

WHAT IS THE MEANING OF ANTALYA BAY EARTQUAKE? (28 DECEMBER 2013)

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Abstract

A scary moderate earthquake happened in Antalya Bay at 28 December 2013 with the magnitude of 6.0. The source and meaning of the earthquake are documented in this short note by compiling tectonic and seismic data.

Keywords: Antalya Bay, earthquake, 28 December 2013

1. Introduction

A scary moderate magnitude earthquake took place in the southern part of Turkey at 28 December 2013, 15:21. According to the focal mechanism solutions of the main shock performed by different seismic stations (Figure 1), the event is pure thrust faulting with 20° average dip amount towards the north.

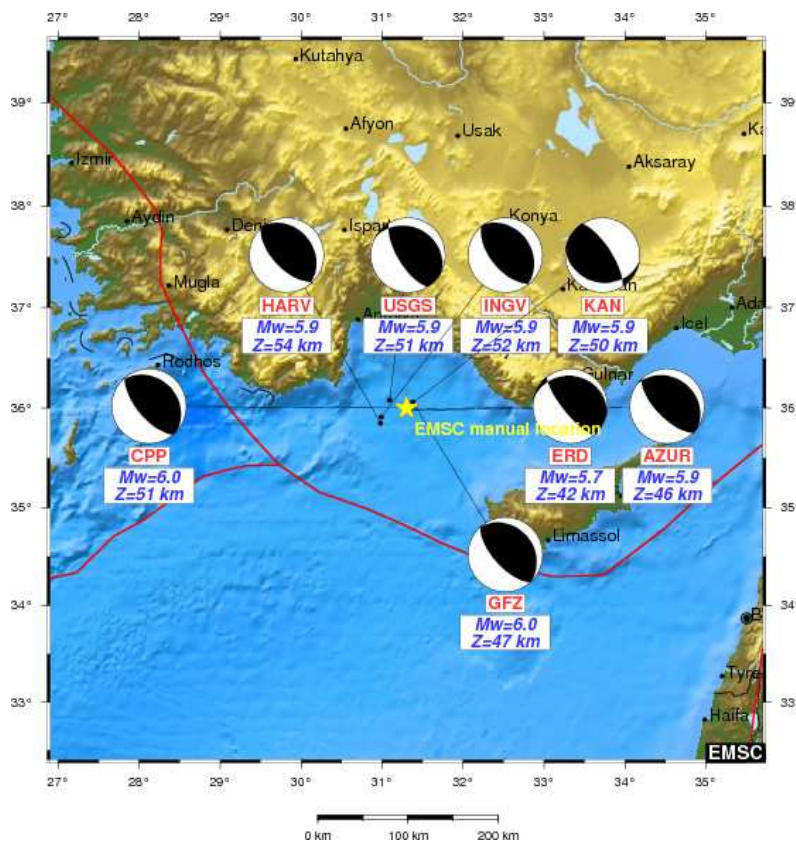


Figure 1: Focal mechanism solutions of the Antalya Bay earthquake reported by different seismic stations (EMSC).

Turkey is located on a mega mountain range which is Alpine-Himalayan belt. Different types of tectonic regimes depending on the movement of plates have been lasting and high seismic activity takes places along this belt [1] and [2]. The recent convergent plate boundary affecting Turkey between African and Anatolian Plates that is located on the southern part of Turkey in the Eastern Mediterranean. This convergent margin is a complex structure and a zone rather than a single line. Two parallel arc on the southern side of Fethiye, Pliny and Strabo Arcs [3] and the eastern most part of the convergent margin is called “Cyprus Arc” and (Figure 2).

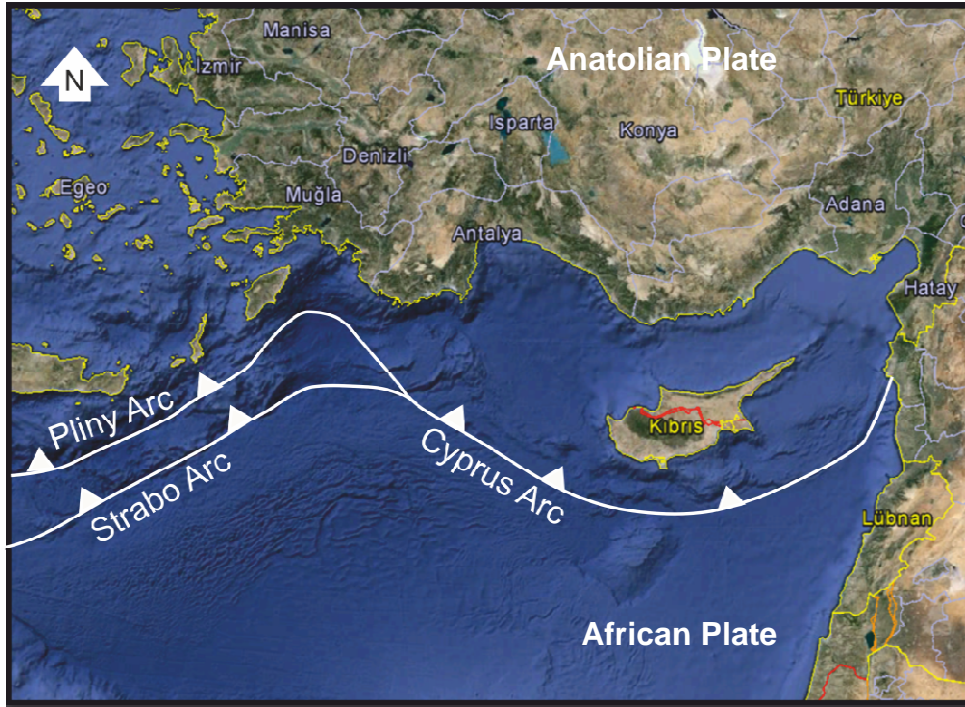


Figure 2: Convergent plate boundary between African and Anatolian Plates along Pliny, Strabo and Cyprus Arcs.

As it is seen in Figure 2, these arcs dipping in northern direction but they have also antithetic and synthetic relatively small structures. This interpretation indicates that African plate moves toward under the Anatolian plate along Pliny-Strabo and Cyprus Arcs. These arcs are shown by a line at that figure, but they have many parallel relatively small faults. The trend of the arc at Antalya Bay is approximately NW-SE in direction.

The occurrence of 28 December Antalya Bay earthquake was not surprise for earthquake engineers. The earthquake activity on Antalya Bay have been divided into two period in this work; 2000-2005 (Figure 3) and 2005-2014 (Figure 4). The epicentral distribution of the event bigger than 3.5 in Figure 3 and Figure 4 indicate scattering and clustering pattern, respectively. Generally, their longest axes are in NW-SE-trending line and it is compatible with the trend of faults in here.

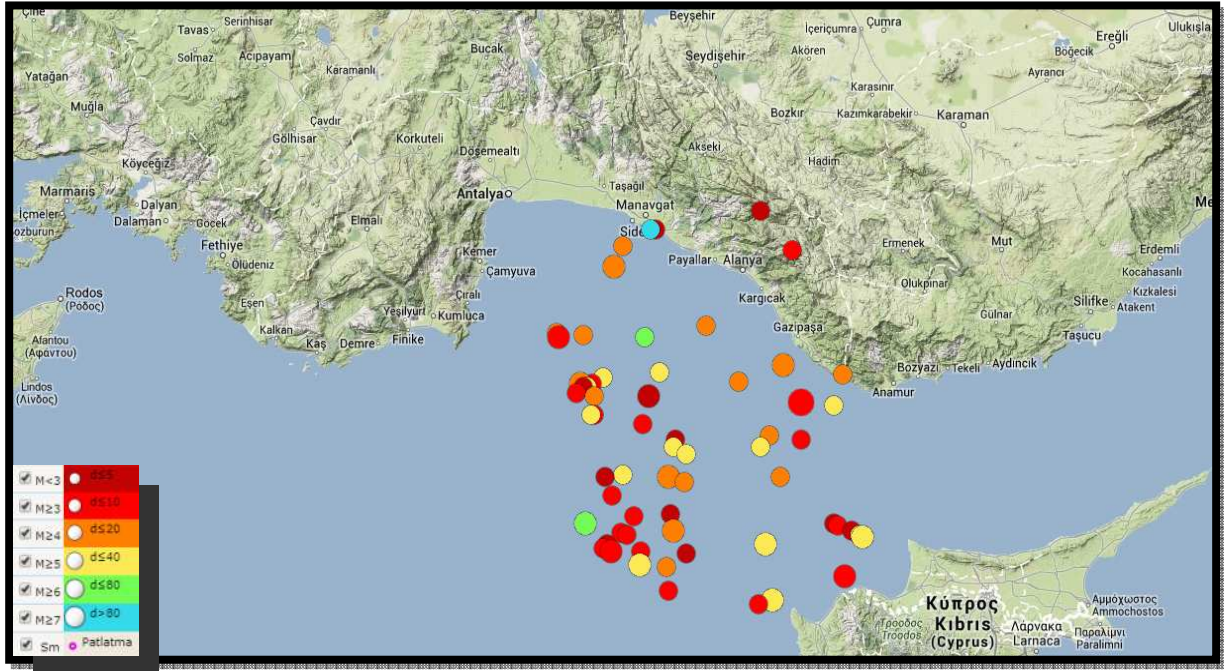


Figure 3: The epicentral distribution of the earthquake recorded by KOERI with magnitude bigger than 3.5 between 2000-2005 time period.

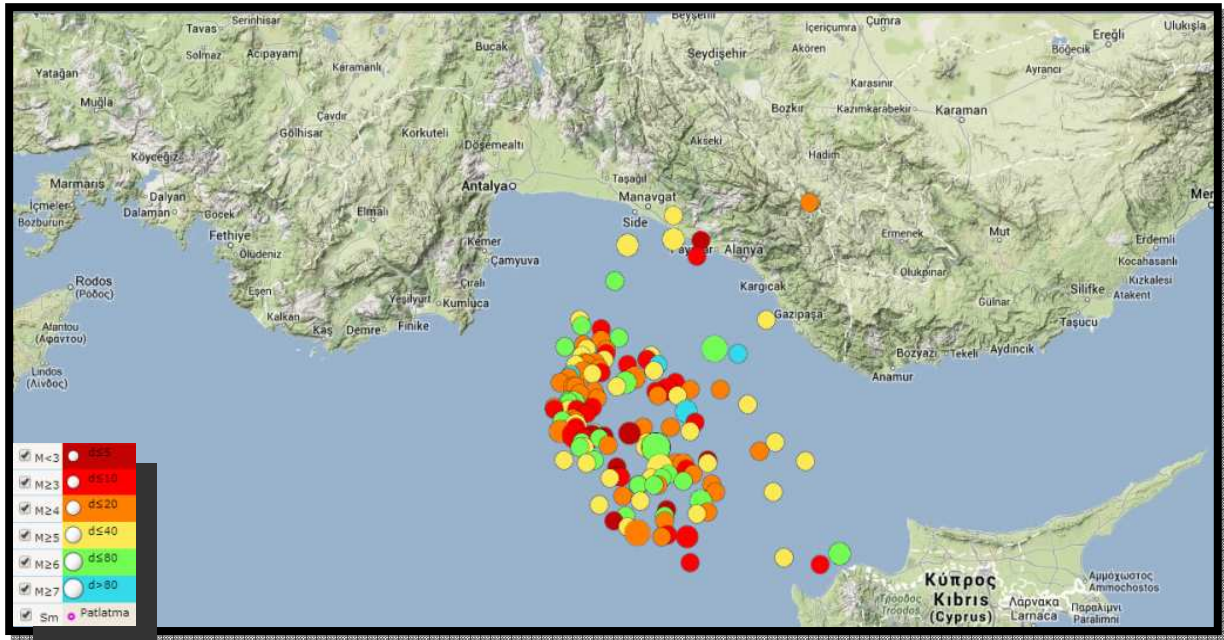


Figure 4: The epicentral distribution of the earthquake recorded by KOERI with magnitude bigger than 3.5 between 2005-2014 time period.

2. Conclusion

A plate boundary between African and Anatolian Plates locates Eastern Mediterranean with different trends that NW-SE near Antalya Bay, NE-SW passing southern side of Fethiye, Rhodes, Crete (Figure 2). The largest event took place around Antalya is $M_s=6.4$ (01.03.1926) during this century in the sea. 14 years earthquake activity is ongoing that clearly points out the activeness of faults. African Plate moves 10 mm/yr toward Anatolian Plate along the arcs [4].

Depth of the earthquake on 28 December 2013 has been reported as 47 – 54 km by different seismic stations (Figure 1, Z values). It is a moderate depth earthquake and sourced from convergent plate boundary. Consequently, such earthquake with the similar magnitude could be created by this boundary in future because this area is not stable from the crustal point of view.

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