

Elements of seismology

Lets start with something easy but essential

What is the difference between

- focus
- hypocenter
- epicenter

of the Earthquake?

Richter scale magnitude in relation to energy of EQ

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$$\frac{E_2}{E_1} = 10^{1.5}$$

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- How many times energy of EQ will increase if we increase M by 2?

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- What magnitude difference is needed to double EQ energy?

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- How many times energy of EQ will increase if we increase M by 2? 1000
- What magnitude difference is needed to double EQ energy? 0.2

Richter Scale	TNT equivalent	other
1.0	0.5 kg	2 MJ
2.0	15 kg	63 MJ
3.0	0.5 t	2 GJ - WW2-era air bomb
4.0	15 t	63 GJ
4.6		an earthquake strong enough to be recorded around the globe
5.0	500 t	2 TJ
5.5	3 kt	11 TJ
6.0	15 kt	63 TJ - an "ordinary" atomic bomb
7.0	0.5 Mt	2 PJ - hydrogen bomb
7.5	2.7 Mt	11 PJ
8.0	15 Mt	63 PJ - Romeo test - the largest nuclear explosion by the US (Bikini, 1954)
8.3	50 Mt	"Tsar bomba", the largest nuclear explosion ever - USSR, Novaya Zemlya, 1961
9.0	500 Mt	the Great Sendai Earthquake, Japan, 2011
9.2	1 Gt	the Sumatra–Andaman earthquake, 2004
9.5	2.7 Gt	most powerful earthquake ever recorded - Valdivia, Chile 1960
12.5	100 Tt	Yucatan asteroid impact 64 million years ago

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$$\log \frac{N_2}{N_1} = -b$$

$$\frac{N_2}{N_1} = 10^{-b}$$

$$N_2 = 10^{-b} \cdot N_1$$

In general

$$\frac{N_2}{N_1} = 10^{-b(\Delta M)}$$

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