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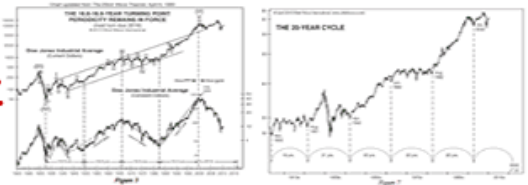
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BP Gulf Oil Gusher: Methane, Climate & Dead Zones

[Politics](#) / [Environmental Issues](#) Jul 11, 2010 - 12:53 PM
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Politics & Social

DK Matai writes: Gas and Methane Levels At Record

As much as one million times the normal level of methane is showing up near the Gulf of Mexico oil gusher, enough potentially to create dead zones in the water. "These are higher levels than we have ever seen at any other location in the ocean itself," according to sources cited by Reuters. The "flow team" of the US Geological Survey estimates that 2,900 cubic feet of natural gas, which primarily contains methane, is being released into the Gulf waters with every barrel of oil.



The constant flow of around 65,000 barrels of crude oil places the total daily amount of natural gas at over 188 million cubic feet. So far, over 13 billion cubic feet may have been released, making it one of the most vigorous methane eruptions in modern human history. The crude oil from the "Macondo Prospect" well contains around 40 percent methane, compared with about 5 percent found in typical oil deposits. To add to the challenge, methane and other toxic gases are trapped in deep water locations. Methane measurements can give a view to the extent of the oil gush in the Gulf of Mexico. Note our previous briefing: "[Gulf Oil Gusher: Danger of Tsunamis From Methane?](#)"



Dead Fish

Accelerating Effects

Like-for-like, methane is 23 times more potent than Carbon Dioxide or CO₂ at trapping solar radiation, as recognised within the Kyoto Protocol in 1997. Methane is far more reflective and calculated over a period of 20 years, as opposed to 100 years, its radiative force is 72 times that of CO₂ emissions. This makes vast releases of methane very powerful "positive feedback" loops that accelerate global warming.

Volatile Dead Zones

Dead zones are large regions of water that are very low in oxygen, a condition known as "hypoxia" and therefore they can't support life. At times in earth's history, the ocean currents have failed to stir the deepest waters. That is true today of the entire Black Sea, for instance. In those cases, whole ocean basins have stagnated. Conditions there eventually become anoxic -- without oxygen -- as the oxygen in the water disappears denying life. Above the water, the dead zones don't look any different from the surrounding waters. But along the bottom, there's practically no oxygen -- so fish don't swim in it, and bottom dwelling creatures die off.

Underwater toxic clouds of oil and methane gas have now been confirmed as originating from the Gulf of Mexico oil gusher. One of these clouds, encompassing an area the size of San Francisco and 600 feet thick, was found at 3,000 feet or more beneath the surface. Researchers studying the clouds have found concentrations of methane up to 10,000 times greater than normal and oxygen levels depleted by 30 to 40 percent below normal, according to various agencies. Given the rising number of numerous underwater clouds of methane of various sizes, what is the likelihood that they make their way to the surface either gradually or explosively?

As a result of the toxic methane clouds, oil and dispersants, organisms in the Gulf of Mexico are suffocating and it also explains why microbes that require oxygen to break down the oil are not cleaning the spill naturally. Worse is that long-lived "dead zones", ie zones without oxygen are likely, drifting through the Gulf of Mexico and perhaps over deep-water ecosystems where recovery time can be centuries, or not at all. Other larger clouds have been reported, and a large-scale coordinated effort is in motion.

Methane Driven Oceanic Eruption

It is worth considering the following scenario based on a volcano-like release of methane. Prof Gregory Ryskin, associate professor of chemical and biological engineering at Northwestern University in the US, suggests that the culprit for the Permian extinction event may be an enormous cascading eruption of natural gas -- primarily methane -- coming from the ocean depths. In a scientific article published in the September 2003 issue of *Geology*, Prof Ryskin suggested that huge combustible clouds produced by methane gas trapped in stagnant bodies of water and suddenly released could have killed off the majority of marine life and land animals and plants at the end of the Permian era -- long before dinosaurs lived and died.

According to Prof Ryskin, "Methane Driven Oceanic Eruption" is nothing new. Gigantic eruptions of methane gas dissolved in the deep ocean waters have occurred regularly throughout history, including ice ages and perhaps even the Biblical flood. "That amount of energy is absolutely staggering," according to Ryskin. "As soon as one accepts this mechanism, it becomes clear that if it happened once it can happen again." However, Prof Mark Maslin, director of the University College London (UCL) Environment Institute, points out that the conditions during the end of the Permian may have differed in comparison to the modern world, in terms of temperature, circulation and oxygen level within oceans.

Like A Volcano

Unlike oil, significant amount of methane gas dissolves in deep cold water. However, as that methane-water rises, the gas comes out of the solution and creates a methane mist, whose volume is seven times greater than pure water because of much reduced pressure. The resulting eruption is likely to spread quickly and release a part of the ocean basin's worth of natural gas in great clouds into the atmosphere. These could ignite because the amounts of flammable gas would be enormous. The subsequent fires and explosions would be catastrophic. A similar process is responsible for the most violent, explosive volcanic eruptions such as the eruptions of Mount Vesuvius in 79 CE or Mount St Helens in 1980. Those eruptions were driven by the escape of gases -- primarily water vapour -- dissolved in the liquid magma. However, in the underwater case the gas would be methane dissolved in liquid sea water with a similar result. A detailed description is available in Prof Ryskin's paper -- "Methane-driven oceanic eruptions and mass extinctions" -- with multiple citations of the paper by well known peers across the world.

Climate Domino Effects

Scientists have been discussing a number of scenarios of methane escaping from the ocean floor for some time. The sudden release of large amounts of natural gas -- primarily methane -- could be a cause of past, present and future climate chaos. It is believed that the release of trapped methane is a main factor in the global warming of 6°C that happened during the end-Permian extinction. "Methane Driven Oceanic Eruption" also predicts this will greatly affect available oxygen content of the atmosphere. As temperature rises, the permafrost is likely to melt. The methane released from beneath the permafrost could increase temperatures further, melting the permafrost faster, releasing even more methane, and so on. It is feared that such a scenario would accelerate Global Warming to the point where nothing humankind could do would reverse the problem. Note our previous briefing: "[Butterfly Effect, Oi Gusher & Edge of Chaos: World Wide Summit?](#)" However on the positive side, Prof Maslin in London points out that our estimates of the amount of methane locked up in gas hydrates on the planet have dropped over the last 3 decades as we learn more. A summary of our current knowledge can be found in "Gas Hydrates: Past and Future Geohazard?" by Maslin et al published in 2010.

Difference Between Methane and Gas Hydrates

Methane Clathrate -- also known as Methane Hydrates or Gas Hydrates -- is a form of naturally occurring water ice that contains a large amount of methane within its crystal structure. Methane Hydrates -- "the ice that burns" -- are one of the alternative sources of hydrocarbon fuels -- and one with reserves estimated to be larger than those of oil, gas and coal combined. Methane hydrates were first discovered in the 1970s. Their unique characteristic is that they are seemingly frozen and yet flammable. Over the last few years, China and India have reported massive finds of frozen methane gas off their coasts, which they hoped would satisfy their energy needs.

Environmentalists have expressed their concern that tapping methane hydrates could have adverse effects on the world climate from escaping methane that comes from the ocean floor. They believe that this methane could heat up the world's climate to a far greater extent than coal, oil and natural gas do today. However, this number is constantly being revised downwards and Prof David Archer et al at the Department of The Geophysical Sciences, University of Chicago, suggested in 2009 that methane release from gas hydrates could add a maximum of another 0.5°C to global warming by 2100.

Global Warming & The Gun Hypothesis

Although not related to Prof Ryskin's "Methane Driven Oceanic Eruption", the clathrate gun hypothesis works on the basis that rises in sea temperatures can trigger the sudden release of methane from methane clathrate compounds buried in seabeds and permafrost. The methane itself is a powerful greenhouse gas and this leads to further temperature rises and methane clathrate destabilisation -- in effect initiating a runaway process as irreversible, once started, as the firing of a gun. There is stronger evidence that runaway methane clathrate breakdown may have caused drastic alteration of the ocean environment and the atmosphere of earth on a number of occasions in the past. The seminal paper in this regard is the "Methane Hydrates in Quaternary Climate Change: The Clathrate Gun Hypothesis" by Prof James Kennett et al, at the Department of Geological Sciences and Marine Science Institute, University of California, Santa Barbara, published in 2003. Prof Maslin points out that subsequent scientific research has shown that though this was a very nice theory at the time, recent evidence suggests that the expansion and contraction of both tropical and high latitude wetlands control the long term evolution of methane in the atmosphere.

Oceanic Methane's Significance

What caused the worst mass extinction in earth's history 251 million years ago? An asteroid or comet colliding with earth? A greenhouse effect? Volcanic eruptions in Siberia? Or an entirely different culprit? There is strong evidence that a runaway methane driven oceanic eruption may have caused drastic alteration of the ocean environment and the atmosphere of earth on a number of occasions in the past, over timescales of tens of thousands of years; most notably in connection with the Permian extinction event. Though these extremely low probability high impact events from the past seem like science fiction, they do provide evidence of how the Earth System can operate. Prof Maslin in London suggests that methane release from gas hydrates is an additional effect. This could potentially be another geohazard, alongside natural gas or methane release in large quantities. We need to study methane gas emissions and monitor methane hydrates to ensure we understand the explosive potential of these reserves and the likelihood of tsunami generation, in combination, or on their own.

Conclusion

It is important to recognise the role that methane has played throughout history in causing massive turbulence within the Earth System. At this stage of the Gulf of Mexico catastrophe, it is important to pay close attention to the role that methane is playing in creating dead zones and potential sources for volatile eruption that could affect not just sea-based, but also land- and air-based life. Although a global-scale methane driven oceanic eruption is highly unlikely at present, there may be stagnant, oxygen-poor basins in the ocean where methane might accumulate to dangerous levels. Even a small explosion of that methane could cause a catastrophe. Imagine what would happen if such an event occurred. Tsunamis could be generated in continuous waves. Methane and water clouds would auto-ignite and the massive fires could cause widespread destruction.

Consequences could be global. "I have little doubt there will be another methane-driven eruption -- though not on the same scale as 251 million years ago -- unless humans intervene," says Prof Ryskin. Even if there is only a small probability that such eruptions could occur, we should start looking for areas of the ocean where this might be most likely, beginning with the underwater gas clouds and dead zones now being spawned by the Gulf of Mexico oil gusher. Could the methane also be mined using techniques developed within hydro-pondages? Maybe we could tap the methane as an energy source and burn it to produce electricity before it gets into the atmosphere. What would be your suggestions for diffusing those very large underwater methane clouds especially if, on their way to the surface, they could erupt explosively?

By DK Matai

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Asymmetric Threats Contingency Alliance (ATCA) & The Philanthropia

We welcome your participation in this Socratic dialogue. Please access by [clicking here](#).

ATCA: The Asymmetric Threats Contingency Alliance is a philanthropic expert initiative founded in 2001 to resolve complex global challenges through collective Socratic dialogue and joint executive action to build a wisdom based global economy. Adhering to the doctrine of non-violence, ATCA addresses asymmetric threats and social opportunities arising from climate chaos and the environment; radical poverty and microfinance; geo-politics and energy; organised crime & extremism; advanced technologies -- bio, info, nano, robo & AI; demographic skews and resource shortages; pandemics; financial systems and systemic risk; as well as transhumanism and ethics. Present membership of ATCA is by invitation only and has over 5,000 distinguished members from over 120 countries: including 1,000 Parliamentarians; 1,500 Chairmen and CEOs of corporations; 1,000 Heads of NGOs; 750 Directors at Academic Centres of Excellence; 500 Inventors and Original thinkers; as well as 250 Editors-in-Chief of major media.

The Philanthropia, founded in 2005, brings together over 1,000 leading individual and private philanthropists, family offices, foundations, private banks, non-governmental organisations and specialist advisors to address complex global challenges such as countering climate chaos, reducing radical poverty and developing global leadership for the younger generation through the appliance of science and technology, leveraging acumen and finance, as well as encouraging collaboration with a strong commitment to ethics. Philanthropia emphasises multi-faith spiritual values: introspection, healthy living and ecology. Philanthropia Targets: Countering climate chaos and carbon neutrality; Eliminating radical poverty -- through micro-credit schemes, empowerment of women and more responsible capitalism; Leadership for the Younger Generation; and Corporate and social responsibility.

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