应用地球物理学

强随机噪声条件下时窗类型局部线性化对TFPF技术的影响

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摘要　为了更广泛地应用时频峰值滤波方法消减地震勘探记录中强随机噪声，本文比较详细地探讨了该方法在应用时需要处理的时窗选取、一个时窗内局部线性化等主要基础技术问题.经过时变时窗的仿真计算，运用多项指标比较，包括整体背景强弱、振幅谱、信噪比、均方误差、有效子波波峰波谷幅值、畸变程度，综合评价出 (L_0+L_x) 时窗滤波的效果较理想.对于三角波这类简单类型的周期波，其时频峰值滤波效果与边线段平均曲率变化、时窗长度等条件有关，即三角波边线段平均曲率越大，滤波结果的均方误差越大；另外，边线段平均曲率增大时，选取的时窗长度有变小的趋势.总之，在地震勘探中应用时频峰值滤波方法消减强随机噪声时，一方面要合理地选取时窗参数，另一方面时窗参数又不能变化过大，以避免对有效子波波形产生畸变影响.

关键词　时频峰值滤波　自适应时窗　局部线性化　地震勘探　强随机噪声

分类号　P631

The influence of limited linearization of time window on TFPT under the strong noise background

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Abstract Time-frequency peak filtering (TFPF) method is a staple technique for eliminating strong random noise in seismic exploration data. For applying these techniques extensively, this paper discussed the details of application of this method, such as choice of the length of time window, local linearization in one time window, etc. For the results of the simulation of time-varying time window TFPF, we compare many values, including the strength of global background, the amplitude of spectrum, signal-to-noise ratio, mean square error, the amplitude of peak/valley of valid wavelet, and the degree of the aberrance of wavelets, and then conclude synthetically that time-windowing filtering (L_0+L_x) will get rather ideal effect. In the case of triangle waves, the filtering effect of TFPF is related to the average curvature of side line, the length of time window, etc. The bigger the average curvature of side line is, the bigger the mean square error is; moreover, increasing the average curvature of side line will cause a trend of decreasing in the chosen length of time window. In conclusion, applying TFPF method for eliminating random noise in seismic exploration, suitable parameter of time window should be chosen, on the other hand, the parameter of time window should not vary too much, so the waveform of valid wavelet is not distorted.

Key words Time-frequency peak filtering; Adaptive length of the time window; Local linearization; Seismic exploration; Strong random noise

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