



## **Assessment of the impact of interactive analysis on improvement of the automatic SEL3 product**

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The assessment of the impact of interactive analysis towards improving the results of the third automatic Standard Event List (SEL3) for recent years was performed by comparing this bulletin with the LEB bulletin. The LEB bulletin is the result of interactive analysis conducted at the International Data Centre (IDC) starting from the SEL3, of which the Reviewed Event Bulletin (REB) provided to States Parties is a subset fulfilling specific event definition criteria. For the year 2005 a total of 46483 and 30019 events from SEL3 and LEB, respectively were considered for comparison. The comparison task was accomplished by identifying matching events in SEL3 and LEB that have a common Event Identification number (EVID). Events whose EVIDs could not be found in one of the bulletins are considered as unmatched events in the other bulletin.

Accordingly, a total of 25991 (corresponding to 55.9% of SEL3 and 85.6% of LEB events), 20492 (44.1% of SEL3 events) and 4028 (13.4% of LEB events) were identified as matched, unmatched SEL3 and unmatched LEB events, respectively. Among the matched events 62.9% have location difference of less than  $1^\circ$  (47.6% even less than  $0.5^\circ$ ) while about 11% have location differences greater than or equal to  $5.0^\circ$ . Location differences in excess of  $100^\circ$  were observed during the comparison process. Another observation was that a few events with four common defining phases used for the corresponding SEL3 and LEB events were shifted during the analysis by  $20^\circ$  and more. The majority of the matched events have intersecting error ellipses indicating that these events share common solutions.

Improvement during interactive analysis was further assessed by considering different classes of error ellipse area for matched events. The number of events from the LEB

with less than or equal to 5,000 km<sup>2</sup> in ellipse area is considerably greater (>65%) than the corresponding number for the SEL3 events (<40%). In more quantitative terms this improvement is furthermore manifested in the 50<sup>th</sup> and 90<sup>th</sup> percentiles of the error ellipse distributions. In a small number of cases (~12%) the interactive analysis on SEL3 events resulted in an increase of the corresponding LEB error ellipse area.

During interactive analysis nearly half of the SEL3 events are discarded, as they were built by using invalid detections and phases belonging to other events. On the other side, a significant number of (unmatched) LEB events are found during interactive analysis, with the majority thereof eventually included in the REB. Investigation of the few large LEB only events showed that they could have been built by using legitimate automatic picks detected within 90 seconds from the phases associated to an earlier event from the same region.

This comparison between the automatic SEL3 and the LEB bulletins shows significant improvements resulting from interactive analysis in terms of accuracy and also with respect to completeness. Besides highlighting the value added during the interactive analysis, the limitations to be expected from automatic IDC products are also recognized.