Jack Venrick

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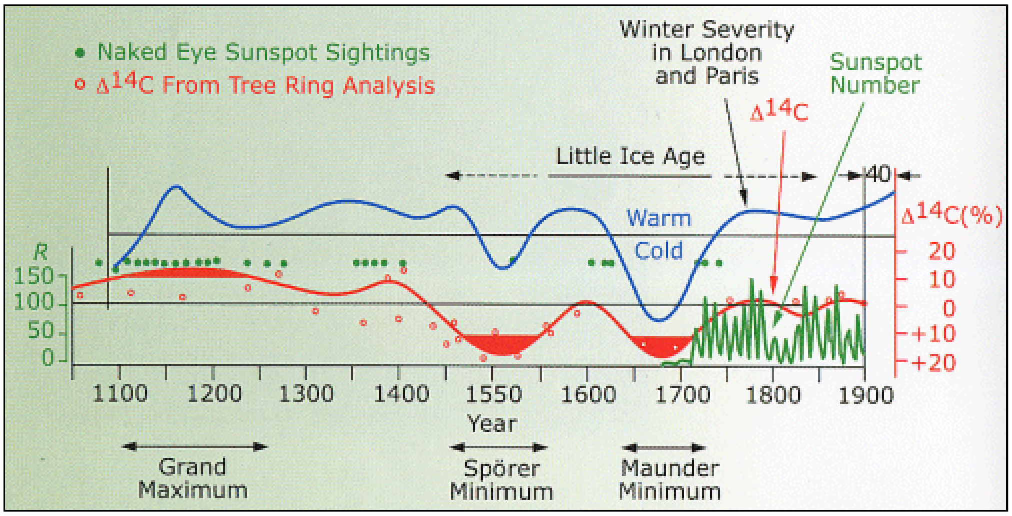
To: "AJack R. Venrick" <jacksranch@skynetbb.com>
Sent: Wednesday, October 15, 2008 1:28 PM
Attach: Global Warming Has Ended - The Next Climate Change to A Pronounced Cold Era Has Begun..eml; Dr. Willie Soon's Presentation at Good Neighbor Law Forum March 15, 2008 Debunking Gore's Political Junk Science Re. CO2 (NOTE - 2MB Email size).eml; Its the Sun Stupid - That Drives Our Climate Not CO2.eml; Mary debunks Al Gore's global warming theory.eml; So it appears that Arctic ice isn't vanishing after all.eml
Subject: The Inconstant Sun

This confirms Dr. Soons studies.



Inferred variations in solar intensity (red and green lines) over the last 900 years appear to be related to the severity of winters in London and Paris.
The red line is deduced from the abundance of a heavy form of carbon (carbon-14) in tree rings.
This "isotope" of carbon is formed in the upper atmosphere when incoming cosmic rays smash into carbon dioxide molecules.
When the Sun's activity is low, its weakened magnetic field lets more cosmic rays into the solar system, so carbon-14 abundances go up.
(Notice on the graph that the scale for carbon-14 is upside down "(not the graph)".) This image by scientist John Eddy is based on an earlier one that appeared in *Science*, 192, 1189 (1976).

http://science.nasa.gov/headlines/y2003/17jan_solcon.htm

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The Inconstant Sun

An experiment onboard shuttle mission STS-107 is monitoring the Sun's variable brightness. Scientists say it's crucial data for understanding climate change.

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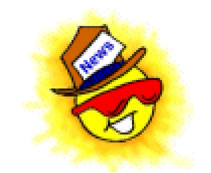
January 17, 2003: Our Sun may seem an enduring, unwavering beacon

in the sky, but in truth it has a "heartbeat" of sorts--a pulsation between dimmer and brighter phases so slow that it only "beats" 9 times each century!

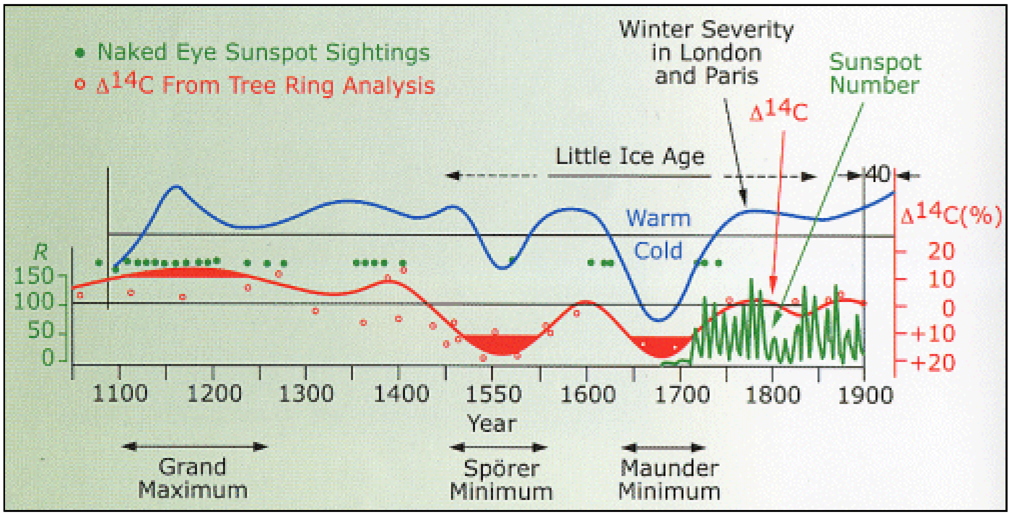
It's understandable that you might not have noticed. The pulsing is not only slow, it's also subtle. The total energy coming from the Sun only varies by about 0.1% over each 11-year cycle. For a long time scientists didn't notice it either, which is why the Sun's intensity is called, ironically, the "solar constant."

Right: A record of the Sun's intensity based on satellite data collected since 1978. Image credit: Catania Astrophysical Laboratory. [more]

The intensity of the Sun varies along with the 11-year sunspot cycle. When sunspots are numerous the solar constant is high (about 1367 W/m^2); when sunspots are scarce the value is low (about 1365 W/m^2). Eleven years isn't the only "beat," however. The solar constant can fluctuate by ~0.1% over days and weeks as sunspots grow and dissipate. The solar constant also drifts by 0.2% to 0.6% over many centuries, according to scientists who study tree rings.



These small changes can affect Earth in a big way. For example, between 1645 and 1715 (a period astronomers call the "Maunder Minimum") the sunspot cycle stopped; the face of the Sun was nearly blank for 70 years. At the same time Europe was hit by an extraordinary cold spell: the Thames River in London froze, glaciers advanced in the Alps, and northern sea ice increased. An earlier centuries-long surge in solar activity (inferred from studies of tree rings) had the opposite effect: Vikings were able to settle the thawed-out coast of Greenland in the 980s, and even grow enough wheat there to export the surplus to Scandinavia.



Above: Inferred variations in solar intensity (red and green lines) over the last 900 years appear to be related to the severity of winters in London and Paris. The red line is deduced from the abundance of a heavy form of carbon (carbon-14) in tree rings. This "isotope" of carbon is formed in the upper atmosphere when incoming cosmic rays smash into carbon dioxide molecules. When the Sun's activity is low, its weakened magnetic field lets more cosmic rays into the solar system, so carbon-14 abundances go up. (Notice on the graph that the scale for carbon-14 is upside down.) This image by scientist John Eddy is based on an earlier one that appeared in *Science*, 192, 1189 (1976).

Researchers still aren't sure how small changes in the Sun's output nudge Earth's climate in one direction or another. To find the answer, they need to monitor our climate *and* keep a finger on the Sun's "pulse" for many decades running.

"Consistency in this data record is crucial," says Alexandre Joukoff, a scientist at the Royal Meteorological Institute of Belgium who studies the solar constant. "Gaps or flaws in the record undermine our ability to use statistics to draw strong conclusions about phenomena such as Earth's climate."

Getting consistent measurements from the ground is tricky, explains Joukoff, because Earth's changing seasons and weather cause sunlight hitting the ground to wax and wane. On average, clouds and the atmosphere absorb or reflect 51 percent of the incoming sunlight, and this can vary widely between overcast and cloudless days.

Right: Clouds like these vex scientists who try to measure the solar constant from the ground. Image copyright: Lauri Kangas.

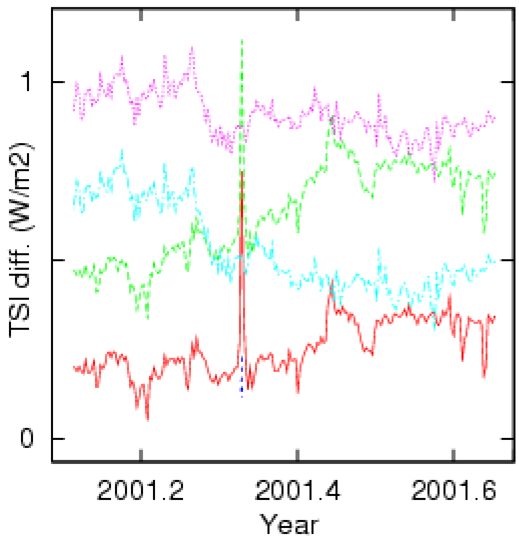
The best place to measure the solar constant is high above the clouds--in space. But there's a problem there, too: The typical design-life of most satellites is only 5 to 10 years; after that, fuel runs out and the satellite goes cold and quiet. They're not around long enough to measure the solar constant for decades-long stretches.

When new satellites are launched to replace dying ones, it's hard to know if a reading of, say, "10 units" from the new satellite truly equals "10 units" measured by the old one, making the consistency of the data record uncertain. Furthermore, satellite sensors degrade as they age--a result of sustained exposure to solar ultraviolet radiation.

From this patchwork of aging satellites and sensors, scientists somehow need to assemble a continuous, consistent record of the Sun's intensity over 30 ...

40 ... 50 or more years!

Below: If space radiometers were perfect, the data from these 5 different sensors would overlap and form a single line. In fact, they differ by as much as 1.5 W/m^2. Image credit: Royal Meteorological Institute of Belgium. [more]



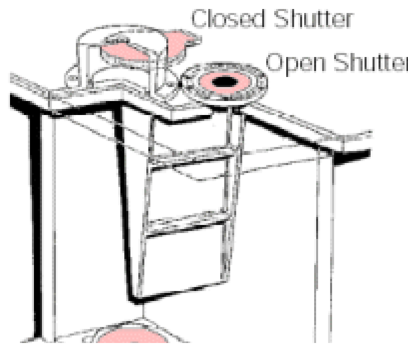
"SOLCON is what makes that possible," says Joukoff.

SOLCON, short for "Solar Constant radiometer," is a high-precision solar-intensity sensor that Joukoff and colleagues keep at the Royal Meteorological Institute of Belgium. By sheltering the sensor from UV radiation and rarely using it, they spare this "gold standard" instrument from most of the effects of aging, making it a dependable touchstone over the years.

Every few years they fly SOLCON on a short mission into space to spot-check the agreement of Sun-watching satellites in orbit at the time. In fact, SOLCON is in orbit now. It's one of the 80+ experiments onboard the space shuttle Columbia (STS-107), which left Earth on January 16th for a 16-day research mission. Researchers will use the sensor in the days ahead to spot-check two satellites: the Solar and Heliospheric Observatory (SOHO) and ACRIM-3. Adjusted to match SOLCON, the separate records from these satellites and others can then be stitched together into a continuous history of our Sun's cycles of brightness--a kind of long-term "EKG" readout for our pulsing star.

"This kind of data is invaluable because it helps us understand the past as well as the future," notes Paal Brekke, the deputy project scientist for SOHO. "Methods for estimating the Sun's intensity hundreds of years ago, such as measuring the cosmic ray-generated carbon-14 embedded in the rings of old trees, can be improved by comparing those clues today with a reliable satellite record.

Right: A diagram of the SOLCON instrument, courtesy Royal Meteorological Institute of Belgium. [more]



In principle, SOLCON is like an old-fashioned two-pan balance--but for heat instead of mass. It consists of two identical chambers and a device between them that detects any heat moving from one chamber to the other. One chamber is opened to incoming sunlight via a very precise aperture. The other "reference" chamber is kept closed and heated only electrically. To measure intensity of incoming sunlight, the device adjusts the current to an electric heater in the sun-exposed chamber until no heat flows between the chambers--that is, until the "scales" are balanced. The amount of current required to achieve a balance is a measure of the energy in the sunlight. Most solar intensity sensors in orbit operate in this way.

Eventually, even SOLCON will need to be replaced. One candidate for its successor is the Total Irradiance Monitor (TIM) built by the Laboratory for Atmospheric and Space Physics in Colorado. TIM is very similar to SOLCON, except that it uses four chambers instead of two for better internal cross-checking of instrument aging.

The date has not yet been set, but when the day comes, the successor will fly a single mission--probably a shuttle research mission like STS-107--in tandem with the old instrument in order to assess the new sensor's accuracy. After that, SOLCON will finally be retired.

The Sun, of course, will keep on going--but if all goes as planned, we won't miss a beat.