Newly Discovered 'Radiation Clouds' Could Pose Extra Risks to Frequent Flyers

But there's no need to panic.

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Researchers have found evidence of mysterious 'radiation clouds' in Earth's stratosphere, which could expose passengers and crew on commercial flights to significantly higher levels of radiation than we realised.

For years now, researchers have known that increased exposure to cosmic rays at high altitudes is an unfortunate side effect of airflight, but the discovery of localised radiation clouds means travellers could be receiving twice as much radiation – or more – when passing through these isolated pockets of air.

"We have flown radiation sensors onboard 264 research flights at altitudes as high as 17.3 km (56,700 ft) from 2013 to 2017," principal investigator W. Kent Tobiska from LA-based research firm Space Environment Technologies told Spaceweather.com.

"On at least six occasions, our sensors have recorded surges in ionising radiation that we interpret as analogous to localised clouds."

Before now, scientists knew that air travellers were exposed to low levels of radiation from traces of solar wind and cosmic rays that manage to penetrate Earth's protective magnetic field.

The amount of exposure depends on the length of your flight and where you're flying, with journeys passing closer to Earth's polar regions receiving an increased amount of radiation.

When there's no unusual solar storm activity going on, high-latitude flights (passing near the poles) deliver as much radiation to a passenger as a chest X-ray in about 12.5 hours.

At mid-latitudes, this drops down to a chest X-ray in 25 hours, and flights around the equator deliver the same amount of radiation in around 100 hours.

As the US Centres for Disease Control and Prevention points out, this means a coast-to-coast flight across the US would deliver significantly less radiation than a chest X-ray – about 0.035 mSv (3.5 mrem) in radiation dose units.

But when Tobiska's team monitored in-flight radiation levels as part of the NASA-funded Automated Radiation Measurements for Aerospace Safety (ARMAS) program, they saw long-lasting surges in the data – in one case, the result was more than double the expected radiation dose.

"We have seen several cases where the exposure is doubled while flying through the cloud," Tobiska told David Hambling at *New Scientist*.

"It is quite variable and can easily be more or less than that."

While cosmic rays and solar wind have been identified as the two main sources of high-altitude radiation, Tobiska and his team suspect there's something else going on here.

It's likely there's a third source of high-altitude radiation, they suggest, which could explain why the data surges don't match the smooth gradients of radiation that the ARMAS instruments usually detect.

"Our new measurements show a third component," Tobiska says.

Earth's magnetic field traps the particles that make up cosmic rays and solar winds in radiation belts, such as the Van Allen radiation belt.

These belts act kind of like magnetic bottles that confine the particles within them, but when events like solar wind bursts happen, charged particles can 'leak' from the bottles, escaping the belt and settling in Earth's stratosphere.

"Those electrons are driven into the upper atmosphere, collide with nitrogen and oxygen atoms and molecules, and then create a spray of secondary and tertiary radiation, likely in the form of gamma rays," Tobiska told *New Scientist*.

While it's only a working hypothesis for now, the leaking magnetic bottle could explain results seen by South Korean researchers in 2015, who detected inconsistent levels of radiation on a military reconnaissance aircraft being flown at constant altitude.

Physicist Daniel Baker from the University of Colorado, who wasn't involved with the recent study, agrees that the leaking bottle idea could be what's behind these unusual surges in the data.

"It is plausible that the ARMAS results are related to enhanced loss of radiation belt particles from the magnetosphere into the middle and lower atmosphere," he told *New Scientist*.

If the radiation clouds are the result of particles leaking from Earth's magnetic belts, satellite data and airborne sensors could help us to identify where these areas exist in the sky, and help pilots avoid them much as they would other pockets of dangerous weather.

The overall risk of high-altitude radiation for regular travellers is low – with a chest X-ray only estimated to increase the risk of a fatal cancer by one in a million.

But if these clouds do exist and can be identified, we should still make every effort to not fly through them where possible – especially for those who spend a lot of time in the air.

"This is mainly for crew members," says Tobiska, "but would certainly benefit frequent flyers and even foetuses in their first trimester."

The findings are reported in *Space Weather*.