

Changing atmosphere increases build-up of space debris

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(PhysOrg.com) -- Scientists from the University of Southampton have confirmed a long-term change in the Earth's upper atmosphere at altitudes where satellites are operating.

This change, a contraction of the thermosphere, has been attributed to the build-up of [greenhouse gases](#), such as carbon dioxide, and is causing satellites - and [space debris](#) - to remain in orbit for longer than expected.

Researchers led by Dr Hugh Lewis and Dr Graham Swinerd from the University's School of Engineering Sciences previously showed that this contraction can lead to an increase in collisions between satellites and orbital debris. Now the team has suggested that international efforts to control the growth of space debris may be much less effective in the future if these atmospheric changes continue.

While [carbon dioxide](#) causes a global rise in temperature at the Earth's surface, it has the opposite effect in the thermosphere. Here, the temperature is dropping and there is a corresponding decrease in density. Using data from 30 satellites from the past 40 years, Southampton postgraduate student Arrun Saunders has found that [atmospheric density](#) in the thermosphere has been decreasing at a rate of five percent per decade at an altitude of 300km. The effect is greater at higher altitudes.

Dr Lewis believes the decrease of atmospheric density will impact upon the effectiveness of removing space debris - which consists of man-made objects such as redundant satellites and used rocket bodies - from

orbit.

"As the atmospheric density in the thermosphere decreases, debris can remain in orbit for up to 25 percent longer," he says. "The fact that these objects are staying in orbit longer counteracts the positive effects that we would otherwise see with active debris removal.

"Our study shows that if we double the number of debris objects we can remove each year, we can get back on track with reducing the debris population. Achieving this target, however, will be challenging."

Postgraduate student Rebecca Newland adds: "Removing debris from orbit is technically very difficult and also expensive, which is why we are looking at ways to identify the best objects to remove."

Work has already begun in the international space sector to develop ways of removing space debris.

Dr Lewis adds: "We have already seen the positive effects that can be achieved by adopting mitigation measures. Now we have a good foundation from which we can continue to work towards the goal of limiting the growth of space debris."

Provided by University of Southampton

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