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Waveform cross correlation at the International Data Centre: comparison with Reviewed Event Bulletin and regional catalogues

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Waveform cross correlation substantially improves detection, phase association, and event building procedures at the International Data Centre (IDC) of the Comprehensive Nuclear-Test-Ban Treaty Organization. There were 50% to 100% events extra to the official Reviewed Event Bulletin (REB) were found in the aftershock sequences of small, middle size, and very big earthquakes. Several per cent of the events reported in the REB were not found with cross correlation even when all aftershocks were used as master events. These REB events are scrutinized in interactive analysis in order to reveal the reason of the cross correlation failure. As a corroborative method, we use detailed regional catalogues, which often include aftershocks with magnitudes between 2.0 and 3.0. Since the resolution of regional networks is by at least one unit of magnitude higher, the REB events missed from the relevant regional catalogues are considered as bogus. We compare events by origin time and location because the regional networks and the International Monitoring System are based on different sets of seismic stations and phase comparison is not possible. Three intracontinental sequences have been studied: after the March 20, 2008 earthquake in China (mb(IDC)=5.4), the May 20, 2012 event in Italy (mb(IDC)=5.3), and one earthquake (mb(IDC)=5.6) in Virginia, USA (August 23, 2011). Overall, most of the events not found by cross correlation are missing from the relevant regional catalogues. At the same time, these catalogues confirm most of additional REB events found only by cross correlation. This observation supports all previous findings of the improved quality of events built by cross correlation.