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Stressed seaweed contributes to cloudy coastal skies, study suggests

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Scientists at The University of Manchester have helped to identify that the presence of large amounts of seaweed in coastal areas can influence the climate.

A new international study has found that large brown seaweeds, when under stress, release large quantities of inorganic iodine into the coastal atmosphere, where it may contribute to cloud formation.

A scientific paper published online today (Monday 6 May 2008) in the Proceedings of the National Academy of Science (PNAS) identifies that iodine is stored in the form of iodide – single, negatively charged ions.

When this iodide is released it acts as the first known inorganic – and the most simple – antioxidant in any living system.

“When kelp experience stress, for example when they are exposed to intense light, desiccation or atmospheric ozone during low tides, they very quickly begin to release large quantities of iodide from stores inside the tissues,” explains lead author, Dr Frithjof Küpper from the Scottish Association for Marine Science.

“These ions detoxify ozone and other oxidants that could otherwise damage kelp, and, in the process, produce molecular iodine.

“Our new data provide a biological explanation why we can measure large amounts of iodine oxide and volatile halocarbons in the atmosphere above kelp beds and forests. These chemicals act as condensation nuclei around which clouds may form.”

The paper’s co-author, Dr Gordon McFiggans, an atmospheric scientist from The University of Manchester’s School of Earth, Atmospheric and Environmental Sciences (SEAES) said: “The findings are applicable to any coastal areas where there are extensive kelp beds. In the UK, these are typically place like the Hebrides, Robin Hood's Bay and Anglesey. The kelps need rocky intertidal zones to prosper - sandy beaches aren't very good.

“The increase in the number of cloud condensation nuclei may lead to ‘thicker’ clouds. These are optically brighter, reflecting more sunlight upwards and allowing less to reach the ground, and last for longer. In such a cloud there are a higher number of small cloud droplets and rainfall is suppressed, compared with clouds of fewer larger droplets.

“The increase in cloud condensation nuclei by kelps could lead to more extensive, longer lasting cloud cover in the coastal region – a much moodier, typically British coastal skyline.”

The research team also found that large amounts of iodide are released from kelp tissues into sea water as a consequence to the oxidative stress during a defence response against pathogen attack. They say kelps therefore play an important role in the global biogeochemical cycle of iodine and in the removal of ozone close to the Earth's surface.

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This interdisciplinary and international study – with contributions from the United Kingdom, the Netherlands, Germany, France, Switzerland, the European Molecular Biology Laboratory (EMBL) and the USA – comes almost 200 years after the discovery of iodine as a novel element – in kelp ashes.

Notes to editors

A copy of the paper is available on request.

For more information please contact Alex Waddington, Media Relations Officer, the University of Manchester, 0161 275 8387 or 07717 881569.

Dr McFiggans is available for comment.

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