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Unexpected discovery could impact on future climate models

Dust plumes blowing off the coast of Western Sahara over the Atlantic Ocean
Credit: NASA/NOAA

Astronomers have made an unexpected find using a polarimeter (an instrument used to measure the wave properties of light) funded by the Science and Technology Facilities Council (STFC), that has the potential to affect future climate models.

University of Hertfordshire astronomers were making observations of the stars in search of new planets after mounting the 'PlanetPol' (polarimeter they designed and constructed to take extremely sensitive readings) on the William Herschel Telescope (part of the Isaac Newton Group of Telescopes) in La Palma in the Canary Islands, when their measurements became affected by a layer of dust.

The presence of the dust itself, which satellite images and modelling of the dust's movement show had originated from the Sahara and the Sahel, was not a surprise, but its behaviour was. Scientists normally assume that aerosols, including mineral dust, have random orientation in the atmosphere, but the team members say the polarizing affect the dust was having on the light could only be the result of dust particles being vertically aligned.

Furthermore, electric fields that are now thought to be responsible for this phenomenon are likely to affect the transport of dust over long distances. For the first time this might explain why large Saharan dust grains can travel as far as the UK instead of falling to the ground long before.

This could impact on climate theories because atmospheric dust is a significant source of uncertainty for scientists trying to model the climate. 'If it's proven the dust is affected by electric fields, elements of current climate models may have to be re-worked with this new information, to remain accurate', explains Joseph Ulanowski, Centre for Atmospheric and Instrumentation Research (CAIR) at the University of Hertfordshire.

Dust storm hits the Canary Islands
Credit: Jacques Descloitres, MODIS Land Rapid Response Team at NASA GSFC

Climate models are extremely complex and involve many other influences, so further research will now be carried out to see how significant a find this dust phenomenon is. CAIR will now join a Met Office-led campaign in the Middle East in the spring 2009 which presents an opportunity to investigate this further.

Professor James Hough, Director of Astronomy Research at the University of Hertfordshire said, 'It's been fascinating to see how we have been able to use astronomical observations to learn far more about dust in the Earth's atmosphere, especially as we first considered the Saharan dust event to be a real nuisance and of no value to us at all.'

The polarimeter, called PlanetPol, was designed and constructed by the University of Hertfordshire using funding from the Science and Technology Facilities Council. It can be mounted on any large telescope. In this case it was mounted on the William Herschel Telescope, part of the Isaac Newton Group of telescopes (ING) in La Palma in the Canary Islands.

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University of Hertfordshire

The University of Hertfordshire is an ambitious and entrepreneurial University. It offers excellence in teaching, learning and research and puts students at the heart of its activities. It is a model of a 21st Century university, international, business-facing and business-like in approach - making it distinctive in an ever changing higher education environment.

The University of Hertfordshire is one of its region's largest employers with over 2,700 staff and a turnover of more than £205 million. With a student community of over 23,000, including more than 2,000 international students from over eighty five different countries, the University has a global network of over 160,000 alumni.

Centre for Atmospheric and Instrumentation Research (CAIR)

CAIR is based at the University of Hertfordshire and undertakes research into atmospheric interactions and microphysical processes affecting radiative properties and air quality.

Isaac Newton Group of Telescopes

The Isaac Newton Group of Telescopes (ING) consists of the 4.2 metre William Herschel Telescope, and the 2.5 metre Isaac Newton Telescope. The telescopes are owned and operated jointly by the Science and Technology Facilities Council (STFC) of the United Kingdom, the Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) of the Netherlands and the Instituto de Astrofísica de Canarias (IAC) of Spain. The telescopes are located in the Spanish Observatorio del Roque de los Muchachos on La Palma, Canary Islands which is operated by the Instituto de Astrofísica de Canarias (IAC).

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