the seismogram of each station, determine the displacement amplitude of the first wave P by indicating the beginning and end of the wave, i.e. the point on the velocity seismogram where it starts and the point where it crosses the zero value, which means the maximum displacement, as in (Fig. 27). The beginning and the end of the wave are marked with blue lines on the seismogram. The beginning marked with a dashed line is assumed by default as the time of the P wave. It can be changed by right-clicking on the velocity seismogram with the Ctrl key pressed. The end of the wave marked with a solid line is determined by right-clicking on the velocity seismogram. The end of the wave should coincide with the intersection of the zero axis of the velocity signal and the maximum of the displacement signal. Sometimes a drift or an offset may be superimposed on the signal, then by clicking the Shift key must be pressed, which causes the offset to be removed during the integration, or the Shift and Alt keys, which causes the offset and the drift to be removed (Fig. 28). Then a blue line appears on the graph, defining the area of integration. The velocity signal is integrated using the trapezoidal method and the integration result is marked on the displacement seismogram in the form of two blue horizontal lines. There may be slight differences between these lines and the seismogram, due to the sampling of the signal and the fact that the marked end and beginning of the wave may be between the signal samples. Larger differences require correcting the start or end of the wave.

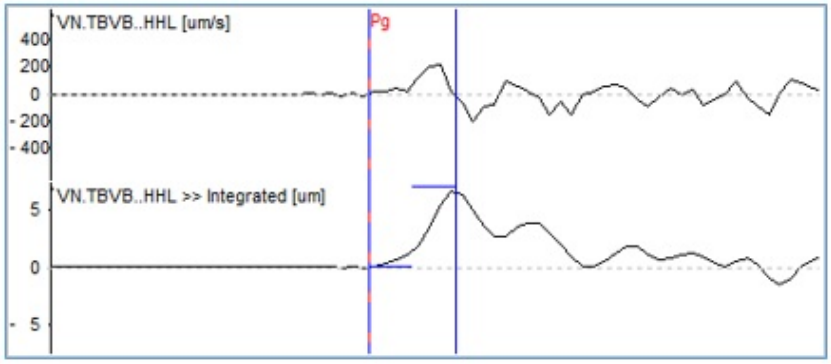

Fig. 27. Determination of the maximum displacement

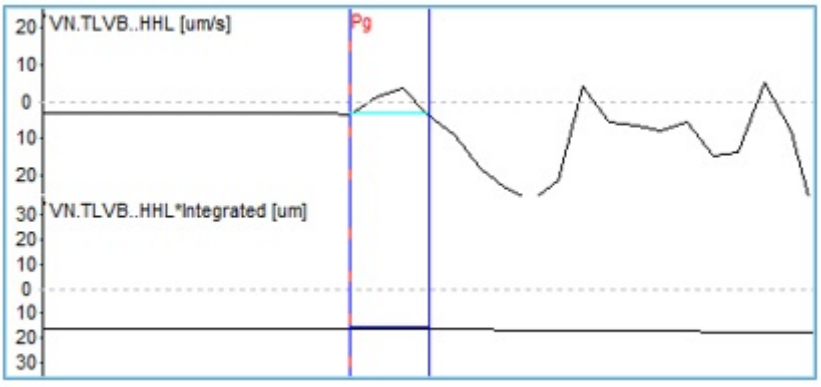

Fig. 28 Determination of the maximum displacement of the wave taking into account the signal offset

After selecting the waves and pressing **Computing**, three seismic moment tensors are calculated and their result is displayed in the form of "beach balls" in position (6 - Fig. 26). Pressing **Ok** accepts the result.

At least 6 P waves are required for MT calculations. This limit has been reduced compared to the hybridmt-v1.2.2 limit, where 8 P waves are required, however, at least 8 waves for full solution MT and 7 waves for trace null are recommended solution. Otherwise, the quality of the result is poor. In such a situation, after pressing **Ok**, a message appears (Fig. 29) and the analyst has the opportunity to make a decision. Double couple MT is always added to the development.

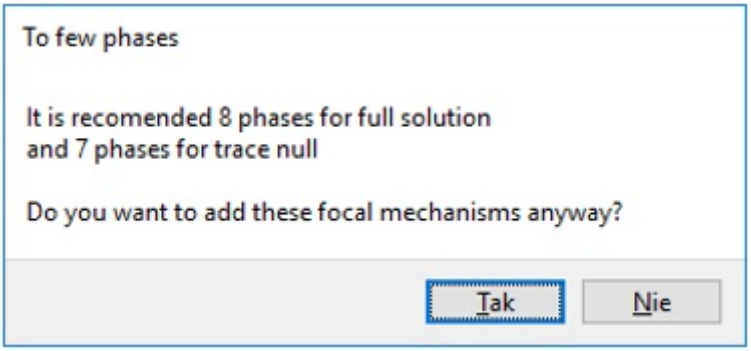

Fig. 29 Message about the recommendation of the number of phases for MT calculation