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Segmentation of Makran Subduction Zone and its consequences on tsunami hazard estimations

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In a plate tectonic setting like that of the Makran Accretionary Complex of Oman Sea, a fairly high earthquake activity would be expected, as in many of the other major Accretionary complexes/subduction zones around the world. But this region which is located between the Zendan-Minab Fault System and Oranch Fault Zone shows relatively low seismicity in comparison with the surrounding region.

Better documented tsunami events in the Makran subduction zones are 3, including two events of seismic origin, and one of unknown origin. The latest event is the major earthquake generated tsunami of 1945 in eastern Makran that ruptured approximately one-fifth the length of the subduction zone. It is important to note that, the epicenter of this event is also close to the Sonne Fault which has created segments on the Makran Subduction Zone. The crossing points between Makran Subduction Zone and these oblique fault zones can be a location for occurrence of major earthquake activities. However, more studies are required for further clarification.

In contrast to the east, the plate boundary in western Makran has no clear record of historically as well as instrumental great events. The large changes in seismicity between eastern and western Makran suggest segmentation of the subduction zone. This is being supported by Kukowski et al., (2000) where they introduce a new boundary coinciding very well with the Sonne strike-slip fault. As mentioned the western part is characterized by the absence of events. East of the Sonne fault and west of long 64°E is the only region with a clustering of events within the submarine and southernmost onshore part of the Accretionary Wedge, also including the Mw 8.1 event of 1945 (Byrne et al., 1992). Most events in the wedge appear to be pure-thrust earthquakes and are interpreted as plate boundary events (Quittmeyer and Kafka, 1984; Byrne et al., 1992). The earthquake of August 12, 1963, a few tens of kilometers east of the Sonne fault, had a large strike-slip component and its depth was estimated to be only 5 km (Quittmeyer and Kafka, 1984). Taking into account the uncertainties of focal estimation, it is being speculated that this event may have occurred in connection with motion along the Sonne fault (Kukowski et al. 2000)and are not associated with the subduction. The absence of subduction events in western Makran indicates either that entirely aseismic subduction occurs or that the plate boundary is currently locked and experiences great earthquakes with long repeat times. Evidence is presently inconclusive concerning which of these two hypotheses can be correct.

In this presentation after discussing the Makran Subduction Zone segmentation using geophysical data, its effect on tsunami hazard estimation will be presented.