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Volcanic hazards could become fiercer and more frequent

Apr 23, 2010 12 comments



Volcanic ash emerging from Eyjafjallajökull, Iceland

The erupting Icelandic volcano that wrought havoc on European air traffic may have calmed for now, but geologists are warning that volcanic hazards such as this could become more commonplace due to climate change. They believe there is evidence that melting ice is placing an increasing strain on volcanic regions across the globe, which could trigger a range of different geological hazards. These findings appear in a special issue of *Philosophical Transactions of the Royal Society A*.

Perhaps the most topical paper is research led by Freysteinn Sigmundsson at the University of Iceland, which looks specifically at volcanic activity in Iceland. The researchers point out that volcanic activity was 10 times more frequent following the last deglaciation period in Iceland 10–12 thousand years ago. Iceland's icecaps have been thinning continuously since 1890 so the researchers argue that we could be heading towards another period of fierce volcanic eruptions. They note, however, that there is no direct evidence to link the recent activity of the Eyjafjallajökull volcano with ice-melt.

A fiery land

Sigmundsson's team has developed a model of how Icelandic volcanism might respond to the removal of ice mass. This model is tailored to Iceland's volcanic situation, which is unique because the country is located along the Mid-Atlantic Ridge and is above a "hotspot" – an upwelling of hot rock that emerges from deep within the Earth's interior. As the North American plate and the Eurasian plate diverge from each other, at the Mid-Atlantic ridge, pressure is reduced in the molten rock deep beneath Iceland. This can induce melting in this region known as the mantle, which can lead to volcanic activity at the surface.

Sigmundsson and his team suspect that a sudden removal of pressure, due to melting glaciers, could lead to additional upwelling in the Earth's mantle. Their visco-elastic model is applied to the Vatnajökull ice cap, the largest glacier in Iceland covering 8% of the country, which is thinning at a rate of approximately 50 cm each year. They find that this extent of thinning should correspond to a pressure release of the order 0.5–1.5 kPa each year.

This figure is comparable with the 3.2 kPa per year released due to the regular plate tectonics beneath Iceland so it could significantly

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increase volcanism at the surface, say the researchers. They emphasize, however, that it may take decades or even centuries for this molten material to reach the surface if it makes it at all. This uncertainty is due to the complicated nature of flow in the mantle, which is dependent on a range of factors including magma chemistry and the availability of underground fissures.

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Apr 1, 2010

The plume may reappear

Michael Sheridan, a volcanologist at the University of Buffalo in the US, believes that it is this poor understanding of the sub-surface geology that means we cannot assume that this latest eruption of Eyjafjallajökull is over just yet. "Icelandic volcanoes that erupted from fissures have, in the past, produced a profound climatic effect that can last several decades," he warns. "This volcano has a much more enigmatic record than others that have more frequent eruptions. It's not like we know the size of its magma chamber, the volume of its products or its history."

Eyjafjallajökull, which lies in the south of Iceland, has been so problematic because of the plumes of volcanic ash that have been carried on the wind across western Europe. Plumes of ash, however, are not the only volcanic hazards that can emerge when volcanic material interacts with ice. A more local threat is meltwater floods that result from the sudden release of water from glacial and subglacial lakes, known locally as *jökulhlaups*.

But these geological hazards are not confined to just Iceland. In a separate paper in the series, Hugh Tuffen, a researcher at Lancaster University in the UK, argues that rising global temperatures could also increase the number of global hazards caused by the melting of ice on glaciated volcanoes. Tuffen says that there is compelling statistical evidence that melting ice during the last deglaciation period triggered a dramatic acceleration in volcanic activity.

Unprepared for the hazard

Tuffen believes that we could be stumbling towards a similar situation with little understanding of the physical interactions between ice and volcanic activity. "We think the melting of ice can destabilize volcanoes, but in ways that we still don't fully understand," he says.

Tuffen is particularly concerned about the threat of mudflows and landslides that can result from both volcano collapse and glacial melt. "The communities living beneath the volcanoes of the Andes in South America may be particularly vulnerable," he says. The sort of threat he is referring to was realized in 1985 when the Nevado del Ruiz volcano erupted in Columbia, triggering mudflows that killed more than 23,000 people in one event.

Jenny Collier, a geologist at Imperial College in the UK agrees that there is more work to be done on the influence of ice melt on volcanism. "Volcanoes are inherently unstable structures – being steep sided and formed of layers of loose and variable material," she says.

About the author

James Dacey is a reporter for *physicsworld.com*

12 comments

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Run! Run! Calamities Galore!

Yes, yes, volcanic hazards could become fiercer and more frequent.

On the other hand, volcanic hazards could become milder and less frequent.

So why the scary headlines?

With kind regards,
Oliver K. Manuel
Emeritus Professor
Nuclear & Space Science
Former NASA PI for Apollo

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Quote:

*Originally posted by **Oliver K. Manuel***

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Man you got a definite opinion on anything dont you?

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In the science fiction disaster movie, 2012, the entire planet is in danger thanks to a massive neutrino burst warming the Earth's core. Well, let analyze this hypothesis more thoroughly.

In this article the earthquakes became five times more energetic, then before.

tinyurl.com...y3bu7ya

Evidence of global warming can be observed throughout whole solar system. These evidences were used against man-made global warming hypothesis and they persists, eventhough this hypothesis was confirmed independently for example by rainy weekends.

www.abovetopsecret.c...pg1

There are another indicia of hypothesis, Earth is passing through dark matter cloud, which possibly surrounds the approaching invisible massive object.

en.wikipedia.org...Nibiru_collision

The increasing of vacuum density by increasing of neutrino or axions density cannot be observed easily, because it's slowing down both clock speed, both light speed at the same moment. Well - at the case, if we are using the light (laser interferometry in particular) for measurement of both time, both space intervals. But when we use for example distance between Earth and Moon as a measure, we could determine these changes. By recent French study the light speed changes by a few centimeters per second each year as determined by Lunar ranging data.

physics.verticalnews...3088699.html

We still have old iridium meter and kilogram prototypes. These prototypes aren't dependent on the light speed in vacuum so much. When matter get into dense vacuum, it expands slightly. And this expansion could be observed by comparison of laser meter prototype and iridium meter prototype.

www.physorg.com...news108836759.html

Massive objects would swell in more dense vacuum and kilogram prototype would lost its mass, when compared with younger copies of it.

www.physorg.com...news64.html

In this context it may be significant, the decay speed of some radioactive elements was observed increasing.

physicsworld.com...36108

Solar minimum caused the cooling of atmosphere, but the temperature of ocean is still raising. It looks like something is heating it from bottom up. The source could be the geothermal heat from faster decay of radioactive elements inside of Earth core.

physicsworld.com...42356

www.skepticalscience...tal-Heat-Content.gif

There are another evidences, which aren't so conclusive. For example, the observed changes in geomagnetic field could be attributed to sudden change of convection due the center of mass of solar system. This position is normally driven by eleven years long period of Jupiter planet and it switches the circulation of solar plasma by Coriolis force (there is an evidence of correlation of climatic cycles and periods of solar activity. tinyurl.com...yhff54)

But recently we observed a deep violation of solar cycle periodicity. It could mean, something even more massive, then the Jupiter planet is flying around us.

Edited by Ragtime on Apr 24, 2010 3:38 AM.

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Apology

Quote:

*Originally posted by **Aetius***

Man you got a definite opinion on anything dont you?

You are right, Aetius. I am exasperated with all of the CO₂-induced global warming stories promoted by Al Gore, NASA, the NAS, the UN's IPCC and their army of Nobel Prize winning consensus scientists!

Please accept my apology.

With kind regards,
Oliver K. Manuel

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Better be prepare...

...no matter no body has the knowledge or the power to control the forces of Father Planet. Volcano La Sufriere in Monserrat Island is very active for the last years and no matter what, those ashes are pretty buggy and harmful.

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Pressure that can cause eruption

One kilopascal is supposed to cause detectable amount of additional eruptions? These folks must surely be joking.

Crusial bodies of magma rest roughly at a 11 kilometer depth which corresponds to pressure of 290 MPa, or 290,000 kPa. See

www.springerlink.com...

How is one kPa supposed to make any difference? It's like a 5-inch layer of soil. It's just sad that this kind of crackpottery has made it to Physics World, one of the few magazines that I considered to be focusing on meaningful content rather than fashionable insanities of uneducated yet passionate or corrupt activists.

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climate change

could the recent upsurge in tectonic plate movement ie earthquakes/volcanoes be due to the magnetic refrigeration at the poles shifting due to polarity reversal thus causing the spin of the mantle to become slow or erratic

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I hope I dont repeat thinks

Is this volcanic activity monitoring by satellites and not only this activity but also melting of ice in nearby saroundings.

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Quote:

*Originally posted by **lumidek1***

One kilopascal is supposed to cause detectable amount of additional eruptions? These folks must surely be joking.

For example scientists are proposing the possibility, that a giant dam may have triggered the earthquake that killed some 80000 people in China's Sichuan.

10

Gloven
Apr 25, 2010 11:00 PM
Prague, Czech Republic

online.wsj.com...391567210056475.html

The pressure of dam is comparable to pressure of glacier melted, when recalculated to area affected by this quake. The problem arises, when all this pressure gets concentrated into small area near contact of lithospheric plates.

Another example: Can foot of snow fell cause a 4.3 magnitude earthquake near Chicago? It's just a pressure of few grams per square foot. But even such minute pressure could become significant, when it affects large area at the same moment.

letsgorideabike.com...

Edited by Ragtime on Apr 25, 2010 6:00 PM.

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tuffen
Apr 26, 2010 12:11 PM

So why the scary headlines?

Because the ice on many volcanoes is rapidly thinning and there is strong evidence that in the past thinning of ice has led to an acceleration in volcanic activity.

Edited by tuffen on Apr 26, 2010 12:12 PM.

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Ragtime
Apr 26, 2010 12:39 PM
Prague, Czech Republic

Quote:

*Originally posted by **tuffen***
So why the scary headlines?

Of course, the message of this article is clear and self-evident. Only famous internet trolls could have problem with it.

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