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Analysis of the IDC Reviewed Event Bulletin for Detection Capability Estimation of the IMS Primary and Auxiliary Seismic Stations

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We have investigated the IDC Reviewed Event Bulletin (REB) for the time period 1 January 2000 to 30 November 2008 to quantify the event detection capability of individual seismic stations of the International Monitoring System (IMS). For a specific target area, we can obtain estimates of the detection threshold of a given station by considering the ensemble of REB reported events in the area, and simply downscaling each event magnitude with the observed SNR at the station. However, there are some problem areas associated with this procedure such as:

- Possible biases in the REB magnitudes caused by non-detections
- Skewness in the distribution of threshold estimates, also caused by non-detections
- The validity of using the signal-to-noise ratio for downscaling the event magnitude

We address these issues by dividing the events into a binned global grid system and introduce a data censoring procedure to reduce these effects. A major result of this study is a quantification and ranking of the IMS primary and auxiliary seismic stations based on their capability to detect events within regional, teleseismic and core phase distance ranges. For each station, source regions with noticeable signal amplitude focusing effects (bright spots) and defocusing effects are conveniently identified and quantified. Future work will focus on applying maximum-likelihood magnitude estimation techniques in order to validate and possibly improve the censoring procedure.