

Beacon Hill Seminars – Spring 2018

Climate Vulnerability:

Responding to the Physical, Economic & Social
Challenges of Earth's Changing Climate

Session 5

The Climate Vulnerability of Agriculture and The Global Food System



4 April 2018

Tim Weiskel

Cambridge Climate Research Associates
Spring Semester 2018

Climate Vulnerability

Beacon Hill Seminars - 2018 Program

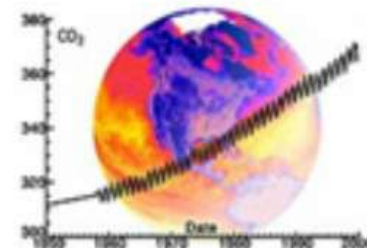
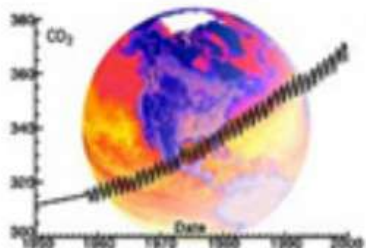
Responding to the Physical, Economic &
Social Challenges of Earth's Changing
Climate

conducted by

Timothy C. Weiskel

Research Director, Cambridge Climate Research Associates and
The Citizen-Science Online Learning Initiative (CSOLI)

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<http://www.ecoethics.net/CSOLI/BHS-2018/>

Suanna Selby Crowley, PhD, RPA

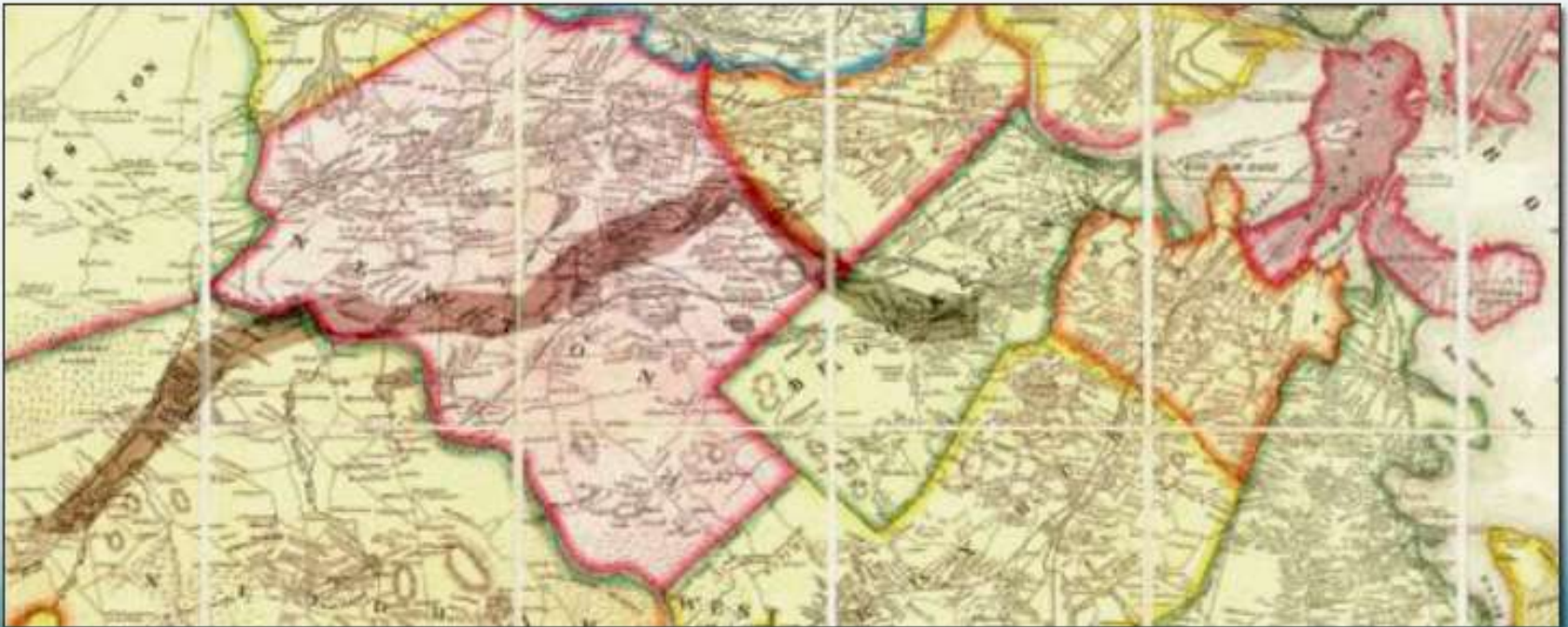
Director of Development & Outreach at the
Metropolitan Waterworks Museum

Suanna@AnthroScienceAdvisors.com

Dr. Suanna Selby Crowley is geoscientist with over 25 years of field and research experience. Her undergraduate work in anthropology and geology was completed at the **College of William & Mary in Virginia**. As a MacCracken Fellow at **New York University**, she received her Master's degree in anthropology and linguistics, and finished her Doctoral degree in anthropology and geoarchaeology.



1845-1848 Lake Cochituate Water System: Natick to Beacon Hill



Saving Paradise: Sea Level Rise, Changing Cape Cod's Groundwater

Posted on [March 31, 2018](#) | [Leave a comment](#) | [Edit](#)



<https://environmentaljusticetv.wordpress.com/2018/03/31/saving-paradise-sea-level-rise-changing-cape-cods-groundwater/>

Water Scarce Cities: Thriving in a Finite World

Posted on [April 3, 2018](#) | [Leave a comment](#) | [Edit](#)



<https://environmentaljusticetv.wordpress.com/2018/04/03/water-scarce-cities-thriving-in-a-finite-world-2/>

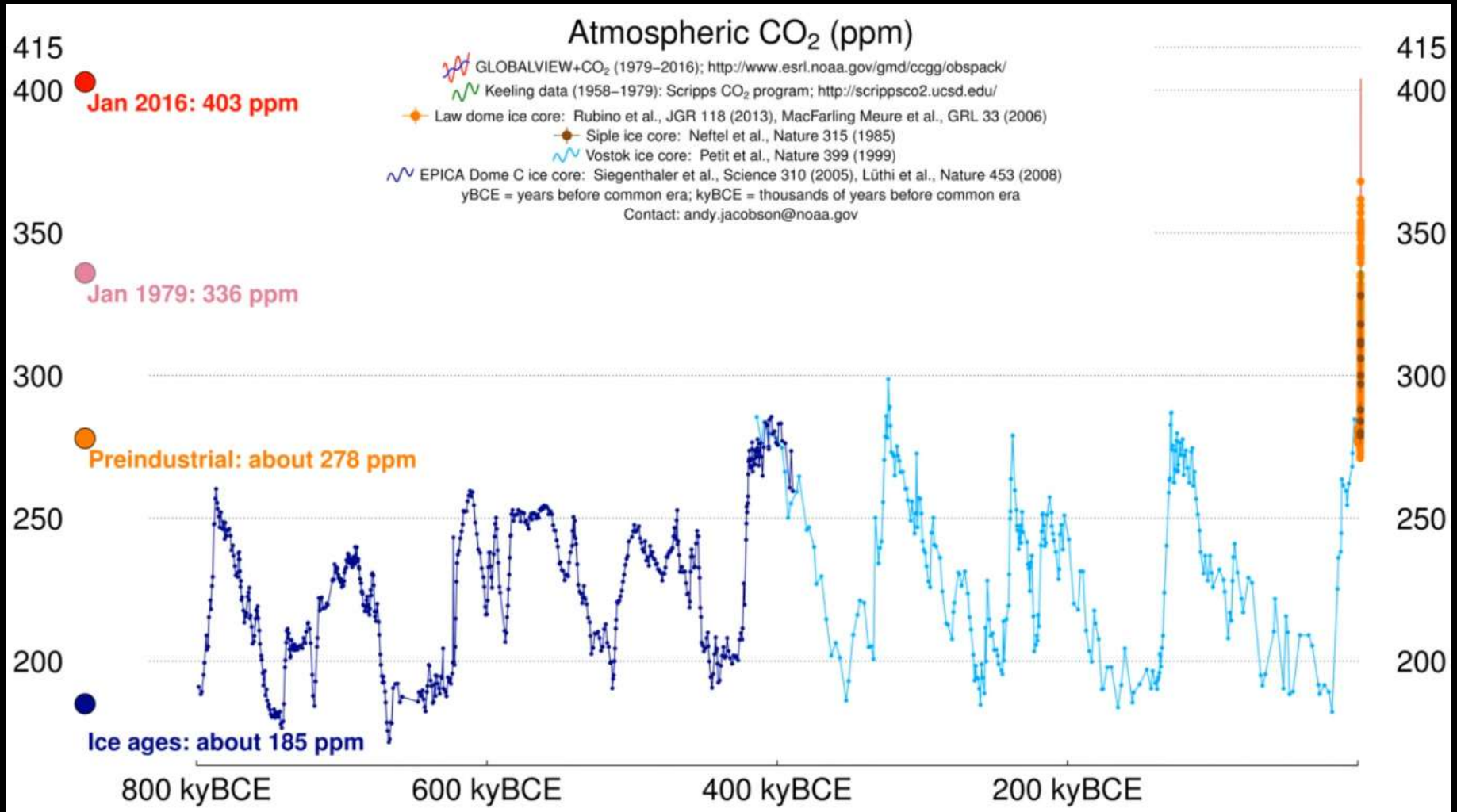
Let's remember where *we* are



Let's remember where *we* are
... in Earth's unfolding history...

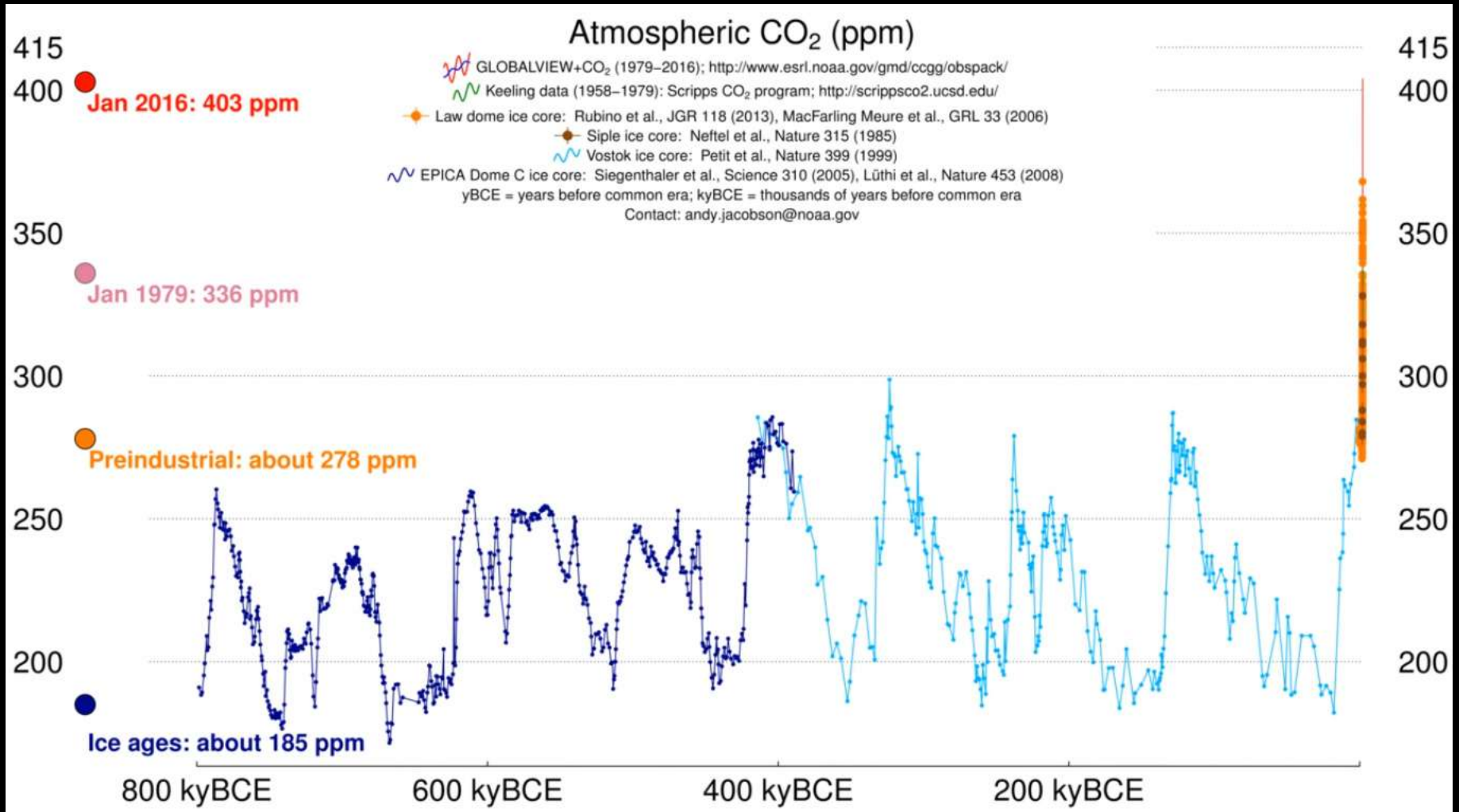


There are patterns in the data...



There are patterns in the data...

What are the significant ones?



Syndromes and Scenarios: Abrupt Change in Natural Systems

Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History

Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History

AGU FALL MEETING

San Francisco | 15–19 December 2014



Abrupt change: the past

- Abrupt change is a common and natural feature of the Earth's climate system
- Up until the 1990's we thought of climate change as mostly "gradual", forced primarily by sun-earth changes
- Greenland ice cores and ocean sediment cores changed that view...

<https://environmentaljusticetv.wordpress.com/2015/03/02/abrupt-climate-change-past-present-and-future/>

AGU FALL MEETING

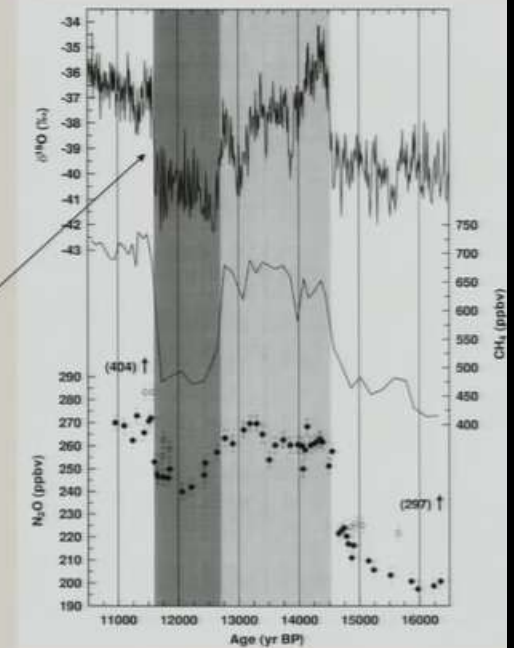
San Francisco | 15–19 December 2014



Abrupt climate changes: the story evolves

- **>10°C increase in Greenland temperature in 50 years**
- Double snow in 1 to 3 years
- Sea ice retreat in 1 to 2 years
- CH₄ up 50% in 50 years
- N₂O up 10% in 50 years

Copenhagen to Gibraltar is 10°C
Atlanta to Minneapolis is 9°C



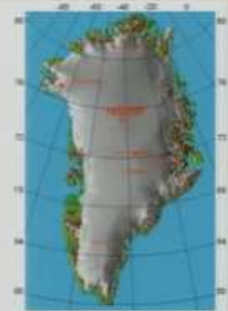
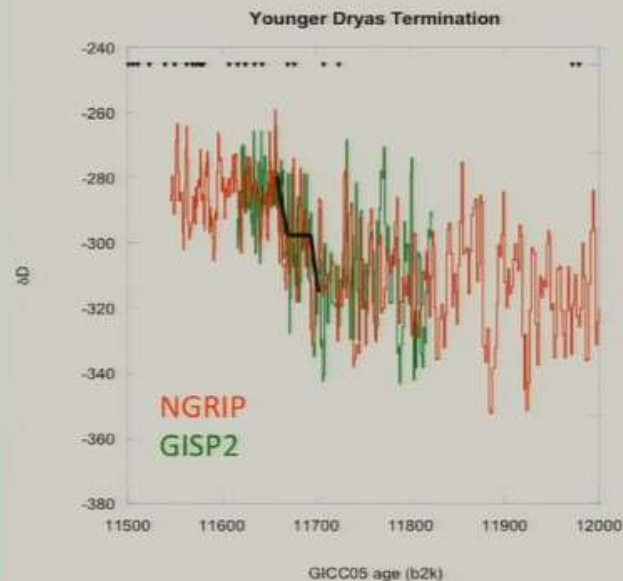
<https://environmentaljusticetv.wordpress.com/2015/03/02/abrupt-climate-change-past-present-and-future/>

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How abrupt is abrupt?



~1°C per year for
5 years in each
step... 100 times
faster than
current warming

<https://environmentaljusticetv.wordpress.com/2015/03/02/abrupt-climate-change-past-present-and-future/>

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AGU FALL MEETING

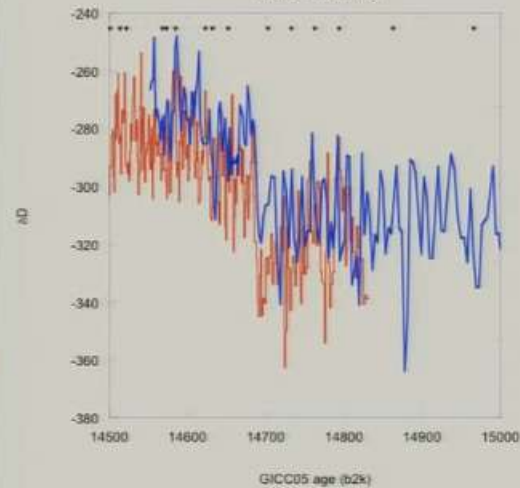
San Francisco | 15–19 December 2014



Can't get much more abrupt: Bølling warming in northern Greenland

NGRIP and NEEM

Bølling warming



Isotope change in 1 to 2 years in 2 cores...*Rate of inferred warming at northern sites 5-10 C per year!!!*

Up to 1,000 times faster than current warming

NEEM - NGRIP synchronizing match points (S.O. Rasmussen)

AGU FALL MEETING

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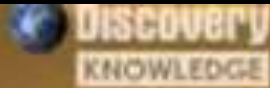


Abrupt change is happening NOW

www.climate.gov (NOAA)

Arctic Sea Ice






WHY ANCIENT EGYPT FELL

<https://environmentaljusticetv.wordpress.com/2014/07/08/why-ancient-egypt-fell-2/>





Dr Harvey Weiss
Dept of Anthropology & Near Eastern Languages
Yale University

Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History



Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History



Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History

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Abrupt change is happening NOW

www.climate.gov (NOAA) Arctic Sea Ice

A satellite-style map of the Arctic region, showing the Arctic Ocean and surrounding landmasses. The sea ice extent is highlighted in a bright blue color, contrasting with the darker blue of the open ocean and the greyish-brown of the land.

Syndromes and Scenarios: Abrupt Change in Natural Systems and Human History

AGU FALL MEETING
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Abrupt change is happening NOW

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Discovery KNOWLEDGE

WHY ANCIENT EGYPT FELL



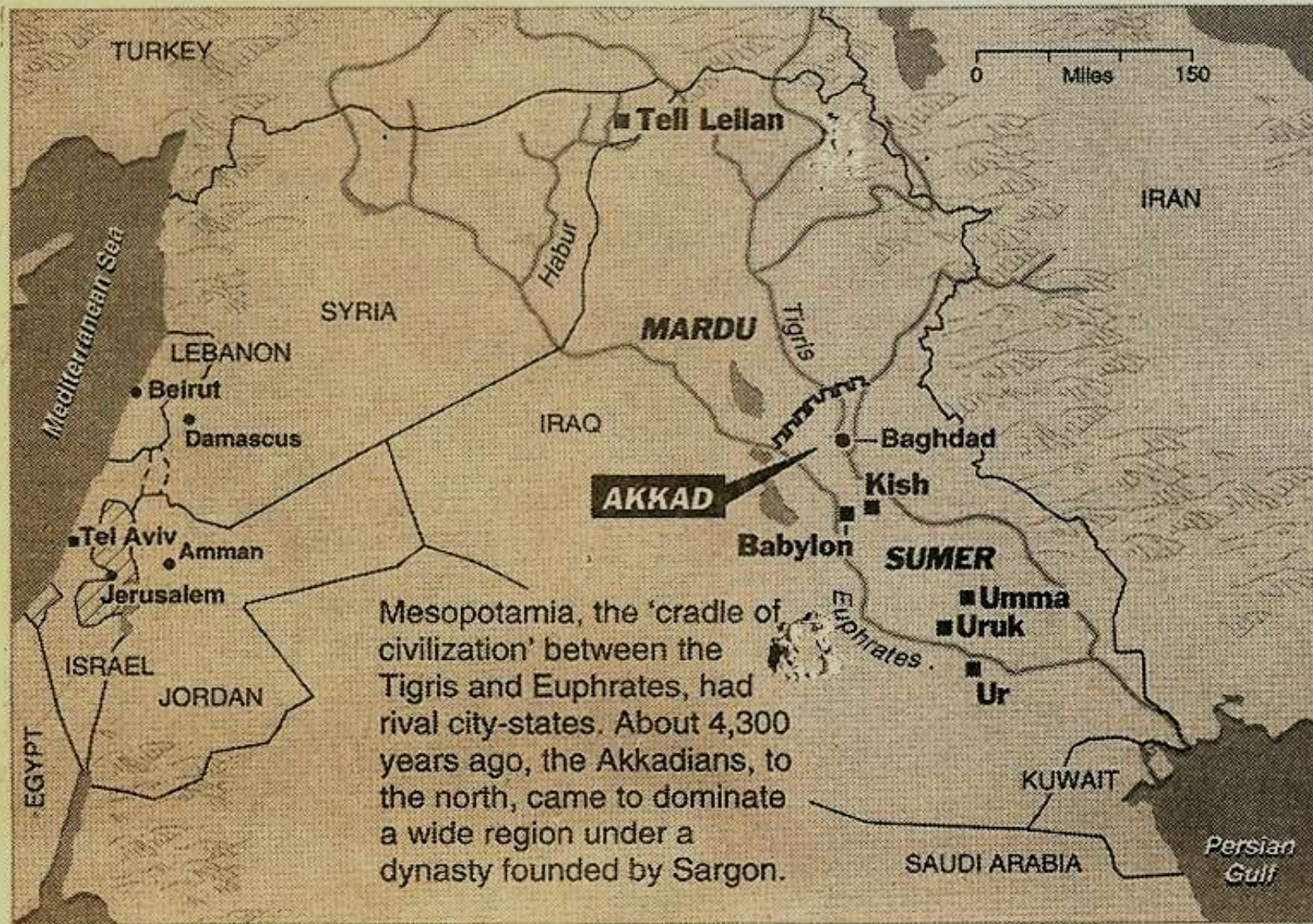
Discovery KNOWLEDGE



Discovery KNOWLEDGE

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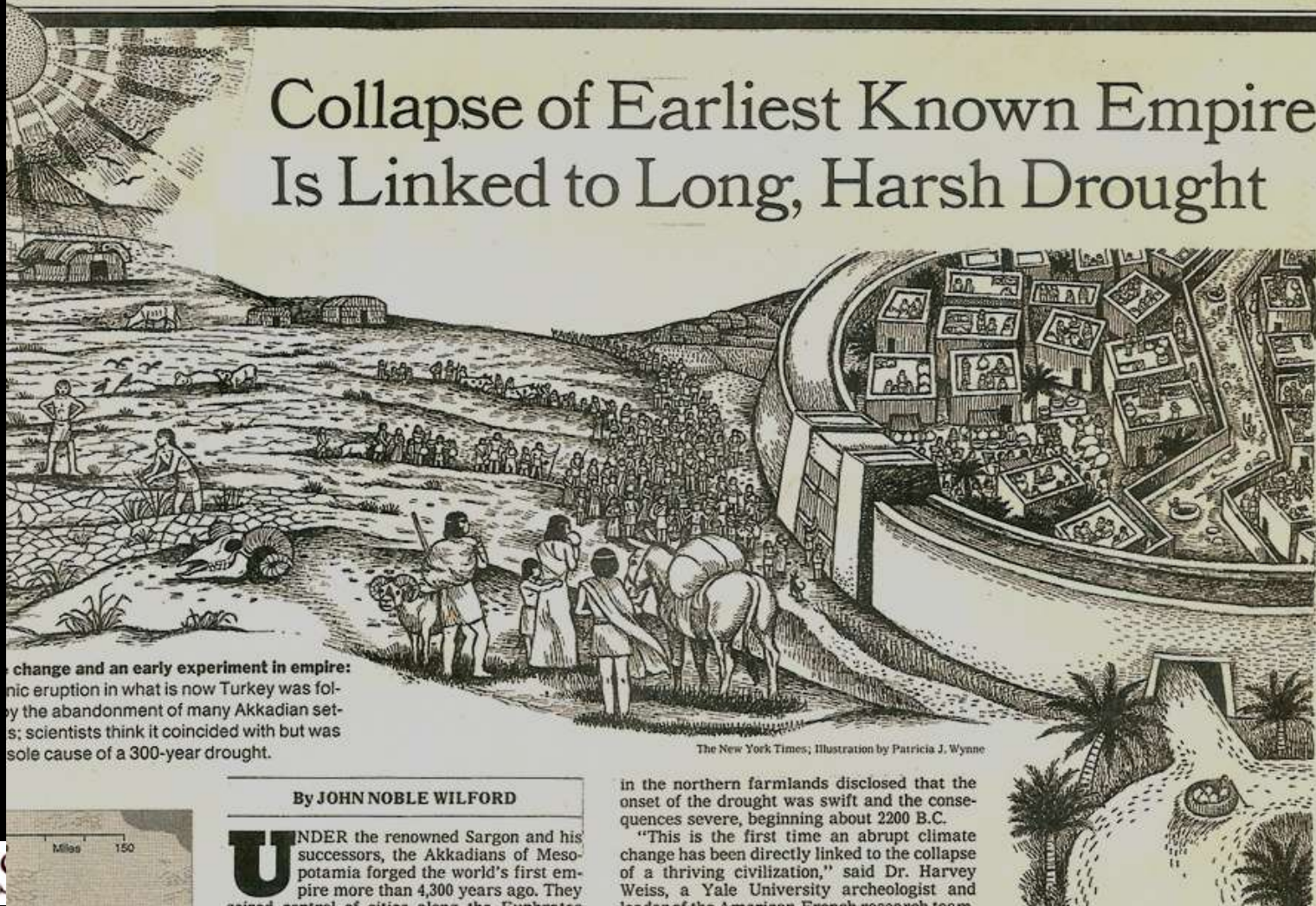




Mesopotamia, the 'cradle of civilization' between the Tigris and Euphrates, had rival city-states. About 4,300 years ago, the Akkadians, to the north, came to dominate a wide region under a dynasty founded by Sargon.

The New York Times

Collapse of Earliest Known Empire Is Linked to Long, Harsh Drought



The New York Times; Illustration by Patricia J. Wynne

change and an early experiment in empire: volcanic eruption in what is now Turkey was followed by the abandonment of many Akkadian settlements; scientists think it coincided with but was not the sole cause of a 300-year drought.

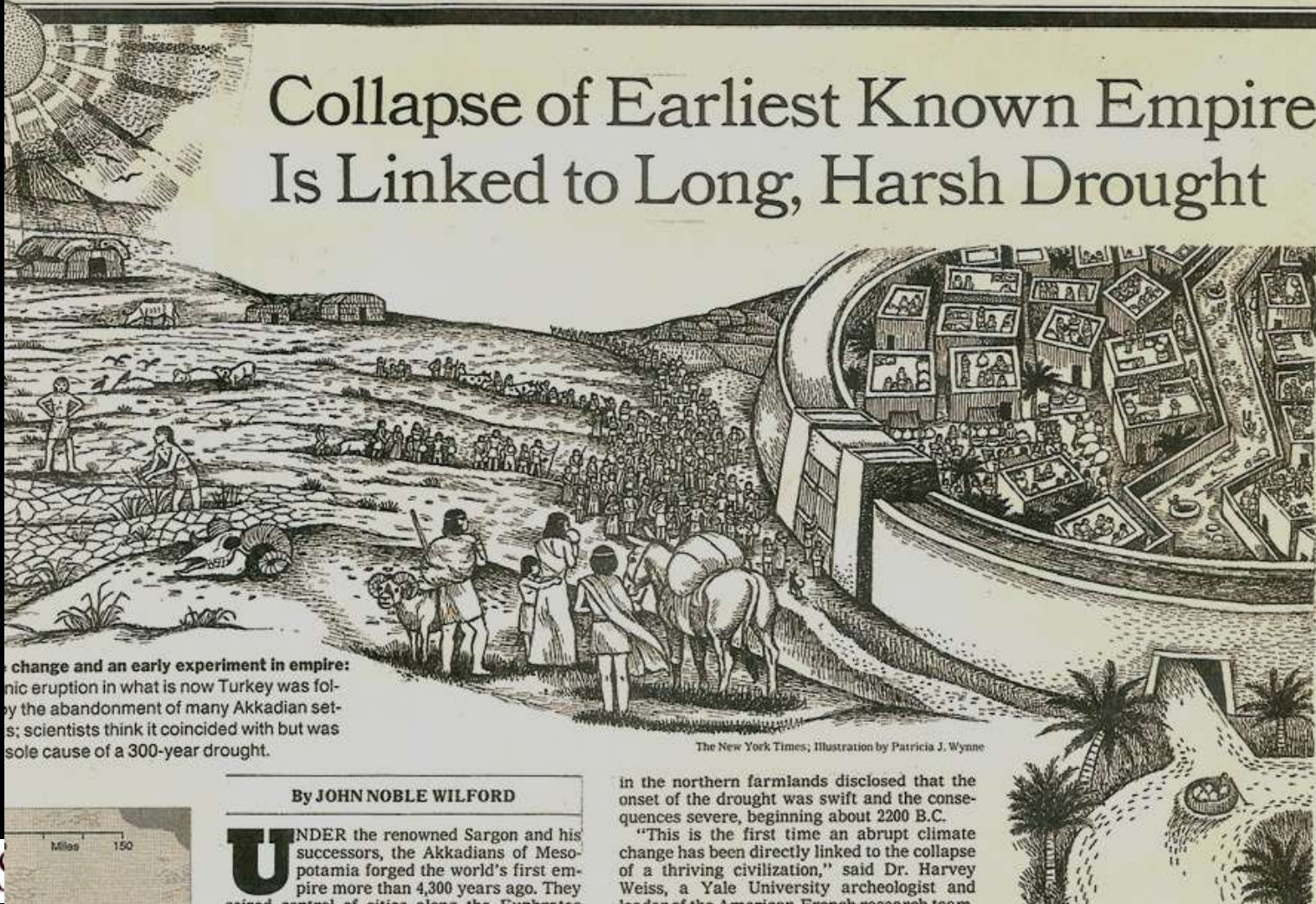
By JOHN NOBLE WILFORD

UNDER the renowned Sargon and his successors, the Akkadians of Mesopotamia forged the world's first empire more than 4,300 years ago. They seized control of cities along the Euphrates

in the northern farmlands disclosed that the onset of the drought was swift and the consequences severe, beginning about 2200 B.C.

"This is the first time an abrupt climate change has been directly linked to the collapse of a thriving civilization," said Dr. Harvey Weiss, a Yale University archeologist and leader of the American-French research team

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The New York Times; Illustration by Patricia J. Wynne

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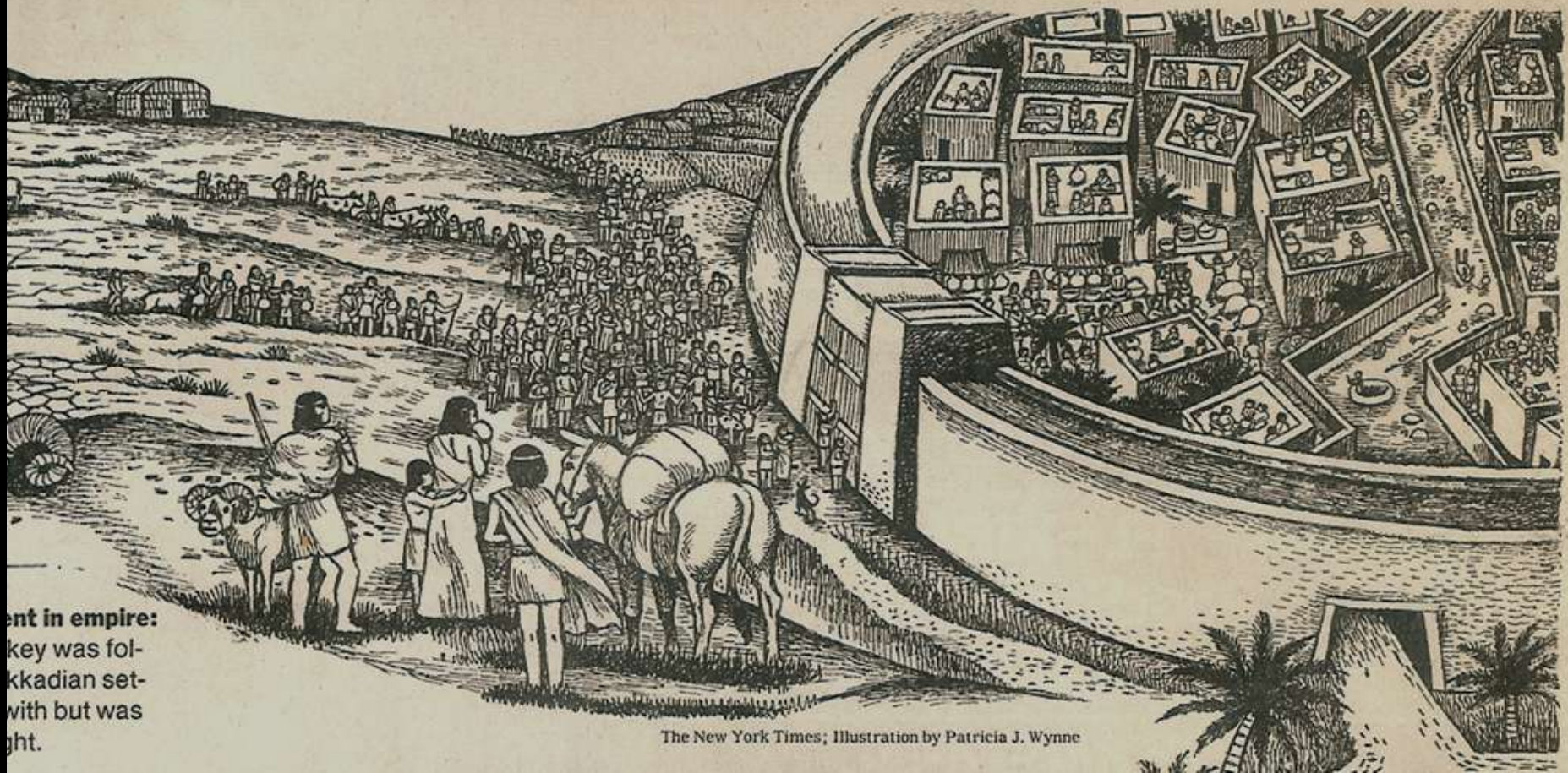
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The New York Times; Illustration by Patricia J. Wynne

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Megadrought and Angkor: Harvey W

Posted on [October 12, 2017](#) |

Megadrought and Collapse is the first book to treat in one volume the current paleoclimatic and archaeological evidence of megadrought events coincident with major prehistoric and historical examples of societal collapse. Previous works have offered multi-causal explanations for collapse, from overpopulation, overexploitation of resources, and warfare to poor leadership and failure to adapt to environmental changes. In earlier synthetic studies of major instances of collapse, the full force of climate change has often not been c

MEGADROUGHT AND COLLAPSE

FROM EARLY AGRICULTURE TO ANGKOR



NASA Predicts 20-40 Year Megadroughts In US Because Of Man-Made Climate Change

Posted on [February 10, 2016](#) | [Leave a comment](#) | [Edit](#)

The image shows a YouTube video player interface. At the top, the video title is "NASA Predicts 20-40 Year Megadroughts In US ...". Below the title, there are icons for a clock and a share button. The video content area shows a blurred background of a field with green plants. A "More videos" overlay is visible, featuring a grid of video thumbnails. The first thumbnail shows a man speaking, and the second shows a collage of images related to climate change, including a Harvard University logo and the word "BIOGESS". To the right of the thumbnails is a list of topics: 1) Climate Change & Extreme Weather, 2) Water Pollution & Scarcity, 3) Environmental Degradation, 4) Food Security, 5) Economy & Jobs, and 6) Geopolitics & War. The video player controls at the bottom show a play button, a volume icon, a progress bar at 0:12 / 2:42, a CC icon, a settings gear, the YouTube logo, and a full-screen icon.

Published on Wednesday, December 4, 2013 by Common Dreams

Humanity Wholly Unprepared for Abrupt Climate Impacts, Warns Report

'The pace of change is orders of magnitude higher than what species have experienced in the last tens of millions of years.'

- Jon Queally, staff writer



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350 Or Bust: Scientists Warn Even 2°C Warming Leads To 'Disastrous Consequences' And Must Be Avoided

Posted on December 5, 2013 | [Leave a comment](#) | [Edit](#)

<http://thinkprogress.org/climate/2013/12/03/3014701/scientists-warming-disastrous-350/>

By [Joe Romm](#) on December 3, 2013 at 5:04 pm

“350 Or Bust: Scientists Warn Even 2°C Warming Leads To ‘Disastrous Consequences’ And Must Be Avoided“

Humanity is choosing to destroy a livable climate, warn 18 of the world’s leading climate experts in a new study. Led by James Hansen, they make the strongest case to date for a target of 350 parts per million (ppm) of CO₂ in the air, or about 1°C (1.8°F) total warming.

Yes, we are already near 400 ppm (and rising 2 ppm a year), and have warmed more than 0.8°C since preindustrial times, so the authors understand the challenge. But in their [must-read article in the journal PLOS One](#), the scientists argue that “aiming for the 2°C [3.6°F] pathway would be foolhardy” because it “would have consequences that can be described as disastrous”:



350 Or Bust: Scientists Warn Even 2°C Warming Leads To ‘Disastrous Consequences’ And Must Be Avoided

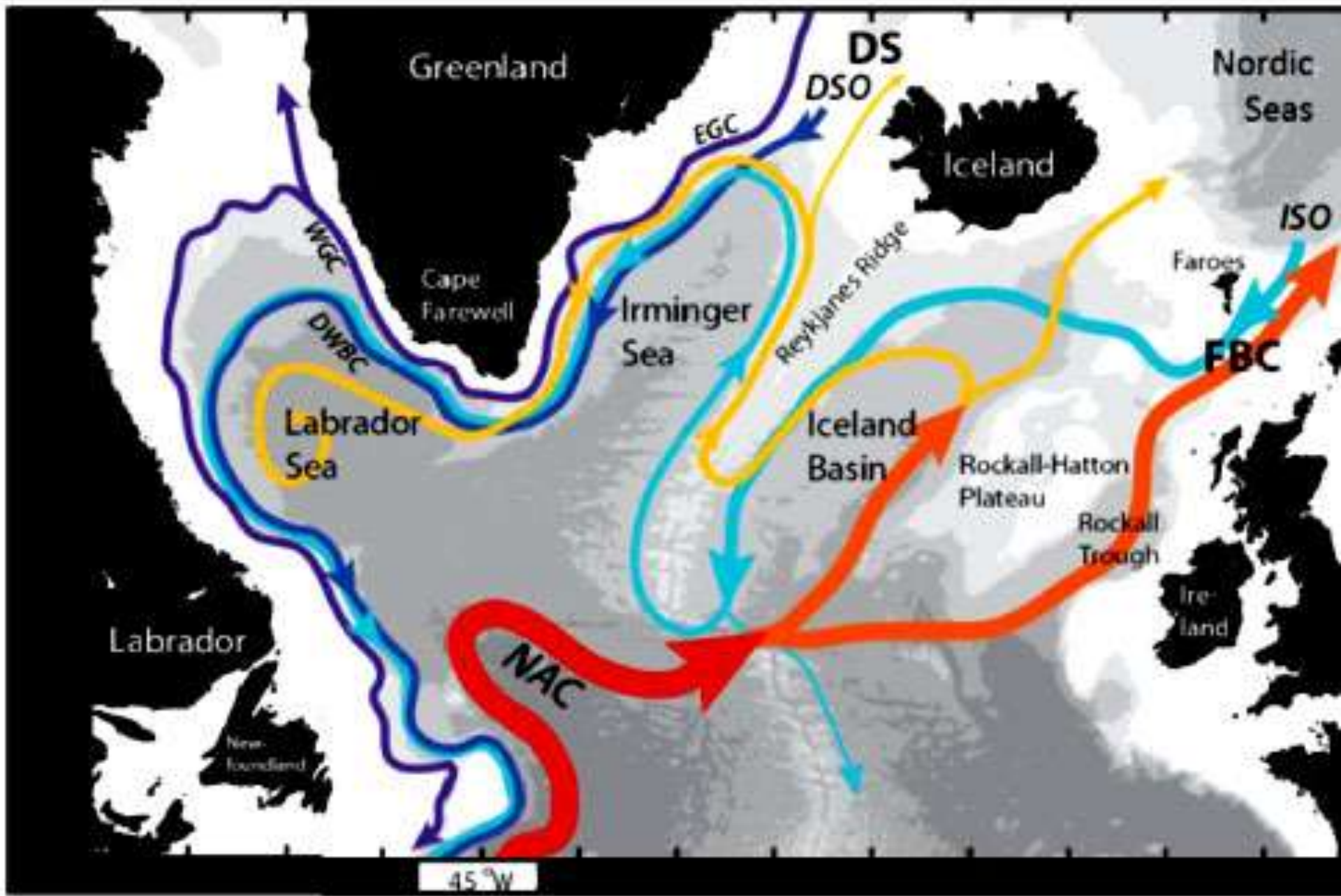
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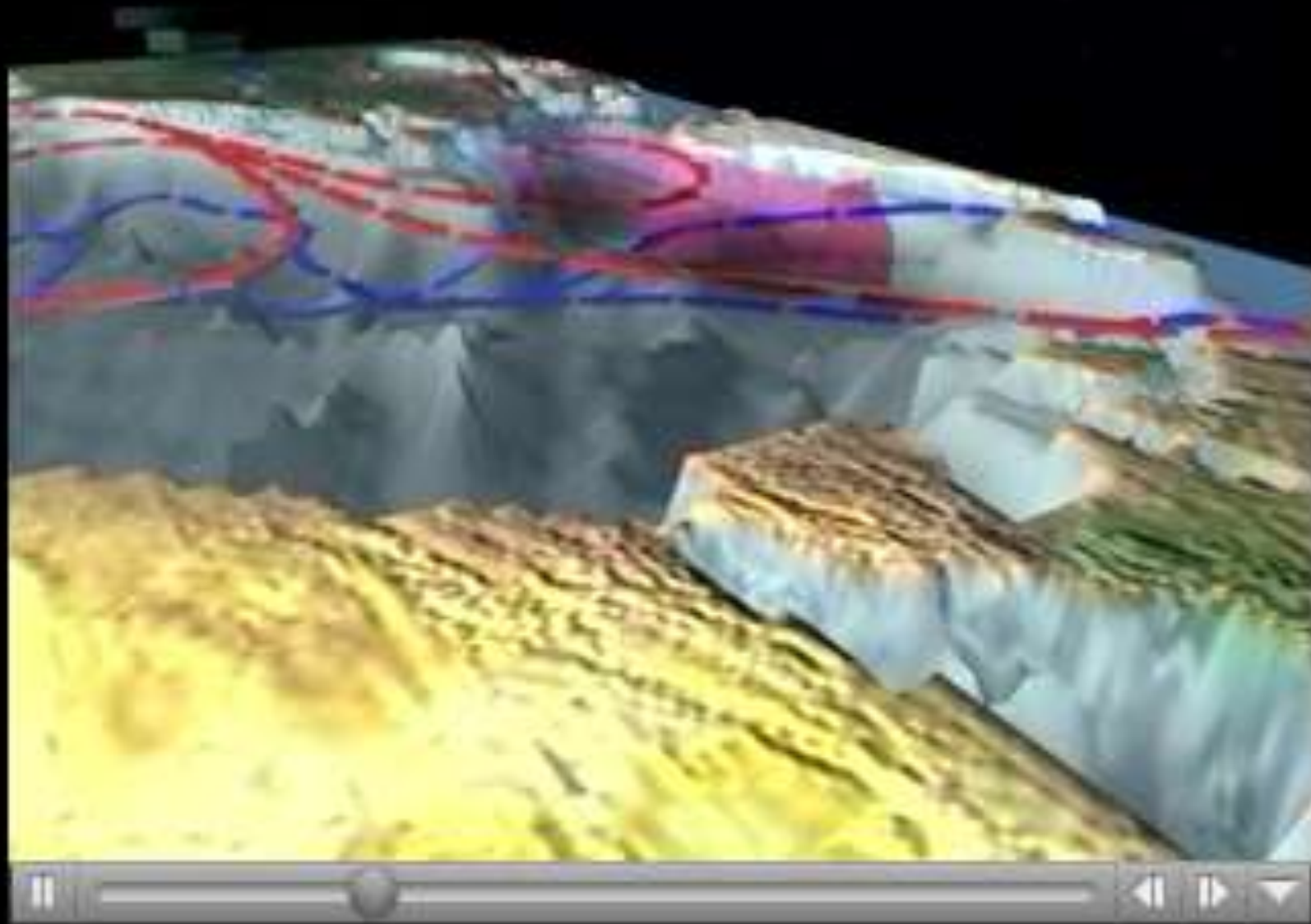


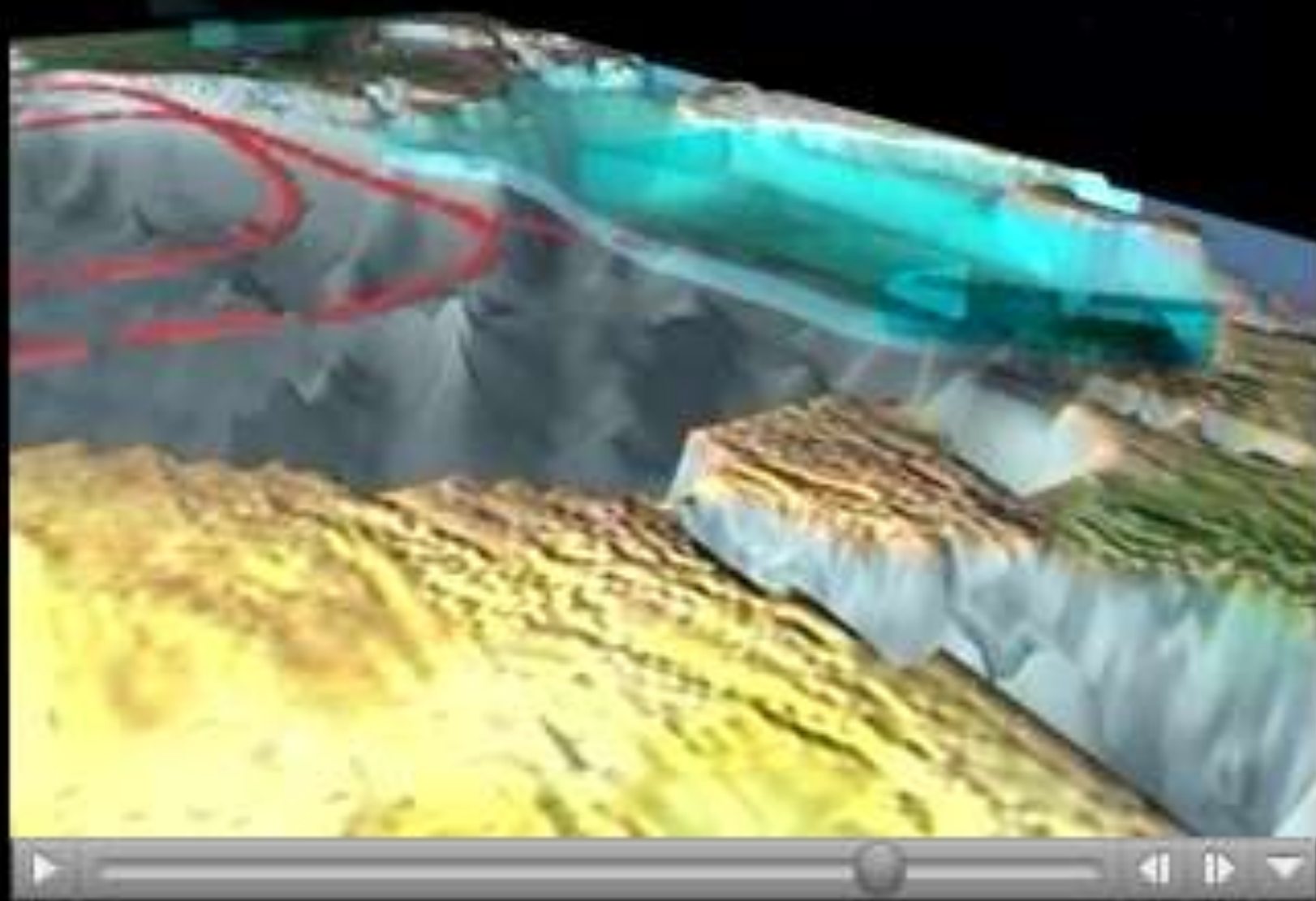


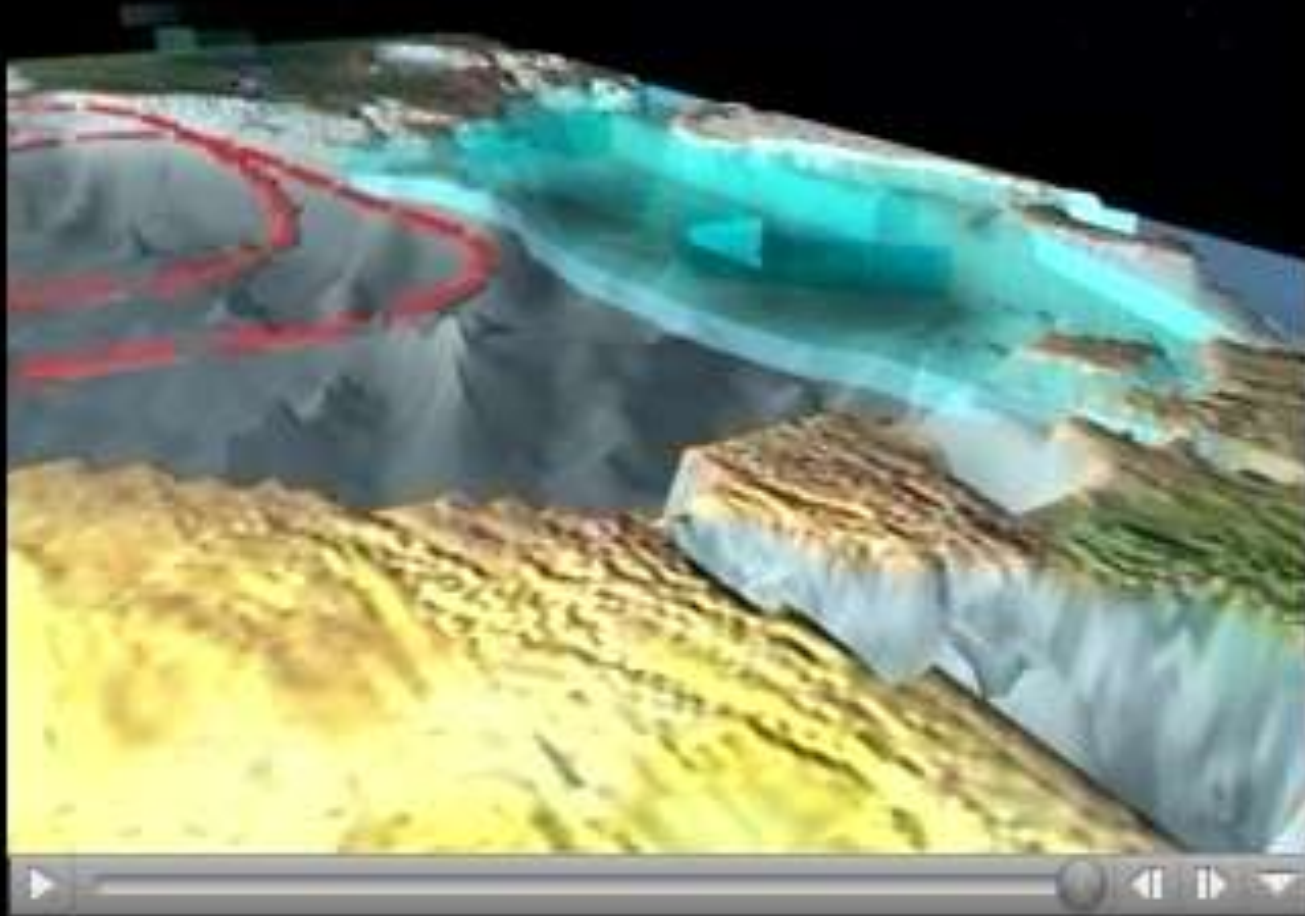


Animation: A simplified model of global ocean circulation] Abrupt Climate Change
from: "Abrupt Climate Change: Should We Be Worried? - Prepared for a panel on
abrupt climate change at the World Economic Forum Davos, Switzerland,
January 27, 2003," Ocean and Climate Change Institution - Woods Hole
Oceanographic Institution, (27 January 2003)

<http://www.whoi.edu/institutes/images/naocirc.mov>







Animation: "If too much fresh water enters the North Atlantic..." Abrupt Climate Change: Should We Be Worried? - Prepared for a panel on abrupt climate change at the World Economic Forum Davos, Switzerland, January 27, 2003," Ocean and Climate Change Institution - Woods Hole Oceanographic Institution., (27 January 2003).

<http://www.whoi.edu/institutes/images/NAShutdown320.mov>

How Drought and Climate Change Helped Make ISIS (w/ Prof. Richard Seager)

Posted on [March 6, 2015](#) | [Leave a comment](#) | [Edit](#)





Cyprus - Vital Indicator of Mediterranean Climate Change



CYPRUS DROUGHT
SEVERE LACK OF WATER ON THE ISLAND

OR BLAMES BIOFUEL PRODUCTION FOR RISING FOOD COSTS

Cyprus running out of water 2008



TURKEY'S WATER SOURCES DRY UP
INCREASED DESERTIFICATION OF ARABLE LAND

Increased desertification of Turkey's arable land -22 Aug



Hadi Mizban/AP

Adilla Finchaan, 50, checks her drought-stricken land in Latifiyah, about 20 miles south of Baghdad, in this photo taken in July 2009. Below-average rainfall and insufficient water in the Euphrates and Tigris rivers — something the Iraqis have blamed on upstream dams in Turkey and Syria — have left Iraq bone-dry for a second straight year.

Audio player interface with controls: play/pause, stop, previous, next, volume, and progress bar. The progress bar shows the audio is at the beginning.

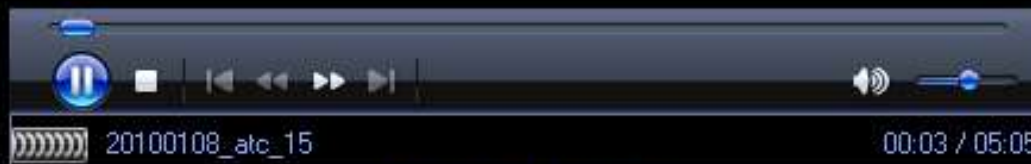
20100107_atc_11 00:05 / 07:46

Click to Play, Pause, Stop
"Mideast Water Crisis Brings Misery, Uncertainty."
 NPR - All Things Considered, (7 January 2010).



Ed Kashi/Corbis

The massive Ataturk Dam (shown here in 1992), in southeast Turkey, harnesses water for one of the biggest irrigation and electric power schemes in the world. A drought and other factors have created an acute water shortage in the Middle East, and resentment in countries downstream from Turkey is growing.



Click to Play, Pause, Stop

"Tide Of Arab-Turk Tension Rises Amid Water Shortage."
NPR - All Things Considered, (8 January 2010).

http://public.npr.org/anon.npr-beason-all-seminars-mp3/npr/atc/2010/01/20100108_atc_15.mp3



"Water shortage threatens Malta - 17 Nov 08," *YouTube - AlJazeeraEnglish*, (17 November 2008).



"Water crisis in Israel," *YouTube - ChoiceJJ, (27 January*



Limassol, Cyprus



"Three tornadoes hit cyprus," *YouTube*, (2 March 2007).

Tornado over Nicosia Cyprus |Part-2|

CrazydudeBG

10 videos

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Tornado over Nicosia Cyprus |Part-2|

A satellite-style image of the island of Cyprus, showing its terrain and coastline. A teal-colored rectangular box is overlaid on the top portion of the image, containing the title text in yellow. The background is a dark blue space with some white cloud-like patterns.

Cyprus: Report from the Front Lines of Climate Change

Cyprus - Vital Indicator of Mediterranean
Climate Change

An Abrupt Climate Change Scenario and Its Implications for United States National Security
October 2003

By Peter Schwartz and Doug Randall

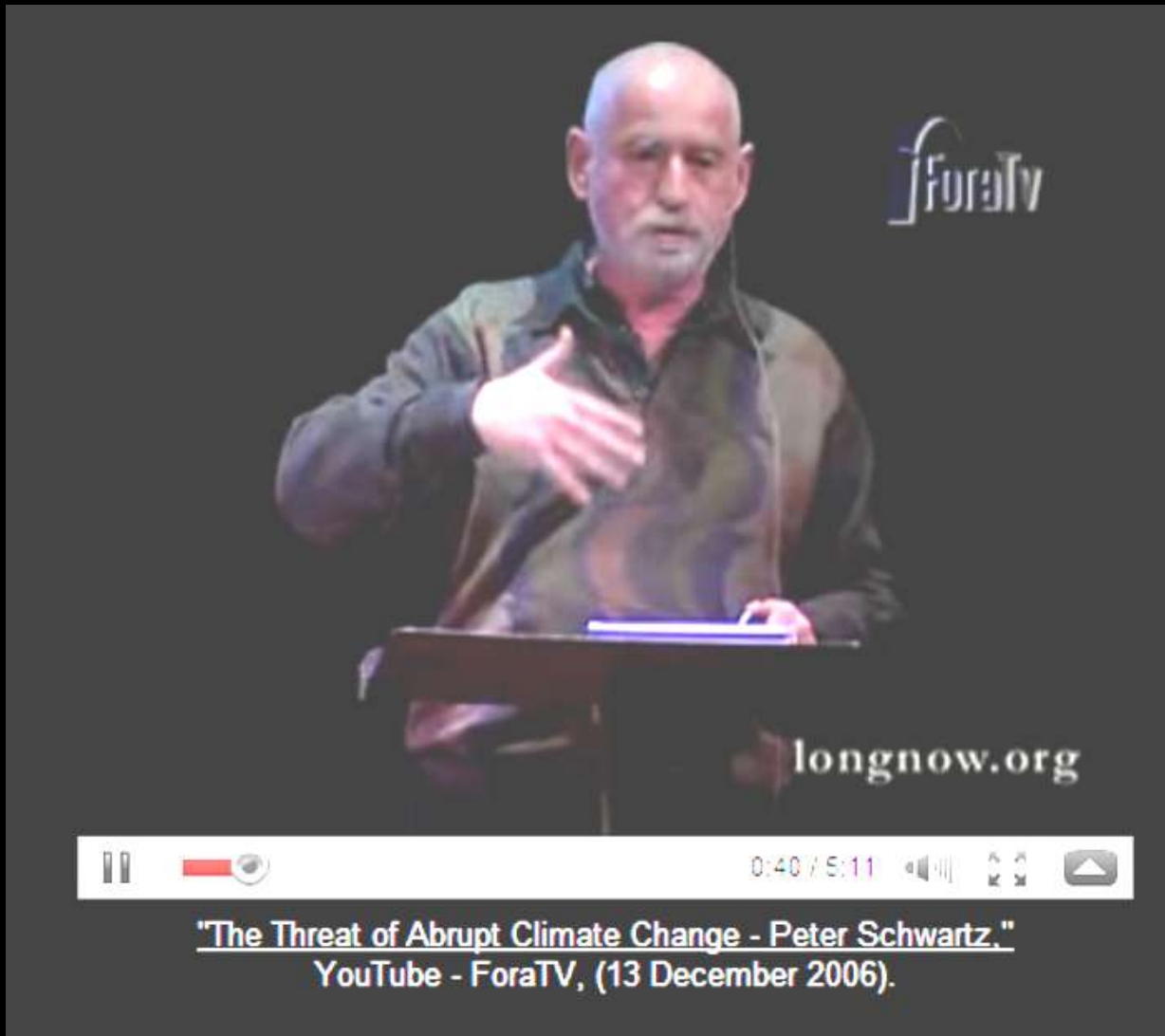
Imagining the Unthinkable

The purpose of this report is to imagine the unthinkable – to push the boundaries of current research on climate change so we may better understand the potential implications on United States national security.

We have interviewed leading climate change scientists, conducted additional research, and reviewed several iterations of the scenario with these experts. The scientists support this project, but caution that the scenario depicted is extreme in two fundamental ways. First, they suggest the occurrences we outline would most likely happen in a few regions, rather than on globally. Second, they say the magnitude of the event may be considerably smaller.

We have created a climate change scenario that although not the most likely, is plausible, and would challenge United States national security in ways that should be considered immediately.

Executive Summary



Part 1

Part 2



"Climate change to spark armed conflicts?,"
MSNBC, (11 December 2009).

<http://www.nbcnews.com/id/21134540/vp/343859>

[63#34385963](http://www.nbcnews.com/id/21134540/vp/343859)



"Climate change
MSNBC,



**NATIONAL SECURITY
AND THE THREAT OF
CLIMATE CHANGE**

SecurityAndClimate.cna.org

The **CNA** Corporation
Assess the risks. Break the news.

Climate Change and the Structure of the Global Food System



The Transition Toward a Sustainable Agriculture

Beacon Hill Seminars – Spring 2018

Climate Vulnerability:

Responding to the Physical, Economic & Social
Challenges of Earth's Changing Climate

Session 5

The Climate Vulnerability of Agriculture and The Global Food System



4 April 2018

Tim Weiskel

Cambridge Climate Research Associates
Spring Semester 2018