

considerable distance. The shock caused no damage at Jiwani or further west along the coast at Chahbahar, where the ruins of the old fort located about two kilometres from Tiz, to the north, and constructed or at least renewed in the early 1870s, were not affected by the shock; nor was its stone masonry ten-metre high tower affected. As a matter of fact, along the Makran coast west of Jiwani and east of Sonmiani, the earthquake was not felt very strongly and it was not perceptible beyond Karachi and Dadu. The earthquake was also felt as a slight shock at Muscat. In contrast, to the northeast of Pasni it was felt as far as Montgomery and Dera Ismail Khan in the Punjab, more than 1000 kilometres away. Damage was reported from Panjgur, Bela and from the Barkhan Tehsil of the Loralai Agency, where casualties were also reported.³⁷² There is no evidence that the shock caused undue concern in Persian territory.³⁷³

The total number of people killed in this earthquake does not seem to have exceeded 300. This figure includes those drowned by the seismic sea-wave (*tsunami*) that accompanied the event and which added significantly to the overall damage caused by the main shock. At least three waves followed the earthquake, of which the first (noticed shortly after the shock) did not come very far inland. The other two followed 90 to 120 minutes later, around 5.00 a.m., and swept over the one-storey houses at Pasni and Ormara, causing great damage and reaching heights of five to ten metres on shore. At Jiwani the waves sank a *dhow* and at Gwadur drowned three people. Elsewhere on the Makran coast they destroyed sailing vessels, littered the land with debris and silted up streams. At Karachi, 360 kilometres away, the waves had a height on land of about 1.5 metres, but they persisted for such a long time that they caused damage to the harbour works and loss of life around Ketī Bandar on the coast of the Indus delta. There, during the recession of the waves and the rapid draw-down of the water that followed during the strong ebbing of the sea, low-lying hills collapsed and spread out, totally destroying a number of fishing villages between Dubbo and Jadiwari, causing many casualties. In the region of Bombay, more than 1100 kilometres away from Pasni, waves reached heights of up to two metres, causing some loss of life. At Karwar, about 1500 kilometres away, waves flooded creeks and inlets. At Muscat the shock was followed by a very high tide and at Mahe in the Seychelles, 3400 kilometres away, wave heights reached about thirty centimetres. There is no information about the effects of the waves in the Persian Gulf,³⁷⁴ but in the Arabian Sea at least one *dhow* on its way from Muscat to Karachi was sunk with casualties.³⁷⁵

Following the earthquake, four large mud volcanoes rose near the shore eight to thirty metres above water, seven to thirteen metres deep and emitting gas, but they were soon eroded by the sea.³⁷⁶ Also inland, the mud volcanoes near Hinglaj were re-activated

and a large volume of gas ignited, causing an eruption the glow of which could be seen from a great distance. Mud volcanoes along the Makran, both inland and offshore, do occur under normal conditions and they should not be considered as evidence of the severity of the shock.³⁷⁷

The earthquake damaged the trans-oceanic cable between India and Great Britain, which broke in eight places off the Makran coast, presumably due to submarine landslides triggered by the shock.³⁷⁸ The land lines between Pasni and Karachi also broke down.

There were substantial ground failures at Pasni and Ormara. About five kilometres to the north of the latter, the ground slumped, forming tensile fractures sixty centimetres wide running in an east–west direction with the south side downthrown by more than 1.5 metres. Though there are previous reports (Sondhi 1947) of uplift at Pasni, tectonic changes in elevation were established only in the Ormara area, where the land rose about two metres. Older raised beaches and marine terraces were observed along the whole Makran coast, from Karachi to Jask, and radiocarbon and uranium–thorium dates on shells from these beaches indicate the beaches were elevated during the last 10 000 years, attesting to numerous past earthquakes comparable to the 1945 event.

Aftershocks continued for some time. On 2 January 1946 Pasni was again damaged, and on 5 August 1947 another shock in the evening ruined many houses at Pasni. In the Kulanch the ground slumped, ejecting water from cracks. Rockfalls were noticed from the mountains and landslides occurred along the coast to the west of Pasni. The shock was widely felt.

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September 23 **Dustabad**. In the morning a destructive earthquake in the sparsely populated region of Daulatabad, southeast of Firdaus (Tun), demolished a number of villages killing about 400 people. Dustabad was totally destroyed and 170 people were killed. Half of Muhammadabad, rebuilt after the earthquake of 1941, collapsed and heavy damage with casualties extended to the *dihistans* of Sarayan, Charmeh and Badamuk. To the west and southwest of Daulatabad and for tens of kilometres, the area was in 1947 totally uninhabited, while to the south there is nothing more than the clay flats of Daqq-i Muhammadabad and the Shikasteh-yi Muhammadabad. The only man-made structures there (a few rubble-stone houses and *ab-anbars*) were levelled with the ground (figure 3.48).

The earthquake was associated with a complex system of faulting. Ground fractures reported by local people, their trace still visible in a number of localities, can be followed for about twenty kilometres in a N-350°-E direction, from west of Kuh-i Qirmiz, cutting across the west slope of Kuh-i Chargaqsh and extending to the north as far as the east flank of Chang-i Kulagh. Beyond this point the trace is no longer visible on the ground, but according to local information it extended

across the pediment between Dustabad and the settlement of Istakhr. From Kuh-i Qirmiz to Kuh-i Chargaqsh the zone of fractures is in late Eocene volcanics (plates 17 and 18). In places it consists of *en echelon* cracks, some of them open and eroded into sinkholes (plate 19) bearing N-25°-E, and elsewhere of crushed zones with the west side downthrown by thirty to eighty centimetres. Two exposures in gullies suggest right-lateral movement of at least one metre.

In the plain, between Dustabad and Sarayan and also between Tighab and Tighdar, the ground slumped and *qanats* were blocked. A series of scarps between Badamuk and Gurab striking N-140°-E, mostly in conglomerates, as well as between Turshab and Hauz Qal'eh Kuhneh south of Muhammadabad, were attributed to this earthquake by the local people.

The shock was widely felt, causing panic in Qayin, Bushruiyeh and Birjand, and it was perceptible in Ravar and Mashhad. It was followed by numerous aftershocks that lasted for about six months, causing additional damage, particularly in the region of Charmeh and at Sarayan.³⁷⁹

1948 July 5 Gauk. Late in the afternoon of 14 Tir 1327, a strong earthquake was felt in the province of Kirman. Published details of the damage it caused are lacking, but local information indicates that the few settlements in the sparsely populated *dihistan* of Gauk were ruined. It is alleged that the earthquake originated in the Kuh-i Dau Shah mountains north of Gauk and triggered rock-falls from the mountains to the northeast of Malik and Tirkan. The shock was strongly felt as far as Bam and Kirman (*Ittila'at* 1327, no. 6684). At Sikunj, the shock

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