# Environmental risks rise as satellite re-entry emissions threaten atmosphere and ozone recovery



At present, more than 9,000 satellites orbit the Earth, playing crucial roles in weather monitoring, communications, navigation, and environmental observation. However, projections indicate that this number could swell to over 60,000 by 2040. A recent study published in the Journal of Geophysical Research Atmospheres has examined the environmental consequences of emissions produced when expired satellites re-enter Earth's atmosphere and burn up.

Satellites typically require replacement after around five years, with most decommissioned satellites disposed of by lowering their orbit to allow them to burn up upon re-entry. This process releases various pollutants into the atmosphere, including aerosolised aluminium oxide. Researchers have simulated the impact of an anticipated annual release of 10,000 tonnes of aluminium oxide by 2040, a figure based on the disposal of roughly 3,000 satellites each year, assuming the satellite population reaches 60,000.

The study found that the aluminium oxide and other materials will concentrate in the high-latitude regions of the atmosphere. This accumulation could cause temperature anomalies of up to 1.5°C in the middle to upper atmosphere, disrupt wind patterns by reducing wind speeds, and lead to ozone depletion. This ozone reduction raises concerns about potentially jeopardising the recovery of the ozone hole, a critical component for protecting life on Earth from harmful ultraviolet radiation.

In addition to aluminium, the re-entry process will release other metals such as titanium, lithium, iron, and copper. The effects of these additional pollutants remain to be fully explored and modelled.

The Guardian is reporting that this research highlights a growing environmental consideration linked to the rapid expansion of satellite constellations and their disposal methods, suggesting that the cumulative impact on atmospheric chemistry and climate could be considerable in the coming decades.

Source: [Noah Wire Services](https://www.noahwire.com)

## Bibliography

1. <https://www.technologyreview.com/2024/12/09/1108076/satellite-reentry-atmospheric-pollution/> - This article discusses the rapid increase in satellite numbers, with projections estimating a tenfold increase by the end of this decade, leading to more satellites re-entering Earth's atmosphere and releasing pollutants like aluminum oxide.
2. <https://www.pnas.org/doi/full/10.1073/pnas.2313374120> - This study examines how metals from spacecraft reentries, including aluminum oxide, are present in stratospheric aerosol particles, indicating that satellite reentries contribute to atmospheric pollution.
3. <https://newspaceeconomy.ca/2024/07/01/potential-ozone-depletion-from-satellite-demise-during-atmospheric-reentry-in-the-era-of-mega-constellations/> - This article highlights that the re-entry of satellites, especially from mega-constellations, releases aluminum oxide particles into the atmosphere, which can lead to ozone depletion.
4. <https://www.space.com/starlink-satellite-reentry-ozone-depletion-atmosphere> - This article reports that chemicals released during satellite reentries could damage Earth's protective ozone layer, especially with the planned expansion of satellite megaconstellations.
5. <https://www.earth.com/news/burning-up-of-satellites-severely-harms-ozone-recovery/> - This article discusses how re-entering satellites increase atmospheric aluminum levels, leading to aluminum oxide particles that can harm the ozone layer, potentially hindering its recovery.
6. <https://news.agu.org/press-release/satellite-megaconstellations-burn-deplete-ozone/> - This press release details how the burning of satellites during re-entry releases aluminum oxide particles into the atmosphere, contributing to ozone depletion and potentially affecting the recovery of the ozone hole.
7. <https://news.google.com/rss/articles/CBMiugFBVV95cUxOaGN0UHo1cGtCM2lUdlY0NWFNVzNVYnJnVDFjMDZ5RFJTUm55bHBPUWI3YzJhTlBBYmRfWDVablFQSFNHY0FCcWVuRHFHenJoVVV5clFmLWZoOEh6Z0gxVEdqbU1TaS1IWjFxbVVBUm5qc2JGT0xfY0wyQTd4bFFOOFZOWlNtWkdGVDRVZ1J1TldjZGtQZmRGM2o5ZHdQZVBTemU0RE52WEQwSWU3Wk5hQk9EdXE5UTVndUE?oc=5&hl=en-US&gl=US&ceid=US:en> - Please view link - unable to able to access data