CSI-style investigation of meteorite hits on Earth

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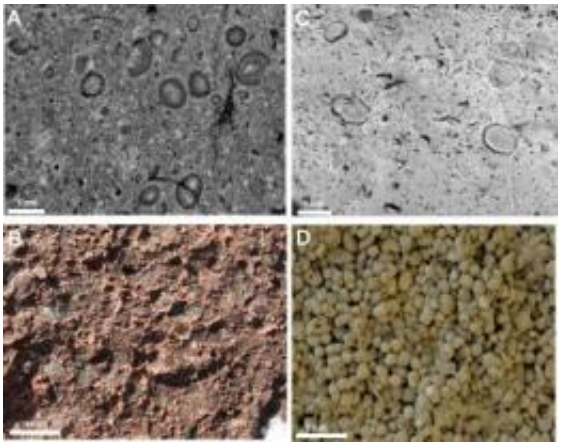

Meteorite impact ejecta (left) compared with volcanic deposits (right) showing closely similar structures made of dust particles. The top two photos show accretionary lapilli in density current deposits, whereas bottom two photos show pellets that formed when dust in the atmosphere clumped together and simply fell onto the land surface. Credit: From Branney and Brown 2011 (*Journal of Geology* 199, 275-292

Volcanologists from the Universities of Leicester and Durham have forensically reconstructed the impact of a meteorite on Earth and how debris was hurled from the crater to devastate the surrounding region.

New research by Mike Branney, of the University of Leicester's Department of Geology, and Richard Brown, University of Durham, shows that some aspects of giant meteorite impacts onto Earth may

mimic the behaviour of large volcanic eruptions.

Meteorite impacts are more common than is popularly appreciated – but what happens when the meteorite hits? Direct observation is understandably difficult, but researchers pick through impact debris that has been spared the ravages of erosion, to forensically reconstruct the catastrophic events.

Mike Branney and Richard Brown analysed an ejecta layer derived from the impact of a huge meteorite and discovered that much of the ejected debris moved across the ground as rapid, dense, ground-hugging currents of gas and debris, remarkably similar to the awesome pyroclastic density currents that flow radially outwards from explosive volcanoes.

Dr Branney said: "In particular, the way that ash and dust stick together seems identical. Moist ash from explosive volcanoes sticks together in the atmosphere to fall out as mm-sized pellets. Where these drop back into a hot pyroclastic density current, they grow into larger layered structures, known as accretionary lapilli."

The researchers studied a finely preserved deposit in northwest Scotland from a huge impact that occurred a billion years ago. It shows both types of these 'volcanic' particles - pellets and lapilli - are produced.

Dr Brown added: "This reveals that that the 10 meter-thick layer, which has been traced for over 50 km along the Scottish coast, was almost entirely emplaced as a devastating density current that sped outwards from the point of impact - just like a density current from a volcano. Only the uppermost few centimetres actually fell out through the atmosphere. "

The Leicester and Durham scientists say that an improved understanding of what happens when large objects hits the Earth will help us

understand how these catastrophic events may have affected life on the planet in the past ... and possibly in the future.

More information: Branney, M.J. & Brown, R.J. 2011. Impactoclastic density current emplacement of terrestrial meteorite-impact ejecta and the formation of dust pellets and accretionary lapilli: evidence from Stac Fada, Scotland. *Journal of Geology* 119, 275-292.

Provided by University of Leicester