

## Head Slate:

Slug: NASA's HD Climate Change Resource Tape

TRT: 20:09

GSFC Library # G2007-001HD

Super(s): NASA

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For more info: [http://www.nasa.gov/centers/goddard/multimedia/hd\\_catalogue.html](http://www.nasa.gov/centers/goddard/multimedia/hd_catalogue.html)

**Synopsis:** Goddard Television's vision is to produce and communicate knowledge about our study of the Earth and space; sharing NASA and Goddard Space Flight Center, its missions, programs, discoveries, experts, and facilities with 245 million Americans and other TV viewers around the globe. In line with this vision, Goddard is releasing its first set of high definition resource tapes, showcasing some of the best visuals we have to offer. This tape highlights NASA's studies of the Earth's changing climate. Using remote sensing data from satellites, this research diagnoses our planet's current health and helps us understand the dynamic Earth system as a whole.

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**Slug: NASA's HD Climate Change Resource Tape**

**Clip Slate: Polar Ice HD Visualizations**

**Description:** Looking at our Earth's "frozen assets" is a high priority when considering Earth system science and global climate change. The following visualizations show both Arctic and Antarctic ice and many of the processes that NASA scientists study.

Section TRT: 9:14

Super(s): NASA

### **ITEM 1: Daily Arctic Sea Ice, Aug 2005 to Aug 2006**

This visualization shows the seasonal advance and retreat of sea ice over the Arctic from 8/5/2005 through 8/4/2006. The yearly cycle is repeated three times while the camera circles the Arctic, providing a view of the sea ice from a variety of perspectives. The second part of this sequence combines the sea ice, derived from the AMSR-E instrument on NASA's Aqua satellite, with the Blue Marble Next Generation dataset to show a full picture view of the Earth's changing seasons in the Northern Hemisphere.

TRT: 2:40

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003372/index.html>

<http://svs.gsfc.nasa.gov/vis/a000000/a003400/a003404/index.html>

### **ITEM 2: Arctic Sea Ice Minimum Concentration, 1979 to 2006**

Each year, the amount of sea ice floating in Arctic waters typically peaks in late winter and reaches its minimum in September. Arctic perennial ice – the ice that remains at the end of each summer - has been retreating at a rate of about ten percent per decade for the past 27 years. This visualization, derived from the Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager (SSM/I), shows the annual minimum Arctic sea ice extent and concentration for 27 years, from 1979 to 2006. The yellow outline represents the average extent of Arctic perennial sea ice during the 27-year satellite record.

TRT: :23

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003378/index.html>

**ITEM 3: Three-Year Average September Minimum Sea Ice Concentration, 1979 to 2005**

This visualization shows the three-year moving average September mean sea ice concentration in the northern hemisphere from 1979-1981 through 2003-2005.

TRT: :12

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003371/index.html>

**ITEM 4: Arctic Monthly Average Sea Ice Extent**

This visualization shows the monthly average sea ice extent over the Arctic region derived from years 1979 through 2002. Both a version with dates and a “clean” version are included.

TRT: :15

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003367/index.html>

**ITEM 5: A Tour of the Cryosphere Excerpt**

This short high definition segment of the production “A Tour of the Cryosphere” created by Goddard’s Scientific Visualization Studio (SVS) starts in Antarctica and ends by showing changing snow cover over North America.

TRT: :41

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003100/a003181/index.html>

**ITEM 6: Polar Sea Ice in the 1990s**

This visualization shows the seasonally changing sea ice on both poles with data taken during the 1990s.

TRT: 2:02

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a002700/a002738/index.html>

**ITEM 7: Jakobshavn Glacier Flow in 2000 and Calving Front Retreat, 2001 to 2006**

From 1997 to 2004, Greenland’s Jakobshavn Glacier nearly doubled its speed, increasing the total amount of ice it discharged and measurably altering the annual rate of global sea level rise. This visualization shows the flow of the Jakobshavn glacier in 2000, followed by a time series of the glacier’s retreat from 2001 through 2006. Both a version with dates and a “clean” version are included.

TRT: :30

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003374/index.html>

**ITEM 8: Ayles Ice Shelf Breakup in the Arctic**

On August 13, 2005, almost the entire Ayles Ice Shelf calved from the northern edge of Ellesmere Island. This piece is equivalent in size to approximately 11,000 football fields or a little larger than the island of Manhattan. This visualization starts from a global view and zooms into the Ayles Ice Shelf. The region is identified by a red outline. Two flashes of solid red identify the shelf itself before the ice shelf breakup is shown. Both a version with labels and a “clean” version are included.

TRT: :42

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003400/a003430/index.html>

**ITEM 9: Antarctic Iceberg Breaks Apart**

In March 2000, two massive Antarctic icebergs, initially designated B-15 and C-16, broke away from the Ross Ice Shelf and migrated west to a point northeast of McMurdo Sound. The resulting barrier altered wind and current patterns. The Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on NASA’s Terra satellite captured these images of the calving icebergs.

TRT: :07

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003304/index.html>

**ITEM 10: Iceberg Slows Shipping Lanes to McMurdo Station**

As the B-15A iceberg migrated towards McMurdo Station it temporarily cut off shipping lanes to the station.

TRT: :11

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003000/a003078/index.html>

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**Slug: NASA's HD Climate Change Resource Tape**

**Clip Slate: Albedo HD Visualizations**

**Description:** Because of its light appearance, ice reflects much of the sun's radiation back into space whereas dark ocean water absorbs more of the sun's energy. As ice melts, more exposed ocean water changes the Earth's albedo, or fraction of energy reflected away from the planet. This leads to increased absorption of energy that further warms the planet in what is called ice-albedo feedback.

Section TRT: :56

Super(s): NASA

**ITEM 1: Ice Albedo – Global View**

TRT: :20

For More Info: <http://svs.gsfc.nasa.gov/vis/a010000/a010000/a010021/index.html>

**ITEM 2: Ice Albedo – Close View**

TRT: :20

For More Info: <http://svs.gsfc.nasa.gov/vis/a010000/a010000/a010022/index.html>

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**Slug: NASA's HD Climate Change Resource Tape**

**Clip Slate: Carbon Dioxide Growth HD Visualizations**

**Description:** Carbon dioxide (CO<sub>2</sub>) is the primary compound responsible for the Earth's "greenhouse effect" that affects climate. The following HD visualizations show how CO<sub>2</sub> levels have grown in recent decades as well as their trends in the more distant past.

Section TRT: 1:30

Super(s): NASA

**ITEM 1: Global Biosphere with Carbon Dioxide Growth Overlaid**

This visualization shows the global biosphere in the background and corresponding carbon dioxide graph in the foreground. The biosphere is represented by phytoplankton concentrations over the ocean and vegetation index over land. The carbon dioxide concentration data are from Maua Loa, Hawaii measurements.

TRT: :34

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003309>

**ITEM 2: Atmospheric Carbon Dioxide from 1980 to 2005**

This visualization shows a graph of atmospheric CO<sub>2</sub> from 1980 to 2005 with fossil fuel emissions, atmospheric increase, carbon sink, El Niño Southern Oscillation (ENSO) curve and ENSO bars.

TRT: :18

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003308>

**ITEM 3: CO<sub>2</sub> Growth in the last 400,000 years**

This visualization shows carbon dioxide graphs from the last 400,000, 1000, and 25 year ranges.

TRT: :13

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003307>

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**Slug: NASA's HD Climate Change Resource Tape**

**Clip Slate: Mt. Kilimanjaro, 1993 & 2000**

**Description:** Some scientists believe the snowcap of Mount Kilimanjaro will be gone in two decades. Researchers say the ice fields on Africa's highest mountain shrank by 80 percent in the past century. The snowcap formed some 11,000 years ago. The Landsat satellite captured these images of Kilimanjaro February 17, 1993 and February 21, 2000.

TRT: :26

Super(s): NASA/USGS

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a002700/a002700/index.html>  
<http://svs.gsfc.nasa.gov/vis/a000000/a002700/a002701/index.html>

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**Slug: NASA's HD Climate Change Resource Tape**

**Clip Slate: Subglacial Lakes HD Visualizations**

**Description:** With data from NASA satellites, a team of scientists has discovered an extensive, active subglacial water system deep beneath a fast-moving Antarctic ice stream. Ongoing research is directed toward understanding Antarctica's "plumbing" so that its direct impacts on future ice discharge and resultant sea level can be confidently predicted.

Section TRT: 1:33

Super(s): NASA

**ITEM 1: Hidden Lakes Conceptual Animation**

The following animation helps to explain the dynamics of subglacial water exchange and what it looks like from space.

TRT: :48

For More Info: <http://svs.gsfc.nasa.gov/vis/a010000/a010100/a010108/index.html>

**ITEM 2: Subglacial Lake Engelhardt (MODIS/ICESat)**

Dissolving through three years of images from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on NASA's Aqua satellite reveals evidence of hidden Subglacial Lake Engelhardt deep beneath the Antarctic ice sheet. The orange slice that appears shows ICESat elevation data and how it dipped over that same period.

TRT: :29

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003400/a003403/index.html>

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**Clip Slate: Ocean Productivity HD Visualizations**

**Description:** A recent study indicates there is a correlation between ocean nutrients and changes in sea surface temperature (SST). This could have major implications on the future of our ocean's food web and how it relates to climate change. The following visualizations show the comparison between global oceanic biosphere and sea surface temperature.

Section TRT: 2:07

Super(s): NASA/GeoEye

**ITEM 1: Ocean Biology, 1997 to 2006**

Scientists now have nearly a decade's worth of data showing the cycle of plant life in the Earth's oceans. From space, the "ocean color" satellites measure the ocean's biology as plant productivity. In this visualization, high plant productivity is represented in green, while areas of low productivity remain blue. Data were collected by the Sea-viewing Wide Field-of-view Sensor (SeaWiFS).

TRT: :53

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003387/index.html>

## **ITEM 2: Ocean Temperature, 2002 to 2006**

Scientists have compared the rise and fall of ocean life with changing ocean temperatures. Ocean warming and cooling events such as El Niño and La Niña have a strong impact on ocean biology, causing decreases and increases in plant productivity, respectively. Temperature data come from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra and Aqua spacecraft.

TRT: :25

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003388/index.html>

## **ITEM 3: MODIS Sea Surface Temperature Highlighting the Gulf Stream, 2002 to 2006**

This visualization shows a 32-day moving average of sea surface temperature data spanning July 4, 2002 to October 23, 2006. The visualization starts over Europe, pans across the Atlantic, and settles in over the Gulf Stream.

TRT: :25

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003389/index.html>

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## **Slug: NASA's HD Climate Change Resource Tape**

### **Clip Slate: Earth Observing Satellite HD Visualizations**

**Description:** NASA's Earth Observing fleet of vehicles constitutes a major milestone in the history of Earth science, facilitating the kinds of wide scale and synergistic research endeavors that until the last decade have been impossible to even consider. Remote sensors allow us to observe and quantify key climate and environmental vital signs such as temperature, ozone concentrations, carbon monoxide and other pollutants, water vapor and other greenhouse gases, cloud types and total cloud cover, aerosol types and concentrations, radiant energy fluxes, and many more.

Section TRT: 2:32

Super(s): NASA

## **ITEM 1: NASA's Orbiting Earth Observing Fleet**

This visualization shows the spacecraft in NASA's Earth Observing fleet. The relative altitudes, speeds, and sun position are correct for 12/01/2003 starting at 5:00 UTC. Aura was added as it would have appeared in orbit had it already been launched at that time.

TRT: :33

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a003200/a003227/index.html>

## **ITEM 2: The Aura Satellite**

Since launching in July 2004, Aura has been retrieving information and producing valuable data of the Earth and its atmospheric properties. Each instrument works individually and alongside its counterparts to bring us ozone measurements, tropospheric maps of carbon monoxide and cloud ice, as well as measurements in the stratosphere. The following two animations depict the Aura satellite. The first is a "beauty pass" of the satellite. The second shows Aura collecting Ozone Monitoring Instrument (OMI) data over the Earth.

TRT: :46

For More Info: <http://svs.gsfc.nasa.gov/vis/a000000/a002900/a002948/index.html>

*Beauty Pass Not Available Online*

## **ITEM 3: The Geostationary Operational Environmental Satellite (GOES) Spacecraft**

The Geostationary Operational Environmental Satellite (GOES) spacecraft help meteorologists observe and predict local weather events, including thunderstorms, tornadoes, fog, flash floods, and other severe weather. This animation shows a GOES spacecraft monitoring the Earth.

TRT: :20

For More Info: *No Online Version Available*

## **ITEM 4: The Global Precipitation Measurement (GPM) Satellite**

The Global Precipitation Measurement (GPM) mission is one of the next generation of satellite-based Earth science missions that will study global precipitation (rain, snow, and ice). This animation shows the planned GPM satellite as it would look in orbit monitoring the Earth.

TRT: :18

For More Info: *No Online Version Available*