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Astrophysics

We could save Earth from a planet-killer comet (if leaders listen to scientists)

Jonathan O'Callaghan

EARTH could escape the threat of a devastating asteroid or comet strike with just a short window to act, according to new research.

Netflix's recent science-fiction blockbuster *Don't Look Up* depicts a scenario in which astronomers discover a 10-kilometre-wide comet set to collide with Earth in six months. The film charts their efforts to warn the world of impending doom and convince politicians to take the necessary action to avert catastrophe.

Although the story is intended as an allegory for climate change, Philip Lubin and Alexander Cohen at the University of California, Santa Barbara, wondered if such a scenario would be survivable in the real world. "It looks possible," says Lubin. "It looks like you could do it."

The size of the comet in the film is similar to the asteroid that wiped out the dinosaurs 66 million years ago. If we spotted such an object with a few years until the predicted impact, the preferred strategy would be to deflect it away from an earthbound trajectory.

However, with just six months to act, Lubin and Cohen found that we would instead have to use nuclear devices to "disassemble" the object. They suggest this would be possible with less than 10 per cent of the world's current nuclear arsenal.

The nuclear devices would need to be fitted on 1000 javelin-shaped penetrators, which could be launched on one of two super-

Astronomers struggle to capture attention in *Don't Look Up*

rockets that are currently in development: NASA's Space Launch System or SpaceX's reusable Starship vehicle, both of which are expected to launch on their first test flights to space in the coming months.

The launch would have to occur five months before the asteroid or comet was due to collide with Earth, giving us just a month to prepare. "You have to be ready. You can't wait," says Lubin.

The penetrators would then strike a month before the Earth impact date, exploding in

concentric rings from the outer edge of the asteroid or comet towards its centre. That would give us the greatest chance of blasting it into small-enough fragments that would be mostly pushed out of the planet's path (arxiv.org/abs/2201.10663).

"Will any of them hit? Probably," says Lubin. "But if it's a choice between everybody dying and some, you have to make some choices."

Detlef Koschny, acting head of the European Space Agency's planetary defence office, says the idea seems reasonable, but wonders if we would have enough time to act. "Even if there are enough nuclear explosive devices, you'd still need to get them up on a rocket in four weeks," he says. "I don't see how that can happen."

Thankfully, our best surveillance efforts suggest we won't need such a call to arms any time soon. "There's nothing that we are worried about for at least the next 100 years," says Áine O'Brien at the University of Glasgow, UK, "but it's always cool to read these kinds of things." ■



NIKO TAVERNISE/NETFLIX

Climate change

Extreme marine heatwaves are the new normal

THE world's oceans passed a threshold eight years ago as marine heatwaves became the "new normal", with extreme temperatures recorded across more than half of Earth's seas since then.

Marine heatwaves, such as the "blob" of warm water in the Pacific Ocean between 2014 and 2016, can cause algal blooms, coral bleaching and mass die-offs of fish and birds that feed on them.

Kyle Van Houtan at Duke University in Durham, North Carolina, and Kisei Tanaka at the US National Oceanic and Atmospheric Administration have now found that 2014 was the first time that more than half of the global ocean surface recorded temperatures were considered extreme compared with a historical baseline. By 2017, such temperatures covered a high of 60 per cent of the oceans (*PLOS Climate*, DOI: 10.1371/journal.pclm.0000007). The figure was less than a fifth in the early 1900s.

While the oceans as a whole crossed the threshold of 50 per cent

only recently, some areas hit it far earlier. The South Atlantic passed the milestone in 1998. "That was a long time ago. I think that's really jarring," says Van Houtan.

The team looked at two sets of global sea surface temperature data from 1870 to 2019, using the first 50 years to establish a historical baseline. The hottest 2 per cent of temperatures were deemed extreme. This was then used as

"This global data set is reinforcing the idea that climate change is already well in progress"

a yardstick to map the prevalence of extremes up to 2019. "They are reinforcing the idea that climate change is already well in progress," says Nick Bond at the University of Washington in Seattle. One thing to bear in mind is that the baseline period was relatively cold, he says.

Alex Sen Gupta at the University of New South Wales in Sydney, Australia, says: "We are becoming increasingly aware that it's temperature extremes rather than mean climate that have the most extreme effects on marine organisms." ■

Adam Vaughan