Scientist investigates Russian meteor

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Dr Hugh Lewis, Lecturer in Aerospace Engineering, has analysed the recent extraordinary Russian meteor event using the "NEOImpactor" tool, which was developed by researchers from the University and designed to investigate the risks faced by the Earth from asteroid impacts.

On the morning of Friday 15 February, an asteroid estimated to be the size of a five-storey building entered the atmosphere over the Urals region of Russia and disintegrated. It generated a blastwave that blew out windows and damaged buildings in the city of Chelyabinsk, injuring more than 1000 people. Just a few hours later, the world witnessed the 40 metre asteroid 2012 DA14 pass between the Earth and the ring of geostationary satellites; the closest approach of an object this size for a century.

Dr Lewis explained the significance of the event: "This is the first time that we've seen injuries resulting from a collision between the Earth and an asteroid. I think that what surprised most people was the scale of the damage from a relatively small object and the fact that we didn't have any warning."

In fact, the asteroid's size explains the lack of warning, he said.

"Small asteroids are very difficult to spot with telescopes because they only reflect a little sunlight."

Scientists have suggested that the energy released in the blast was

equivalent to 500 kilotonnes of TNT.

Using the NEOImpactor tool and estimates of the size, speed and path, Dr Lewis simulated the flight of the meteor up to the point where it disintegrated above Chelyabinsk. NEOImpactor then provided an estimate of the number of people affected by the shockwave and the cost of damage to the buildings in the region.

"The results show that a few thousand people in the Chelyabinsk region could have been affected by the blastwave with damage to the surrounding area costing about 100 million dollars, which fits with what happened, " he said. "The number of people living in this part of Russia is quite low except for those in a few towns and cities, such as Chelyabinsk. So, even a small change in the path of the meteor would likely have resulted in fewer casualties," he added. "In fact, the number of casualties we might expect for an asteroid of this size is very close to zero."

However, Dr Lewis also explained what might have happened if the meteor had arrived on the same trajectory but a few hours later.

"The city of Newcastle Upon Tyne is at the same latitude as Chelyabinsk. Had the meteor arrived about four hours later, on the same trajectory, the blastwave could have had similar consequences for the UK city."

Dr Lewis also used the NEOImpactor tool to investigate the possible consequences of larger asteroids colliding with the Earth. In the last month, the Earth has experienced an approach by the 330 metre asteroid 2004 MN, also called "Apophis", and the smaller, 40 metre asteroid 2012 DA14, which made its closest approach just hours after the meteor over Russia. For an asteroid the size of 2012 DA14, NEOImpactor estimated that 10,000 people could be affected, on average, if it

impacted anywhere in the world. In contrast, an average of nearly one million people could be affected if asteroid Apophis were to collide with the Earth, with many more casualties arising if it impacted in a densely populated region.

Most of the asteroids and comets over one kilometre in size that are potentially hazardous to the Earth have been identified, their orbits around the sun calculated and impacts have been ruled out for the next 100 years. What's more, telescopes are now being used to look for smaller asteroids.

However, the event in Russia has highlighted the need to continue to invest in such sky surveys and to develop an effective plan of action in case an asteroid is discovered on a collision course with the Earth. Coincidentally, such a plan was being discussed at the Vienna meeting of the United Nations Action Team 14 on Near Earth Objects at the time of the Russian meteor event. The UK plays a key role in this Team.

"NEOImpactor, and similar tools being developed at the University, can help to support the planning of mitigation measures," Dr Lewis said, "as they provide important context that can shape decisions."

In spite of the recent, dramatic demonstration of the risks posed by asteroids, there is reason to be optimistic about the future, he added:

"The human race already has the technology to deflect an asteroid if we are given sufficient warning."

In fact, Dr Lewis is currently using the tools developed at the University within a European-wide project investigating mitigation options for the European Space Agency (ESA). The outputs from this work will help to support ESA's role in the global response to the asteroid threat.

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