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Special Report on the January 7, 2007 Earthquake (M=4.8), Norwegian Sea

On January 7, 2007, at 01:50 (UTC/GMT) an earthquake of magnitude 4.8 occurred offshore Møre and Romsdal in the Norwegian Sea. The earthquake was felt along the coastal areas of Møre and Romsdal and offshore oil platforms, as well as Shetland island.

This earthquake is the largest in the area since 1988. There have been four other earthquakes in the same area with magnitudes larger than 4.0 in 1834, 1879, 1880 and 1886. In recent history the largest earthquake in the Norwegian Sea was recorded further north on August 8, 1988 with a magnitude 5.3. In the following the location and the magnitude of the event is given in detail.

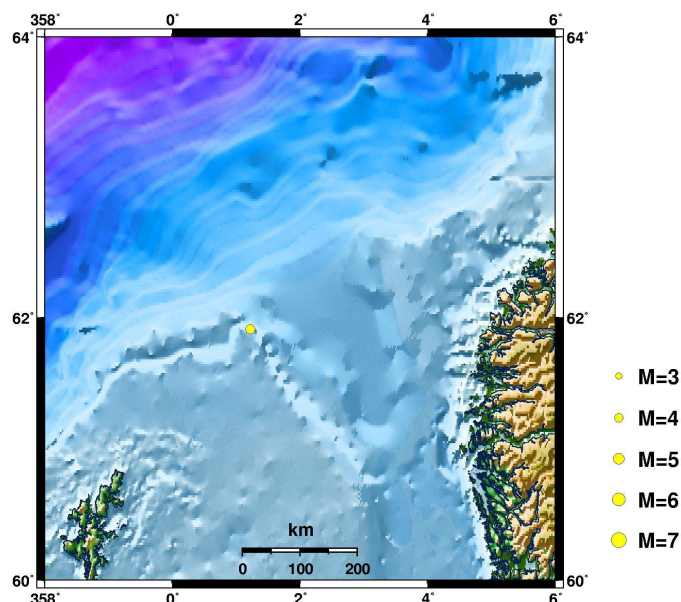


Figure 1: Epicenter location of the earthquake of January 7, 2007 (M=4.8). The map is from www.skjelv.no.

Magnitude estimate

The magnitudes have been reported between 4.1 and 5.0 for various agencies with the lowest magnitudes calculated from the Norwegian National Network and NORSAR (Table 1). For events west of the Viking Graben, the seismic waves are normally damped strongly when recorded in Norway, which explains the low magnitude. Considering that the earthquake was recorded on a distance up to 10 000 km, it obviously cannot be a magnitude 4.1 (M_L). On the British side, the magnitude was calculated to be 4.8 (M_L) (no damping effect), for European stations it was calculated to 4.9 (M_L and M_b) and with the global network (USGS) 5.0 (M_b).

Table 1: The source parameters of the earthquake of January 7, 2007 (F:Fixed depth).

Agency	Date	Time	Latitude°N	Longitude°E	Depth	Magnitude
NNSN (UiB)	07.01.2007	01:50	61.92	01.10	10 (F)	4.8 (M_L)
NORSAR	07.01.2007	01:50	61.86	02.00	-	4.1 (M_L)
BGS (UK)	07.01.2007	01:50	61.94	01.02	10	4.8 (M_L)
EMSC	07.01.2007	01:50	62.03	01.04	2	4.9 (M_b)
USGS	07.01.2007	01:50	61.96	01.15	10	5.0 (M_b)

The event was felt both in Norway and on Shetland. This gives a felt radius of 250 km. Comparing to earlier earthquakes in the region, this indicates a magnitude in the range 4.6 to 4.8. A preliminary estimate of the magnitude is therefore 4.8.

Location

The epicenter is well constrained by local stations on the Norwegian West coast, the Shetlands and Scotland. The current data cannot precisely determine the hypocentral depth which therefore is fixed to 10.0 km. The location is calculated to

Latitude 61.92 °N +/- 0.05

Longitude 1.10 °E +/- 0.10

This location will be refined when a more precise hypocentral depth is determined (from waveform modelling), however it is unlikely to change by more than 10 km.

Felt effects

The nearest stations to the epicentre were Florø and Sulen at distances of around 225 km. The maximum acceleration recorded at these stations was 1 mm/s². The event was felt at several locations on the Norwegian West coast and on Shetland.

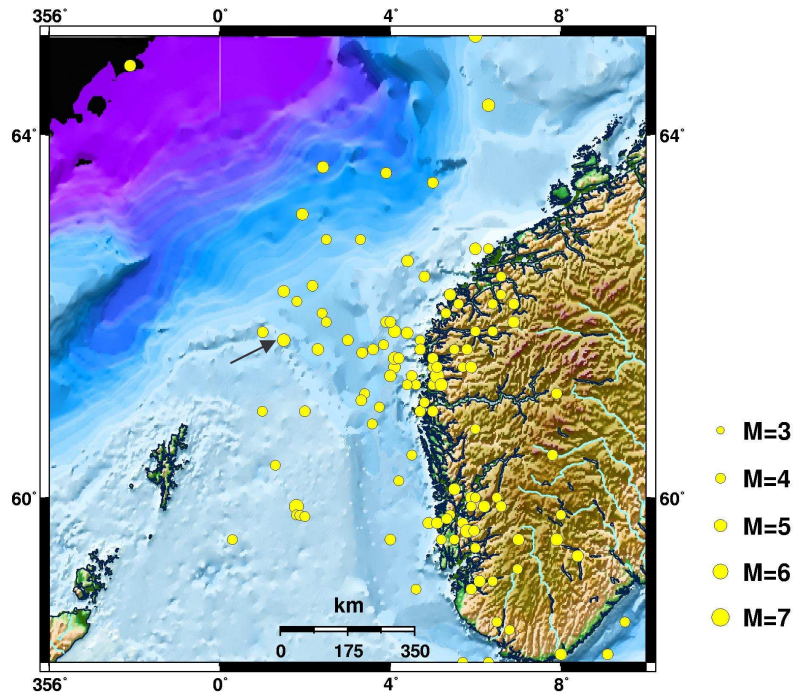


Figure 2: Historical and instrumental earthquake epicenters in Southern Norway, the North Sea and the Norwegian Sea (data from NNSN). All earthquakes shown are $ML \geq 4.0$. The black arrow shows the location of the January 7, 2007 earthquake.

In the following two figures, seismograms from Shetlands (LRW) and Molde (MOL) seismic stations on mainland Norway show the recordings of the E-W component of the ground motion. Please note that the maximum amplitude is significantly larger on Shetlands (LRW) when compared to Molde (MOL) station. This is mainly due to the damping of the Lg-waves across the Viking Graben where the large sediment basins somehow block the wave-propagation.

