WACKY WEATHER?
WHAT’S UP WITH THAT? . . .
Updates from Science of Climate Change

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WACKY WEATHER
WHAT’S UP WITH THAT?
Climate Change Series

Topics In This Series:

1) Updates from Science of Climate Change
2) Impacts and Responses: Social Systems
   Human Health and Resilient Communities
3) Impacts and Responses: Agriculture and Food Systems
4) Impacts and Responses: Biodiversity and Ecosystems
WACKY WEATHER? What Do You Mean?

Wacky . . . as in eccentric, crazy, erratic
WAIT A MINUTE! AREN’T WE SUPPOSED TO BE SERIOUS HERE?

WELL YES! BUT WHO SAYS THAT WE CAN’T MAINTAIN A SENSE OF HUMOR ABOUT SERIOUS MATTERS?

If I had no sense of humor, I would long ago have committed suicide.

Mahatma Gandhi

A well-developed sense of humor is the pole that adds balance to your steps as you walk the tightrope of life.

William Arthur Ward
By definition, extreme weather events are rare and based on a long record of observations and data to establish definitive links between severe events and climate change.
First, Some Definitions . . .

❖ **Weather**
- basically the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities over a short period of time.

❖ **Climate**
- the average of weather over time and space over relatively long periods of time.

❖ The difference between weather and climate is a measure of time.

See the video ‘Weather vs Climate Change’ at [https://www.youtube.com/watch?v=cBdxDFpDp_k](https://www.youtube.com/watch?v=cBdxDFpDp_k)
“Making Sense of the Wacky Weather” By JUSTIN GILLIS
MARCH 30, 2012 — see
https://green.blogs.nytimes.com/2012/03/30/making-sense-of-the-wacky-weather/?_r=0
The Many Faces of Climate Change

CATASTROPHIC CLIMATE CHANGE WARNING FROM UN.....

MAYBE PEOPLE WILL NOTICE IF I TWEET A SELFIE...
The Many Faces of Climate Change...

... storms, floods, and forest fires have battered the U.S.

Super Storm Sandy, 2012

East Coast Flooding, 2013
The Many Faces of Climate Change...

...storms, floods, and forest fires have battered the U.S.

Arizona Extreme Wildfires, 2014

US Mega Wildfires, 2015
The Many Faces of Climate Change...

... including super tornados in the U.S.

EF5 tornado, Oklahoma, May 2013
The Many Faces of Climate Change…
…and blizzards raged across US and Europe

2014 Europe Winter Storms

2015 New England Blizzard
The Many Faces of Climate Change...

...also floods have battered the world.

Europe Floods, 2013

Flood Area

The Many Faces of Climate Change...

...also floods have battered the world.

Europe Floods, 2013

The Many Faces of Climate Change...

...also floods have battered the world.

Europe Floods, 2013

The Many Faces of Climate Change...

...also droughts have ravaged the world.
The Many Faces of Climate Change...

...also, storms have battered the world.

Super Typhoon Haiyan in Philippines, Jan 2014
Arctic Polar Ice Cap Melting Over Time

1984
6.70 million square kilometers
(2.59 million square miles)

2012
3.41 million square kilometers
(1.32 million square miles)

See the video “Arctic Ice: at https://www.youtube.com/watch?v=iS_XfvSylCs
Global Polar Ice Cap Melting Trends

- NASA 2014 study reports the Earth, as a whole, has been losing sea ice at an annual rate of 13,500 square miles per year, an area roughly the size of the state of Maryland.

- Global sea ice loss has actually accelerated in the last 17 years.

- Ice cap melting trends:
  - Arctic ice cap continues to show losses
  - Antarctic ice cap recently showed gains

http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-14-00605.1
Antarctic Polar Ice Cap Changes Over Time
Greenland Ice Sheet Surface Melting Timeline

Surface melting on Greenland is expanding

- 1992
- 2002
- 2005
- 2012

2012 – 97% of ice sheet surface has melted!
The Many Faces of Climate Change

Selected Significant Climate Anomalies and Events in 2016

**CANADA**
A wildfire destroyed large parts of Fort McMurray (Alberta) in early May and became the costliest natural disaster in Canada’s history.

**ALASKA**
2016 was the warmest year for the state since records began in 1925.

**CONTIGUOUS UNITED STATES**
2016 was the 2nd warmest year on record for the contiguous U.S. Every state was warmer than average.

**ARCTIC SEA ICE EXTENT**
During its growth season, the Arctic had its smallest annual maximum extent for the second year in a row. During its melt season, the Arctic reached its 2nd smallest minimum extent on record (tied with 2007).

**EUROPE**
Europe experienced its 3rd warmest year, behind only 2014 (record warm) and 2015 (2nd warmest), making the past three years the three warmest in the 107-year continental record. The average winter (Dec 2015–Feb 2016) temperature was record high.

**TYPHOON LIONROCK**
(Aug 16th-31st)
Lionrock impacted northeastern areas of the Democratic People’s Republic of Korea (DPRK), where rainfall of up to 326 mm in four days led to catastrophic flooding and 133 fatalities.

**ASIA**
Asia observed its 3rd warmest year on record, behind 2015 (record warmest) and 2007 (2nd warmest). Aug, Aug, and Sep were each record warm, while Oct and Nov were both cooler than their long-term averages.

**TROPICAL STORM DARBY**
(Jul 11th-28th)
Tropical Storm Darby was the second tropical cyclone in the past three years to make landfall in Hawaii, and only the fifth landfalling cyclone there since records began in 1949.

**ARABIAN SEA**
2016 was the 2nd warmest year on record since 1950, with a maximum temperature of 28.2°C recorded in April.

**MIDDLE EAST**
On Jul 14th, according to preliminary reports, a temperature of 54.0°C was recorded at Mitribah, Kuwait. Upon verification, this will be the highest temperature on record for Kuwait.

**INDIA**
On May 19th, Phalodi, India reached a temperature of 51.0°C, becoming the highest temperature on record for the country.

**WESTERN PACIFIC OCEAN**
**TYPHOOHN SEASON**
Average activity. 26 storms, 13 typhoons.

**SOUTH WEST PACIFIC OCEAN**
**CYCLONE SEASON**
Average activity. 11 storms, 6 cyclones.

**ANTARCTIC SEA ICE EXTENT**
During its growth season, the Antarctic had its 10th smallest annual maximum. During its melt season, the Arctic reached its 9th smallest minimum extent on record (tied with 2007).

Please Note: Material provided in this map was compiled from NOAA’s State of the Climate in Global Location Reports and international partners. For more information please visit: [http://www.ncdc.noaa.gov/sotc](http://www.ncdc.noaa.gov/sotc)
The Many Faces of Climate Change…

Selected Significant Climate Anomalies and Events in 2015

ALASKA
The year 2015 tied with 2002 as the second warmest year since statewide records began in 1935, behind 2014.

CANADA
Parts of western Canada had their warmest summer on record. Moderate to extreme drought developed across parts of western Canada due to the unusual warmth and dryness.

ARCTIC SEA ICE EXTENT
During its growth season, the Arctic had its smallest annual maximum extent. During its melt season, the Arctic reached its fourth smallest minimum extent on record.

ASIA
Much-warmer-than-average conditions were present across much of the continent. 2015 was the warmest year since continental records began in 1910. Russia had its warmest Jan–Sep since national records began in 1936. China had its warmest Jan–Oct, with Hong Kong experiencing its warmest Jun–Aug period on record.

EASTERN NORTH PACIFIC BASIN
August 2015
At the end of August, three storms—Kilo, Ignacio, and Jimena—represented the first simultaneous occurrence of three major hurricanes in the basin since records began in 1949.

CONTIGUOUS UNITED STATES
The contiguous U.S. had its second warmest (behind 2012) and third wettest year since national records began in 1895. May 2015 was the wettest month of any month on record.

EUROPE
Europe, as a whole, experienced its second warmest year on record, behind 2014. Several countries had a top 5 year: Spain (warmest), Finland (warmest), Austria (2nd), Germany (2nd), France (3rd), and The Netherlands (5th).

INDIA
A major heatwave affected India from 21 May–10 June. Average temperatures over 45°C were observed, with some locations reaching 48°C. Over 2000 fatalities were blamed on the excessive heat.

MOROCCO
C’n Aug 6th, Marrakech received over 13 times its monthly average in one hour.

CHINA
Heavy rain from May–Oct caused floods that affected 75 million people. Provinces in southern China experienced their wettest May in 40 years.

ATLANTIC HURRICANE SEASON
Below average activity
83% of normal ACE
11 storms, 4 hurricanes

WESTERN PACIFIC OCEAN TYPHOON SEASON
Above average activity
28 storms, 11 typhoons

HURRICANE SANDRA
(October 28th–November 4th, 2015)
Maximum winds - 250 km/hr
Sandra was the latest major hurricane observed in the Eastern North Pacific basin since reliable records began in 1971.

CYCLONE CHAPALA
(October 28th–November 4th, 2015)
Maximum winds - 250 km/hr
Chapala was the first hurricane-strength storm (Category 1 in the Saffir-Simpson scale) on record to make landfall in Yemen.

MEXICO
Several storm systems brought heavy precipitation during March 2015, with the national average being over three times the monthly average. This was the wettest March since national records began in 1941.

AFRICA
2015 was the second warmest year, behind 2010, since continental records began in 1910.

NORTH INDIAN OCEAN CYCLONE SEASON
Near average activity
5 storms, 2 cyclones

CHILE
Jan 2015 was the driest Jan in at least five decades.

SOUTH AFRICA
Jul 2014–Jun 2015 was the driest season since 1991/92 and third driest since records began in 1922/23.

SOUTH WEST INDIAN OCEAN CYCLONE SEASON
Near average activity
13 storms, 6 cyclones

SOUTH AMERICA
Much-warmer-than-average conditions engulfed much of the region during the year, resulting in the warmest year since continental records began in 1910.

SOUTH WEST PACIFIC CYCLONE SEASON
Near average activity
5 storms, 2 cyclones

ARGENTINA
Second warmest year, behind 2012, since national records began in 1971. The four warmest years on record have occurred since 2012.

ANTARCTIC SEA ICE EXTENT
During its growth season, the Antarctic had its 16th largest annual maximum extent. During its melt season, the Antarctic reached its fourth largest minimum extent on record.

AUSTRALIA
Experienced its fifth warmest year since national records began in 1910. The month of October was exceptionally warm, recording the largest anomaly for any month on record.

Please Note: Material provided in this map was compiled from NOAA’s NCEI State of the Climate Reports and the WMO Provisional Status of the Climate in 2015.
For more information please visit: http://www.ncdc.noaa.gov/sotc

https://www.ncdc.noaa.gov/sotc/service/global/extremes/201513.gif
**UPDATE: 2016 is Earth's New Warmest Year by Widest Margin on Record!**

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<td>2007</td>
<td>0.61</td>
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Who Says So?

- Intergovernmental Panel on Climate Change (IPCC)
- Scientific body under auspices of the U.N.
- Currently 195 countries have scientist panel members
- Reports endorsed by Science Academy & government of all panel member countries
- Fifth Assessment Report (AR5) released in 2014

http://www.ipcc.ch/
What Does the IPCC Really Say?

Watch the video ‘Climate Change: The State of the Science’ at https://www.youtube.com/watch?v=_EWOrZQ3L-c
What Does the AR5 Say?

The AR5 provides a clear and up to date view of the current state of scientific knowledge relevant to climate change.

It consists of three Working Group (WG) reports:

- **Mitigation of Climate Change** – options & their underlying technological, economic and institutional requirements
- **Impacts, adaptations & vulnerability** – exposure and future risks of human and natural systems, and the potential for and limits to adaptation
- **Physical Science Basis** - a comprehensive assessment including a detailed climate change observations throughout the climate system

And a Synthesis Report (SYR) which integrates and synthesizes material in the WG reports for policymakers

What Does the AR5 Say?

Partial Summary of Impacts

- Total anthropogenic GHG emissions have continued to increase from 1070 to 2010 with largest increases at end of this period
- $\text{CO}_2$ emissions from fossil fuel combustion & industrial processes contributed about 78% of these increases
- Without additional efforts to reduce GHC emissions beyond those in place today, emissions growth is expected to increase driven by population growth and economic activities

http://www.ipcc.ch/
What Does the AR5 Say?

Partial Summary of Impacts (Cont.)

- Such a scenario will result in CO$_2$ equivalent concentrations in 2030 of > 450 ppm and in 2100 of 750-1300 ppm compared to 430 ppm in 2011.

- Such a scenario will result in global mean surface temperature increases in 2100 of 3.7° to 4.8° C (6.7° to 8.6° F) compared to pre-industrial levels (i.e., before 1750)
Global Carbon Cycle Science

- Illustration courtesy NASA Earth Science Enterprise
Global Warming Science

The problem: greenhouse gases absorb and radiate heat to the lower atmosphere.

See the video ‘Explanation of Climate Change’ at https://www.youtube.com/watch?v=6VUPIX7yEOM
Remember These Definitions . . .

- **Global Warming** - an increase in average global temperature as influenced by increased greenhouse gas concentrations without regard to other factors that may cause climate change.

- **Climate Change** - changes in the atmosphere over time scales ranging from weeks to decades to millions of years.
  - vary by natural processes internal to the Earth (e.g., continental drift), external forces (e.g., solar energy), and human activities which affect global wind patterns, rainfall, and temperatures.

See the short video “Climate Change” at https://www.youtube.com/watch?v=TQlHaGhYoF0
To sustain one person, the US produces 22 tons of CO$_2$ per year.
History of Science of Climate Change

Milestones in Climate Science

- Instrumental temperature record begins
- Greenhouse effect on Venus measured
- Plass and Revelle and Suess
- Hulburt and Callendar
- Keeling Direct CO2 measurement
- Warnings by scientific community to policy makers begin.
- Hansen predicts further warming; testifies before congress

1820 Fourier
1850 Tyndall
1900 Arrhenius
1950 Hulburt
2000 Callendar

Fourier describes atmosphere’s contribution to planetary temperature
Tyndall describes CO2’s blocking of infrared
Arrhenius calculates warming from doubling of CO2
Hulburt calculates 4°C warming from doubling of CO2 with H2O feedback, and refutes Angstrom

Satellite observation of enhanced greenhouse effect
Manabe and Wetherald build first model of Earth’s entire climate

CO2 sources identified. Models describe Earth systems, feedbacks, carbon cycle and climate

Watch the video ‘CO₂ at the Top of the World’ at http://yearsoflivingdangerously.com/video/co2-top-world/
Watch the video ‘The Hockey Stick at 16’ at http://yearsoflivingdangerously.com/video/hockey-stick-16/
- During the last 2 billion years the Earth's climate has alternated between a frigid "Ice House" and a steaming "Hot House".

http://www.scotese.com/climate.htm
History of Atmospheric CO₂ Conc. And Occurrence of Ice Ages

Atmospheric CO₂ Concentrations During the Last Four Ice Ages.

Previous Peak 325,000 YBP

10 Year Projection

Keeling Curve

http://www.planetforlife.com/co2history
Science of GHG Emissions From Human Activities

Greenhouse Gas Emissions by Economic Sectors

AFOLU: Agriculture, Forestry and Other Land Use

Climate scientists can use weather data averaged over time plus **proxy data** to help them identify previous trends to improve their predictions of future trends.

**What Are Proxy Data?**

Proxy data include biological, cryological (which refers to frozen water), geological, and historical records that scientists use to deduce Earth’s atmospheric conditions in the distant past. By examining evidence such as the tree rings of old-growth trees and ice core samples taken from glaciers, scientists can figure out what Earth’s temperature, greenhouse gas composition, and precipitation levels were like over the course of its geologic history.

See the videos ‘Mountain Expedition’ and ‘Ice Core Climate Record’ of ‘Years of Living Dangerously’ series at Access Video of Sarasota County Library at [http://sarac.co.sarasota.fl.us/](http://sarac.co.sarasota.fl.us/)
Once More, Weather Vs Climate Forecasting

- Meteorologists predict local or regional atmospheric conditions for the hours, days, or weeks ahead. Prediction tends to focus primarily on real-time (current) data.

- Climate scientists, on the other hand, look at atmospheric conditions in terms of averages and trends (patterns) that have occurred over many decades, centuries, and millennia.

See the video ‘Tree Rings’ at http://www.sho.com/sho/video/titles/29655/tree-rings
Tools Used to Forecast Climate & Weather

- Weather balloons, satellites, specially designed airplanes, and radar and other ground-based data collection instruments are used to measure:
  - wind speed
  - air temperature
  - Precipitation
  - humidity levels, etc.

- Reliable records have been kept since 1800s and provide accurate weather forecasts (weekly and daily).

- Sophisticated Earth-observing satellites equipped with remote-sensing equipment circle the globe to:
  - record sea surface and other temperatures,
  - measure atmospheric gases and rainfall amounts,
  - take visible and infrared photos of Earth’s surface, and
  - calculate Earth’s outgoing infrared and reflected solar radiation.
Climate scientists also use increasingly higher resolution computer models, known as **global climate models**, to simulate the physical processes of the atmosphere and oceans and make predictions about future climate scenarios.

Watch the short video ‘Modeling Our Climate’ at [https://www.youtube.com/watch?v=SuZHnqxltKo](https://www.youtube.com/watch?v=SuZHnqxltKo)
Global Climate Models

Global climate computer programs ("models") simulate and analyze the complex physics of the atmosphere, ocean, snow, ice, and land and all the forces acting on them.
Global Mean Temperatures Track Both Natural & Human-Induced Effects

Period      Rate
Years        /decade

Recovery from volcanic eruptions dominates Industrial smoke and dust mask warming (global dimming)

Greenhouse gases dominate
Are Extreme Weather Events Increasing?

- IPCC’s 2012 special report, ‘Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation’ (SREX)
  - indicates that scientists have enough confidence in the data collected since 1950 to definitively link extreme events to global climate change.

Watch the video ‘Overview of the IPCC Report on Extreme Events’ at https://www.youtube.com/watch?v=VIGeHzuwFSQ
What Does *this* Change in Climate Mean?

“Many of the world's climate zones may disappear by 2100, leaving new ones in their place unlike any that exist today”

“..we are going to be seeing climates that certainly are completely outside the range of modern human experience..”

Source 2007 Articles: 26 March *Scientific American*; 27 March *Guardian*; 27 March IOL Reuters
Climate change computer models predict a range of sea level rises for different locations due to the global warming and melting of glaciers worldwide.

These models also predict more frequent extreme weather conditions that will produce heavy rains and flooding to many parts of the country.
Worldwide Documentation of Increasing Extreme Flooding Events and Impacts

Consequences: extreme weather

![Diagram showing global costs of extreme weather events](image)

![Diagram showing number of floods by region](image)
Worldwide Documentation of Increasing Sea Level Rises

Sea level in 2014 compared to the global average at the mid-point of the 1993-2013 time series.

Global Sea Level Rise Impacts Example

See the videos ‘Geography of Bangladesh’ and ‘Climate Change’ of ‘Years of Living Dangerously’ series via Access Video of Sarasota County Library System at http://sarac.co.sarasota.fl.us/
Viewing FL Sea Level Rise Impacts

- Online Flood Model Maps can be used to simulate rising sea levels anywhere in the world, including counties in Florida.

- Potential land mass impacts in FL w/ 23 ft sea level rise shown.
- Model predictions range from 2 feet up to 7 ft for 2100.
- Enough ice sheet mass exists for a 213 ft sea level rise.

http://geology.com/sea-level-rise/florida.shtml
Why is Florida so Vulnerable?

Flat Topography

Limestone Geology

Hurricane and Storm Surge Impacts

Triple Whammy

See 12/16/13 presentation at https://floridaclimateinstitute.org/resources/presentations
Failing Drainage

Malfunctioning Canals

See 12/16/13 presentation at https://floridaclimateinstitute.org/resources/presentations
Sea Level Rise Impacts in FL

Miami Beach, South Florida

Watch the video ‘South FL and Sea Level Rise at https://www.youtube.com/watch?v=X1hJYLw7OIM
Viewing Sea Level Rise Impacts in Sarasota County

Island Park, Downtown City of Sarasota

Present

6 Ft Sea Level Rise

See Interactive Map to Visualize Sea Level Rise and Coastal Flooding Impacts at [http://coast.noaa.gov/slr/](http://coast.noaa.gov/slr/)
Climate Change Responses in FL

- **Formation of FL Climate Change Task Force**
  - includes all State University System in order to bring together the collective expertise and research in FL
  - cooperates with State and Federal agencies to bring science into climate change-related decision making
  - analyzing the significant economic and environmental risks to Florida
  - developing a climate change information system and portal that will connect State University System (SUS) assets with these agencies, private industries, and other groups to facilitate communication

https://floridaclimate.org/
Formation of FL Climate Institute

- created by Florida’s universities with a goal of providing Florida and its businesses and communities the much needed scientific knowledge, support, and education to respond to a changing climate.

- includes a multi-disciplinary network of national and international research and public organizations, scientists, and individuals concerned with achieving a better understanding of climate variability and change.

https://floridaclimateinstitute.org/
What Can I Do?

- **Support and/or participate in the Resilience AmeriCorp program:**
  - recruits, trains, and embeds AmeriCorps VISTA members in ten communities across the country to increase civic engagement and community resilience in low-income areas
  - helps those communities develop plans for becoming more resilient to any number of shocks and stresses, including better preparations for extreme weather events

[Link](http://www.nationalservice.gov/programs/americorps/resilience-americorps)
What Can I Do in Sarasota County?

- Let your voice be heard on climate change planning and action via implementation of the
  a) SW FL Regional Planning Council Assessments – see http://www.swfrpc.org/climate_change.html
  b) Sarasota County Comprehensive Plan – see https://www.scgov.net/compplan/Pages/default.aspx

- Learn about local action steps to take from the Office of Sustainability of Sarasota County – see http://sarasota.ifas.ufl.edu/Sustain/climate.shtml
What Can I Do in General?

1) Green your commute
2) Be energy efficient
3) Choose renewable power
4) Eat wisely
5) Trim your waste
6) Let polluters pay
7) Fly less
8) Get informed
9) Get involved
10) Support and donate

http://www.davidsuzuki.org/what-you-can-do/top-10-ways-you-can-stop-climate-change/
What Can I Do in General?

- Engage your family, friends, neighbors and colleagues about the science of Climate Change using the insights from the Climate lab of the University of CA – see https://www.universityofcalifornia.edu/climate-lab

Why Humans Are So Bad at Thinking About Climate Change
What Can I Do in General?

- Remember to keep your sense of humor by enjoying a combination of comedy and science of Climate Change, for example the following video:

  - “Climate Change Debate: Last Week Tonight with John Oliver (HBO)” at [https://www.youtube.com/watch?v=cjuGCJJUGsg&list=PLr-568g8wbR6rqN_Zf6Qg2XRPCGfmJBJ&index=4](https://www.youtube.com/watch?v=cjuGCJJUGsg&list=PLr-568g8wbR6rqN_Zf6Qg2XRPCGfmJBJ&index=4)
In Summary: Climate Change Science

THANK-YOU!!

CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN

ETC. ETC.
Acknowledgements

Jennifer Francis, Ph.D.
Rutgers University, Institute of Coastal & Marine Science
‘Our Wacky Weather and Disappearing Arctic Sea Ice: Are They Connected?’

FL Center for Environmental Studies
FL Atlantic University
‘Weather and Climate’

www.ces.fau.edu/nasa/content/teacher-materials/wc-ppt.pptx
Online Resources

• Annenberg Foundation. The Habitable Planet Unit 12: Earth’s Changing Climate – see http://www.learner.org/courses/envsci/unit/text.php?unit=12&secNum=1

• Climate Science Awareness and Solutions Program. Earth Institute. Columbial University – see http://csas.ei.columbia.edu/

• FL Center for Environmental Studies, FL Atlantic University, see http://www.ces.fau.edu/

• Florida Climate Change Task Force, Nov 2011 Workshop Proceedings, see https://floridaclimate.org/

• Florida Climate Institute – see https://floridaclimateinstitute.org/

• National Geographic, If All The Ice Melted: An Interactive Map, see http://ngm.nationalgeographic.com/2013/09/rising-seas/if-ice-melted-map

• NRDC. Feeling the Heat in Florida – see http://www.nrdc.org/globalwarming/florida/flainx.asp
Online Resources

• UF/IFAS, EDIS: Climate Change, see http://edis.ifas.ufl.edu/topic_climate_change

• UF/IFAS Extension Sarasota County, Climate Change, see http://sarasota.ifas.ufl.edu/Sustain/climate.shtml

• US EPA, Climate Change, see http://www.epa.gov/climatechange/

• US NASA, Global Climate Change, see http://climate.nasa.gov/
Sarasota County Library Resources


• Environmental Library, Selby Library: Climate Change titles and documents


• Moyers & Company: Climate Change-Faith and Fact. 2014. Access Video Collection


• Years of Living Dangerously. 2014. Nine (9) Episodes. Access Video Collection
Online Video Resources

• FL Climate Institute. Presentations – see https://floridaclimateinstitute.org/resources/presentations

• Gore, A. Averting the Climate Crisis. Ted Talk – see https://www.youtube.com/watch?v=r593zLtZxAU


• RSA. Seven Serious Jokes About Climate Change. – see https://www.youtube.com/watch?v=IHZ3oLdNKzw

• Ted Talks
  • Hansen, J. Why I Must Speak Out About Climate Change – see https://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change?language=en
  • Poyser, J. Confessions of a Climate Change Humorist. Tedx Talk – see https://www.youtube.com/watch?v=hQFYA945WPc
Online Video Resources

- Ted Talks (continued)
  - Schmidt G. The Emergent Patterns of Climate Change – see https://www.ted.com/talks/gavin_schmidt_the_emergent_patterns_of_climate_change?language=en

- Youtube Videos: Humor and Climate Change
  - “Climate Change Denial Disorder” at https://www.youtube.com/watch?v=fZTTI_0mHN0&list=PLr_568g8wbR6rqN_Zf6Qg2XRPCGfmJBJ&index=3
  - “Sex, Spock, and Climate Change” at https://www.youtube.com/watch?v=_hUtI2EMXGk&list=PLr_568g8wbR6rqN_Zf6Qg2XRPCGfmJBJ
  - “Sting Operation Outs Climate Change Denier Scientists [Humor News]” at https://www.youtube.com/watch?v=UeVy3zPDrt0&index=5&list=PLr_568g8wbR6rqN_Zf6Qg2XRPCGfmJBJ