Source time functions and interference from blast arrays

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We present a method to predict realistic source time functions for mine blasts that we developed for one of Europe's largest iron ore mines, Mt Erzberg, Austria, where we repeatedly monitored production blasts with a large array of seismic sensors. That allows us to simulate not only resonance modes, but also waveforms. We verify our predictions with observations from 39 electronically ignited blast sequences. Our target function to optimize the model is the normalized crosscorrelation coeffcient of observed and synthetic waveforms. It varies widely, often from 0.1–0.8, for the same blast array, suggesting that ground motion is far more predictable at some sensor locations than at others. The dense array and an almost full azimuthal coverage also allow us to verify the predicted Doppler shift that arises from the small spatial delays between the blast holes. The good match of our predictions suggests that our model could be used for more advanced predictions of the peak ground velocity, which is essential to designing charge weight distributions in modern mining operations.