Measuring Impact Craters

FAULKES TELESCOPE

Asteroids, Comets and NEOs

Measuring impact craters on the Earth

(Answer Sheet)

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Measuring the sizes of impact craters

Find the following impact craters using Google Earth, pinpoint them and measure their largest diameter (some of the craters are elliptical in shape, not round).

All sizes given below are approximate

Crater Name	Latitude	Longitude	Size (km)
Barringer Meteor Crater This meteor crater was formed about 50,000 years ago by an iron meteorite impact. It is very easy to find in Google Earth.	N35 02	W111 01	*1.20*
Manicouagan This impact crater is one of the oldest known craters on Earth. It was formed about 200 million years ago, and although some of the crater has been worn away by erosion, it is still very clear and easy to find in Google Earth.	N51 23	W68 42	*69.3*
Clearwater Lakes These 2 impact craters were formed by a pair of asteroids hitting the Earth's surface. In one of the craters, a circular area of islands can clearly be seen. This is an elevated part of the crater, as seen in a complex crater. The central part of the second crater cannot be seen however as it is below the water.	N56 13	W74 30	*32.40 & 22.1*
Chicxulub This is a fairly difficult impact crater to find on Google Earth, as most of the crater is buried below sediment. However, if you zoom out of the co-ordinates enough to see the top of the peninsula, part of the crater can be seen as a dark shadow on the land.	N21 24	W89 31	*Boundary not clear but more than 100km*

Crater Name	Latitude	Longitude	Size (km)
Upheaval Dome Originally thought to be a collapsed salt dome, this crater has all the features of a typical impact crater - a central peak, an inner crater and outer concentric shock rings. This makes it easy to identify in Google Earth.	N38 26	W109 54	*3.5*
Rio Cuarto The depressions in the land at Rio Cuarto do not look like typical impact craters. They are elliptical in shape, suggesting that they formed as a result of a group of very low angle impactors 'scratching' the ground as they came down. However, there is some doubt of the validity of these scars as impact craters, with some scientists believing that they are nothing more than features formed by winds on the Earth's surface.	S32 52	W64 14	*4.24 & 3.57*
Gosses Bluff This impact crater in Australia is believed to have been formed over 140 million years ago. The central raised ring is not the rim of the crater - this lies much further out.	S23 50	E132 19	*5.4*
Tenoumer This crater in Africa actually lines up with two other craters in the region. It is easy to identify in Google Earth - once located, try finding the larger crater to the South West.	N22 55	W10 24	*1.88*
Vredefort This impact crater has a multiple ring structure which can be seen by zooming out of the town of Vredefort in Google Earth.	S27 00	E27 30	*60.0 (inner ring)*

Calculating the kinetic energies of impacts

1. The Chicxulub Crater was formed by a rock impactor (density =2700 kg/m^3) with a diameter of 17.5km.

a) Calculate the volume of the impactor, assuming it was spherical.

$$\text{Volume} = \tfrac{4}{3}\pi \text{r}^3$$

$$\text{r} = \tfrac{17.5\times10^3}{2}\text{m} = 8750\text{m}$$

$$\text{Volume} = \tfrac{4}{3}\pi(8750)^3 = 2.81\times10^{12}\text{m}^3$$

b) Calculate the mass of the impactor which created the Chicxulub Crater.

$$\text{Mass} = \text{density} \times \text{volume}$$
$$\text{Mass} = 2.81\times10^{12}\times2700 = 7.6\ \times10^{15}\text{kg}$$

c) Finally, calculate how much Kinetic Energy was released in the impact, given that it was travelling at 20km/s.

$$\text{KE} = \tfrac{1}{2}\text{mv}^2$$

$$\text{KE} = \tfrac{1}{2}(7.58\times10^{15})(20\times10^3)^2$$

$$\text{KE} = 1.52\times10^{24}\ \text{J}$$