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Space

Adverts in space are now economically viable but potentially dangerous

Alex Wilkins

COMPANIES could use constellations of satellites that reflect sunlight to Earth to create advertisements in the sky at a commercially viable cost of \$65 million per mission, according to a feasibility study. But the idea is controversial among researchers, who warn of a pile-up of dangerous space debris and light pollution for ground and space-based telescopes.

Previous proposals for space advertising didn't make commercial sense – the cost of launching enough satellites, which tend to remain in the correct orbit for only a short amount of time, has been prohibitive.

But as launch costs have decreased with the advent of private space companies, Shamil Biktimirov at the Skolkovo Institute of Science and Technology in Moscow, Russia, and his colleagues think it could now be viable if the mechanics of how the satellites are used as advertising are reassessed.

To do this, they borrowed techniques that describe the

dynamics of mega-constellations, such as that of Starlink's communications satellite fleet, and used this to calculate how much revenue companies could get for keeping their satellites in the sky for certain lengths of time.

The researchers propose that a fleet of about 50 satellites with curved reflectors could orbit around the line where day turns to night and reflect the sun's light

Large satellite fleets are already used to offer internet services

to a patch of ground below. They would be arranged to form an image made of bright pixels showing a logo or a basic image. Viewers on the ground would see the constellation move across the sky in about 10 minutes around dawn or dusk, growing from half-moon size to two to three times bigger than the moon at its peak.

To maximise revenue, the satellites would change formation around 25 times to target different locations in a three-month period of operation before the satellites run out of fuel and slowly descend

towards Earth and – Biktimirov hopes – burn up (*Aerospace*, doi.org/gqwxjz).

But this long descent could be a problem. "The spaceflight risk from debris related to these objects is considerable," says John Barentine of Dark Sky Consulting, a company based in Tucson, Arizona. "Left derelict in orbits with long lifetimes, every single object becomes a potential 'bullet' that threatens every other object in similar orbits. Any one might set off a catastrophic cascade of debris generation." The reflected light from space advertising would also interfere with astronomy, he adds.

Biktimirov and his team say the descent of the satellites and any potential collisions could be monitored, but some are sceptical about how accurately this could be done. "The debris is especially concerning, given that tracking objects and satellites across a range of sizes and orbital parameters is inherently challenging," says Aparna Venkatesan at the University of San Francisco, California. ■



JACQUES DAYAN/SHUTTERSTOCK

Environment

Intensive farming could preserve remaining Amazon

ENCOURAGING more intensive farming in areas of the Brazilian Amazon rainforest that have already been felled could help preserve the rest of the rainforest, by boosting crop yields without serious environmental impacts, researchers have found.

For decades, Brazilian farmers have been logging large tracts of the Amazon, a practice that drives the country's economic growth, but

has catastrophic environmental consequences. Deciding the future use of the rainforest is a key part of Brazil's current general election, which will see a second round of voting on 30 October.

Patricio Grassini at the University of Nebraska-Lincoln and his team say that instead of logging more areas of virgin forest to create new farmland, farmers should stock more cattle on ranches and use fertilisers, irrigation systems and better soil management to boost production of soybeans – its largest national export – in existing fields.

The team simulated a range of

intensification scenarios and found that if farmers did this, it could allow Brazil to increase its soybean production by 36 per cent by 2035 without any further deforestation. The environmental impact would be "negligible" compared with that of further deforestation, says Grassini (*Nature Sustainability*, doi.org/jgdt).

If Brazil fails to take action to stem the deforestation rate, 5.7 million hectares of virgin forest

"It is difficult to protect forests and biodiversity while being sensitive to economic aspirations"

and savannah could be cleared for soybean production over the next 15 years, the team found.

"Without an emphasis on intensifying crop production within the existing agricultural area... it would be difficult to protect the last bastions of forests and biodiversity on the planet while being sensitive to the economic aspirations of countries to develop," says Grassini.

However, he says that "strong institutions and policies that prevent deforestation" would be needed to stop illegal logging in areas that back onto virgin forest. ■
Madeleine Cuff