

Cosmic raise in cloud

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New evidence that events in outer space affect the weather and climate of Earth has been revealed in a study by meteorologists at the University of Reading published in the *Proceedings of the Royal Society* on Wednesday 18 January.

In their paper 'Empirical evidence for a non-linear effect of galactic cosmic rays on clouds', Drs Giles Harrison and David Stephenson suggest that cosmic rays have a significant effect on the Earth's lower atmosphere – particularly on levels of cloudiness.

The Reading meteorologists discovered that the chance of an overcast day decreases by 20% on days with low cosmic ray fluxes. The effect is strongest when low cosmic ray fluxes occur – this is often associated with solar flares, but may also result from changes outside the solar system.

“Back in 1959, Edward Ney suggested that variations in cosmic rays, which are charged particles mostly originating outside the solar system, could affect our weather,” said Dr Harrison. “This research now provides strong evidence supporting Ney’s suggestion, which effectively links atmospheric and space science.”

“As well as the influence of weather, our evidence shows a small yet statistically significant effect of cosmic rays on daily cloudiness. This suggests that cosmic rays are an additional external source of climate variability that should be considered when modelling past and future climate.”

To detect changes in the atmosphere from cosmic rays, Harrison and Stephenson used solar radiation measurements made by meteorological stations. They conducted a careful analysis of the UK archives of daily solar radiation observations from 1951-2004 and compared them with neutron counter cosmic ray measurements taken at Climax, Colorado, between 1951 and 2000.

In 1927, the British physicist C.T.R. Wilson received the Nobel Prize for the cloud chamber, which he invented to simulate atmospheric cloud processes. The cloud chamber makes cosmic rays visible by condensing water droplets on ions produced by the cosmic rays. Wilson developed the cloud chamber in the 1890s to simulate atmospheric cloud production processes. He initially thought that ions provided all the nuclei in the atmosphere for cloud formation, but subsequently discovered that clouds formed on uncharged particles too. The mechanism suggested by Harrison and Stephenson to explain the effect of cosmic rays on clouds found is different to Wilson's, and depends on the particles formed by ions, rather than the action of the ions themselves. This is an important distinction, as the cloud chamber does not reproduce real atmospheric conditions. Wilson's work was also published in the *Proceedings of the Royal Society*.

Cosmic rays were discovered by Viktor Hess, following a high altitude balloon flight in August 1912. Hess received the Nobel prize for the discovery in 1936.

Source: University of Reading

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