

Field report for the December 2004 earthquakes in Nador, Morocco.

Patrick Murphy Corella Architect, Calle Piamonte 18, 28004 Madrid, Spain +34 696 22 69 73
alhaquen@tiscali.es

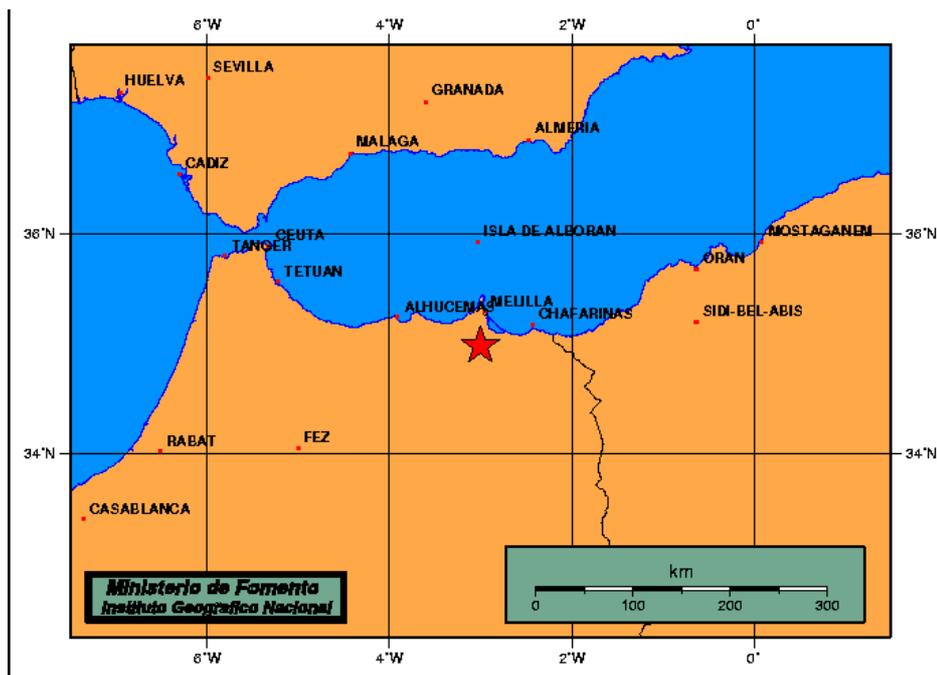
Summary

With a magnitude **4.3** event on 2004/12/02 at 13:53, a vigorous seismic series began in an area about 25kms south of the Moroccan city of Nador, peaking with a handful of events above magnitude 5; **5.3** on 2004/12/02 at 17:50; **5.3** on 2004/12/04 at 10:29; and **5.0** on 2004/12/09 at 07:46, including 12 events above magnitude 4. (*All magnitudes mbLg IGN*).

At the time of the main shocks macroseismic information was only immediately available from the Spanish city of Melilla about 40kms north of the epicentral region where the shocks were reported with EMS 3 and 4. A trip to the macroseismic area on 27th February 2005 confirmed moderately heavy damage to traditional fieldstone masonry structures in the town of Douria, location N 34.97, W 02.90 where families were still camping outdoors three months later and still experiencing continued earthquakes. (**4.3** on 2005/02/18)

An maximum intensity of **EMS 7** was observed in the village of Douria, with widespread damage of grade 3 to vulnerable buildings.

This is an important but largely ignored and understudied event, located about 100kms SE from last year's 6.3 Al-Hoceima earthquake. Its proximity to large population centers however, (*Nador 109,000; Melilla 70,000*) should be noted, being surprising the absence of any seismological analysis for these series.



Damage to traditional structures

1.1 Masonry load bearing wall; loss of outer skin.



Loss of the outer leaf of a wall in Douria. Grade 3 vulnerability A



Loss of the outer leaf of a wall and failure of freestanding stone wall in Douria. Grade 3 vulnerability A

1.2 Shear damage



X shear crack in Douria. Grade 2 vulnerability B



X shear crack in Douria. Note the vulnerability caused by the existing conduit in the wall. Grade 2 vulnerability B



Inside view of crack shown above. Grade 2 vulnerability B



Shear crack in Douria



Shear crack in same room in Douria



Crack shown above seen from another room with a collapsed previously weakened roof. Final diagnosis is grade 3 vulnerability A

1.3 wall failure



Failed unsupported wall in Douria. This is grade 3 vulnerability A



Failed dry stone walling in a homestead NW of Douria

1.4 Corner failure



Failed corner and gable wall. Grade 3 vulnerability A



Failed corner. Grade 3 vulnerability A

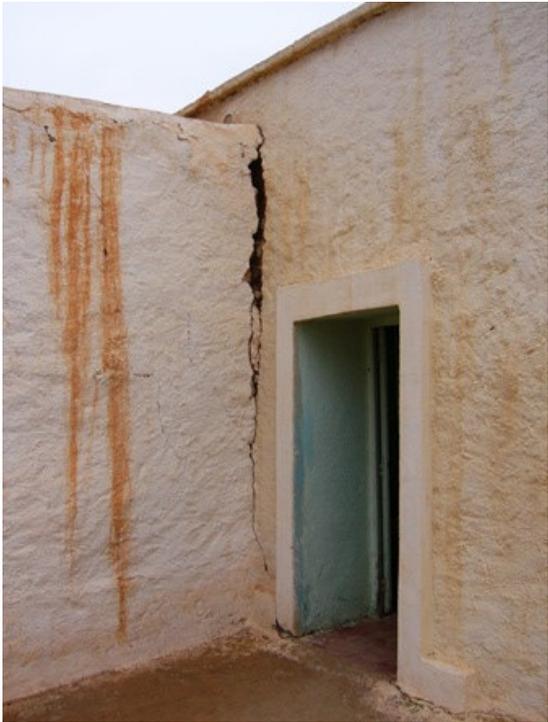


Failed corner and serious damage to roof and walls. Grade 4 vulnerability A

1.5 Loss of connection in bearing walls



Slight loss of connection in bearing walls. Grade 2 vulnerability B



Moderate loss of connection in bearing walls. Grade 3 vulnerability A

1.6 Composite structure



Four views of a damaged composite farm structure with a large concrete beam simply supported on fieldstone bearing walls. Motion of the beam punched the wall out. Grade 3 vulnerability A



2 Damage to engineered structures

2.1 Shear damage to masonry infill panels



Slight shear damage to concrete block infill wall and parapet in this building in Douria. Grade 2 vulnerability C





Very slight shear damage to walls and finishes in Nador Airport. Crack below left is cosmetic pounding damage to one side of an expansion joint. Grade 1 or 2 vulnerability D.

