Revealed: The Earth's 'electrical heartbeat' seen in clouds

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(Phys.org) —The height of clouds changes by up to 200m during a day under the influence of a global 'electrical heartbeat' in the atmosphere, scientists at the University of Reading have discovered.

The findings, made by analysing 10 years' data of cloud heights from the north and south poles, open up a whole new perspective on our understanding of how clouds form and influence our weather and climate.

Scientists have been aware of the daily global ebb and flow of electric current through the atmosphere for 100 years, when it was shown to vary consistently throughout the day wherever on the planet it was measured.

This regular variation, effectively a global electrical heartbeat, is known as the Carnegie curve, after the ship whose cruises provided the defining experiments in the 1920s.

The electric current is caused by electrified storms across the world. Its daily peak occurs at 7pm GMT each day when the major sources of thunderstorms are the American and African landmasses. The current is usually weakest at 3am GMT, night-time across most of the world's continents, when there are fewest thunderstorms occurring globally.

Previously no connection had been made between this current and the formation of clouds. But, by analysing cloud base measurements made during polar darkness when there are few other influences on cloud formation, University of Reading meteorologists Professor Giles Harrison and Dr Maarten Ambaum found evidence for the first time that cloud heights are closely linked to the Carnegie curve.

Professor Harrison said: "What we found was remarkable. The variations from both north and south poles are almost identical, suggesting a strong link with the Carnegie curve, when other factors are taken out of the equation. This may arise from charging of small droplets in the cloud's base, encouraging them to stick together.

"This implies that factors inside or outside the climate system which change the global electric current, such as ocean temperatures or cosmic rays, may influence the properties of layer clouds. However our results say nothing about any long-term effects, as they were found for rapidly-occurring changes from hour to hour."

Layer clouds are particularly relevant to global temperatures. At night they act like a warm blanket, preventing heat from being lost from the earth into space, and during the day help cool the surface by reflecting away the sun's energy.

"The realisation the electrical heartbeat of the planet plays a role in the formation of layer clouds indicates that existing models for clouds and climate are still missing potentially important components," said Dr Ambaum.

"Understanding these missing elements is crucial to improve the accuracy of our weather forecasts and predicting changes to our climate. The climate system keeps on surprising us with its immense complexity and richness."

The findings are published in the journal *Environmental Research Letters*.

More information: Harrison, G. and Ambaum, M. 2013 Electrical signature in polar night cloud base variations, *Environ. Res. Lett.* 8 015027 iopscience.iop.org/1748-9326/8/1/015027/article

Provided by University of Reading