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## LBL Publications

### Title

The global warming hiatus's irrelevance

### Permalink

<https://escholarship.org/uc/item/1h7761fm>

### Journal

Science, 350(6267)

### ISSN

0036-8075

### Authors

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### Publication Date

2015-12-18

### DOI

10.1126/science.350.6267.1482-d

Peer reviewed

## LETTERS

Edited by Jennifer Sills

## Retraction

IN THE REPORT “Observation of chiral currents at the magnetic domain boundary of a topological insulator” (1), we reported the observation of a chiral current in a topological insulator/ferromagnetic insulator heterostructure. The measurement used a superconducting quantum interference device (SQUID) to detect an ac magnetic field that we believed was produced by a current flowing in the sample. Depending on the conductivity of various layers of the sample, a similar signal can arise when electric coupling causes a vertical oscillation of the SQUID in the spatially varying magnetic field produced by the magnetism of the sample. We and collaborators have subsequently shown that the magnitude, shape, frequency dependence, and backgate-voltage dependence of the signal can be explained by the electric coupling artifact (2). Although this does not rule out the presence of chiral edge states in these samples, we cannot state that we have observed them. Thus, we must retract our results. This artifact does not affect other papers that used similar methods to image current in nonmagnetic samples.

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2. E.M. Spanton *et al.*, “Electric coupling in scanning SQUID measurements” (2015); <http://arxiv.org/abs/1512.03373>.

## Editorial expression of concern

IN THE 29 May 2015 issue, *Science* published the Research Article “The protein LEM promotes CD8<sup>+</sup> T cell immunity through effects on mitochondrial respiration” by I. Okoye *et al.* (1). On 23 October 2015, *Science* published a Correction to two

of the figures in the Okoye *et al.* paper (2). An investigation into potential errors in the paper is being undertaken by Imperial College London, UK. In light of the continuing investigation, *Science* is publishing this Editorial Expression of Concern to alert our readers to the fact that questions have been raised about the validity of findings in the Okoye *et al.* paper.

Marcia McNutt

Editor-in-Chief

Published online 10 December 2015;  
10.1126/science.aaa0548

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## Preventing tropical mining disasters

MINING FOR FOSSIL fuels and minerals is penetrating into many of the world’s most remote and biologically important tropical forests. In the Amazon, there are some 53,000 active mining leases (1), and hundreds of billions of dollars in new mines are planned across the Congo basin (2). But are extractive industries in the tropics investing sufficiently to prevent environmental disasters?

The urgency of this question is underscored by a recent disaster at the Samarco iron ore mine in Minas Gerais, Brazil. Tailing-pond dams burst on 5 November, disgorging 50 million cubic meters of mineral sludge into the Rio Doce. Hundreds of kilometers of river have been polluted, with potentially devastating long-term consequences for aquatic wildlife and hundreds of thousands of local inhabitants, who formerly relied on the river for water and fisheries (3). A disaster of this magnitude in a remote tropical forest would cause a catastrophic loss of hyperdiverse forest, and endanger indigenous tribes.

In tropical wet environments, huge quantities of rain can fall in short timespans. Tropical mines therefore require specially designed tailing ponds and infrastructure that can withstand massive inflows of water, but the engineering is often inadequate. This appears to have been the case in the Samarco disaster.

Although many nations require mining corporations to pay a bond to be held in escrow for future clean-ups, it is unclear how often or effectively this is being enforced in tropical developing nations. However, prevention is far better than cure. We urgently need a global framework to police the construction, management, and



maintenance of key infrastructure in tropical mines. Given that tropical nations are hungry for mining-tax revenues and mining corporations (including Vale, the joint owner of Samarco) are often major contributors to political parties, there will be temptations to overlook these urgent safeguards (4).

We propose an independent global authority to fulfill this critical role. Such an authority must be able to temporarily close failing or high-risk mines, and must have mechanisms for reporting to relevant stock exchange listings and financial institutions. Without independently verified security, there is an escalating risk of environmental catastrophe in the world’s tropical regions.

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## The global warming hiatus’s irrelevance

IN 2009, WE argued that short periods of warming or cooling in the observed global average temperature were inconsequential to conclusions about either the existence or magnitude of anthropogenic climate change (1). Natural variations on inter-annual and interdecadal time scales are combined with the effect of human-forcing factors in the observational record, and it came as no surprise that warming of the climate system is episodic and interspersed



A girl runs between mattresses inside a sports arena where residents are taking refuge after being displaced by bursting dams in Minas Gerais, Brazil.

with stagnant and even cooling periods.

This point appears to be completely lost in the ongoing public controversy surrounding the recent study by Karl *et al.* (2), which found that errors in previous estimates of the global surface air temperature were largely responsible for the so-called hiatus in warming since the late 1990s. The current public debate concerning the Karl *et al.* study is completely disconnected from the most important matter at hand: The human burning of fossil fuels, and the resulting emission of CO<sub>2</sub>, has long-term consequences on the entire climate system. How much future warming is realized at the end of the century depends far more on human behavior than it does on modes of natural variability (3).

Scientifically, a hiatus in global mean temperature increase provides an opportunity to more fully understand energy transport in the climate system, particularly during periods where natural variability dominates [e.g., (4)], and the role of variations in climate forcing factors, both natural (5, 6) and human (7). Evidence of the hiatus led the Intergovernmental Panel on Climate Change to slightly decrease the estimated lower bound (8) of the response of global mean temperature to a specified change in greenhouse gases, but the upper bound estimate remains unchanged (9).

As we cautioned in 2009, “Claims that global warming is not occurring that are derived from a cooling observed over such short time periods ignore...natural variability and are misleading” (1). We are disheartened by the abundance of misleading statements about climate change, justified by a temporary variation in the rate of global mean temperature increase, whether they be alarmist or denialist. To more fully understand the human signal amidst the natural noise, we must take the long view. In that sense, whether or not the early 21st century global warming hiatus existed is not important.

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#### ACKNOWLEDGMENT

The views expressed here are those of the authors and do not necessarily reflect the U.S. Department of Energy, the National Oceanic and Atmospheric Administration, or their subsidiary organization. Support for M.F.W. is provided by the Regional and Global Climate Modeling Program of the Office of Biological and Environmental Research in the Department of Energy Office of Science under contract number DE-AC02-05CH11231.

#### TECHNICAL COMMENT ABSTRACTS

##### Comment on “Dilution limits dissolved organic carbon utilization in the deep ocean”

Nianzhi Jiao, Louis Legendre, Carol Robinson, Helmuth Thomas, Ya-Wei Luo, Hongyue Dang, Jihua Liu, Rui Zhang, Kai Tang, Tingwei Luo, Chao Li, Xiaoxue Wang, Chuanlun Zhang

Arrieta *et al.* (Reports, 17 April 2015, p. 331) propose that low concentrations of labile dissolved organic carbon (DOC) preclude prokaryotic consumption of a substantial fraction of DOC in the deep ocean and that this dilution acts as an alternative mechanism to recalcitrance for long-term DOC storage. Here, we show that the authors' data do not support their claims.

Full text at <http://dx.doi.org/10.1126/science.aab2713>

##### Response to Comment on “Dilution limits dissolved organic carbon utilization in the deep ocean”

Jesús M. Arrieta, Eva Mayol, Roberta L. Hansman, Gerhard J. Herndl, Thorsten Dittmar, Carlos M. Duarte

Our recent finding that dilution limits dissolved organic carbon (DOC) utilization in the deep ocean has been criticized based on the common misconception that lability equates to rapid and complete utilization. Even when considering the redefinition of recalcitrant DOC recently proposed by Jiao *et al.*, the dilution hypothesis best explains our experimental observations.

Full text at <http://dx.doi.org/10.1126/science.aac7249>