Environmental Ethics and Land Management

ENVR E-120

http://courses.dce.harvard.edu/~envre120

Basic Concepts of Ecology

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Class - Session 2 – Part 1
28 September 2006

Harvard University Extension School
Fall Semester 2006

By way of review …
Four Simple Thoughts

There are some major historical discontinuities that will most probably intrude upon your lives.

Currently, you are not being told about these discontinuities.

But ignorance will be no excuse. You will be wacked by them anyway… There will be no escaping the potentially catastrophic discontinuities.

You will need to develop an environmental ethic of your own to survive.

Who Should Take This Course?

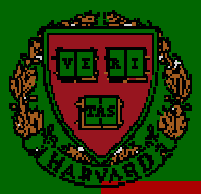
- Anyone with an interest in the survival of the human enterprise.

What will be expected of you?

- Nothing less than the your total attention and complete devotion to the issues raised here for the rest of your life.

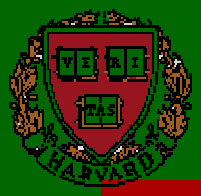
Will there be a test?

- You bet, but not one we will administer….
- You will have to live with the mind you furnish here for the remainder of your days.
- Your biggest problem: Not to become distracted….



This will not always be easy….

Particularly because of the way that Harvard prepares you to think about problems in general……

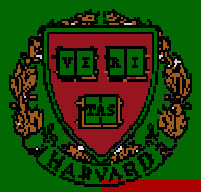


This will not always be easy….

Particularly because of the way that Harvard prepares you to think about problems in general……

In short, keep focused: don't let the merely urgent crowd out the important.

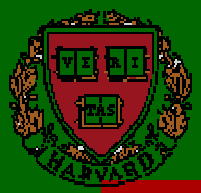
This is a course in the important things – not necessarily the urgent things.



Environmental Ethics must cope with Vastly Different Scales of Time & Space

Cosmic time scales - the present to 10^9 - 10^{10} BP

- What kinds of events occur in this time frame?
- Over what spatial ranges do these conditions apply?
- What -- if anything -- is the human significance of events that occur at cosmic time and spatial scales?
- Do humans have any importance beyond very short temporal scales?



Where did our nearest space ‘neighbor’ come from?

The moon was “thrown” into orbit as debris from a major meteor impact with the earth -- a major celestial collision.

BBC News | Sci/Tech | Earth smash spawned Moon - Netscape

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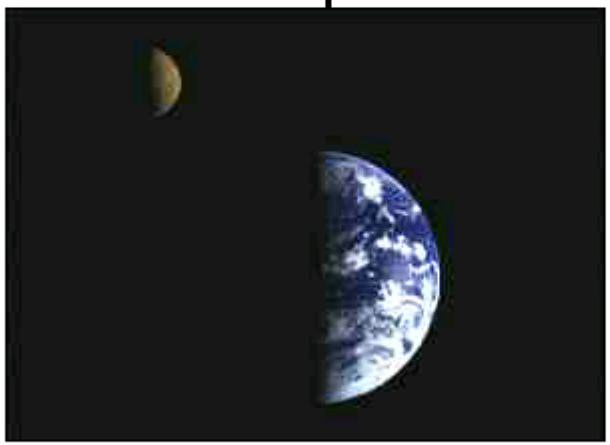

The Earth and Moon were once one

By BBC News Online Science Editor Dr David Whitehouse

The Moon was blasted away from the early Earth by a massive interplanetary collision, according to an idea which has received strong new support.

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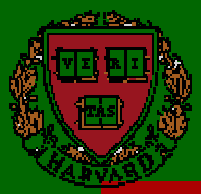

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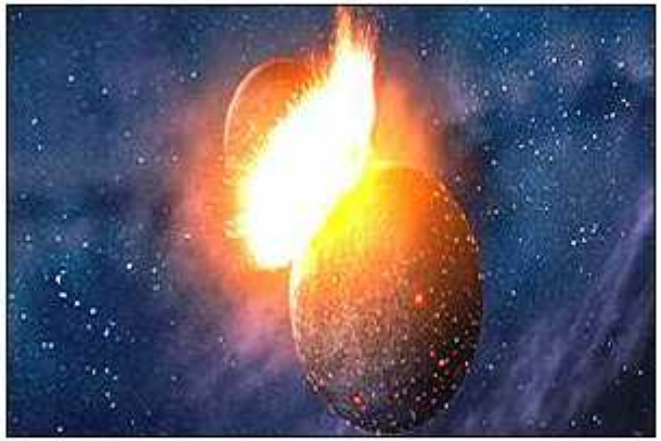
Moon's orbit betrays its violent birth



The Earth was hit by a Mars-sized body

By BBC News Online science editor Dr David Whitehouse

The mysterious tilt of the Moon's orbit around the Earth is probably due to the satellite's violent origin, say scientists writing in the current issue of the journal Nature.

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- NASA: Moon fact sheet
- Southwest Research Institute

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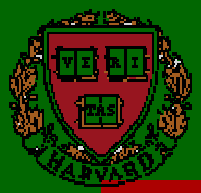

Although “big events” like the cosmic encounter that produced the moon are very rare, other earth collisions with space debris are quite frequent, especially in the ‘asteroid belt.’

Encounters are ‘inevitable’...

BBC News | SCI/TECH | Comets could have seeded life on Earth - Netscape

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Thursday, 5 April, 2001, 15:08 GMT 16:08 UK

Comets could have seeded life on Earth

Impacts with comets and asteroids were common during the Earth's youth

By BBC News Online science editor Dr David Whitehouse

By simulating a high-velocity comet collision with the Earth, a team of scientists has shown that organic molecules hitch-hiking aboard a comet could have survived an impact and seeded life on Earth.

The results add weight to the theory that the raw materials for life came from space.

"This is the beginning of a new field of science"

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- American Chemical Society

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The role of comets in the history of the earth is still being discovered.

Some suggest that life itself is extraterrestrial in origin….

What are the ethical implications, if any, of this?

Some cosmic events have had a big impact

Even if it turns out that life originated endogenously on Earth and only on Earth, we know that the history of life-forms has been dramatically altered by cosmic events in the past.

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Address http://www.nmnh.si.edu/paleo/blast/asteroid_hyp.htm

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The Asteroid Hypothesis

This conceptual sketch depicts the asteroid moments before impact, as it takes aim on Mexico's Yucatan coastline. Approaching at an angle from the southeast, it will send the main force of its impact northward in a fire storm over North America. The evidence has grown so overwhelming that few scientists dispute that an asteroid nearly 10 km (6 mi) wide slammed into what is now Mexico's Yucatan Peninsula.

Internet

The "Asteroid Hypothesis" is currently the leading explanation offered for the "extinction event" represented by the KT Boundary in the geological record. *

“Extinction events” are dramatic cases of cosmic intrusions into the history of life-forms on Earth, but smaller “events have occurred as well...

How might cosmic events have shaped life's more recent history on Earth?

BBC News | SCI/TECH | Asteroids 'affected human evolution' - Netscape

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Thursday, 12 April, 2001, 10:36 GMT 11:36 UK

Asteroids 'affected human evolution'

A threat to our early ancestors?

By BBC News Online science editor Dr David Whitehouse

Impacts by asteroids may have affected the course of human evolution, according to two researchers studying how often the Earth has been struck in the past.

They say that rather than gradual and uninterrupted human evolution, the ascent of mankind could have been influenced by frequent cosmic catastrophes.

Their work, they say, explains one of the

"It is sobering to

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Internet links:

- John Moores University
- The Planetary Society
- Nasa: Asteroid impacts

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Some scientists are suggesting that cosmic events may well have directly affected the evolution of the *human* species.

*

What if "we" emerged as a result of a cosmic event?

Whatever their role in Earth's past, asteroids and meteors appear to be an ongoing "fact of life" on Earth. There is no "escaping" them. *

In fact there is a call for new defenses to cope with them. *

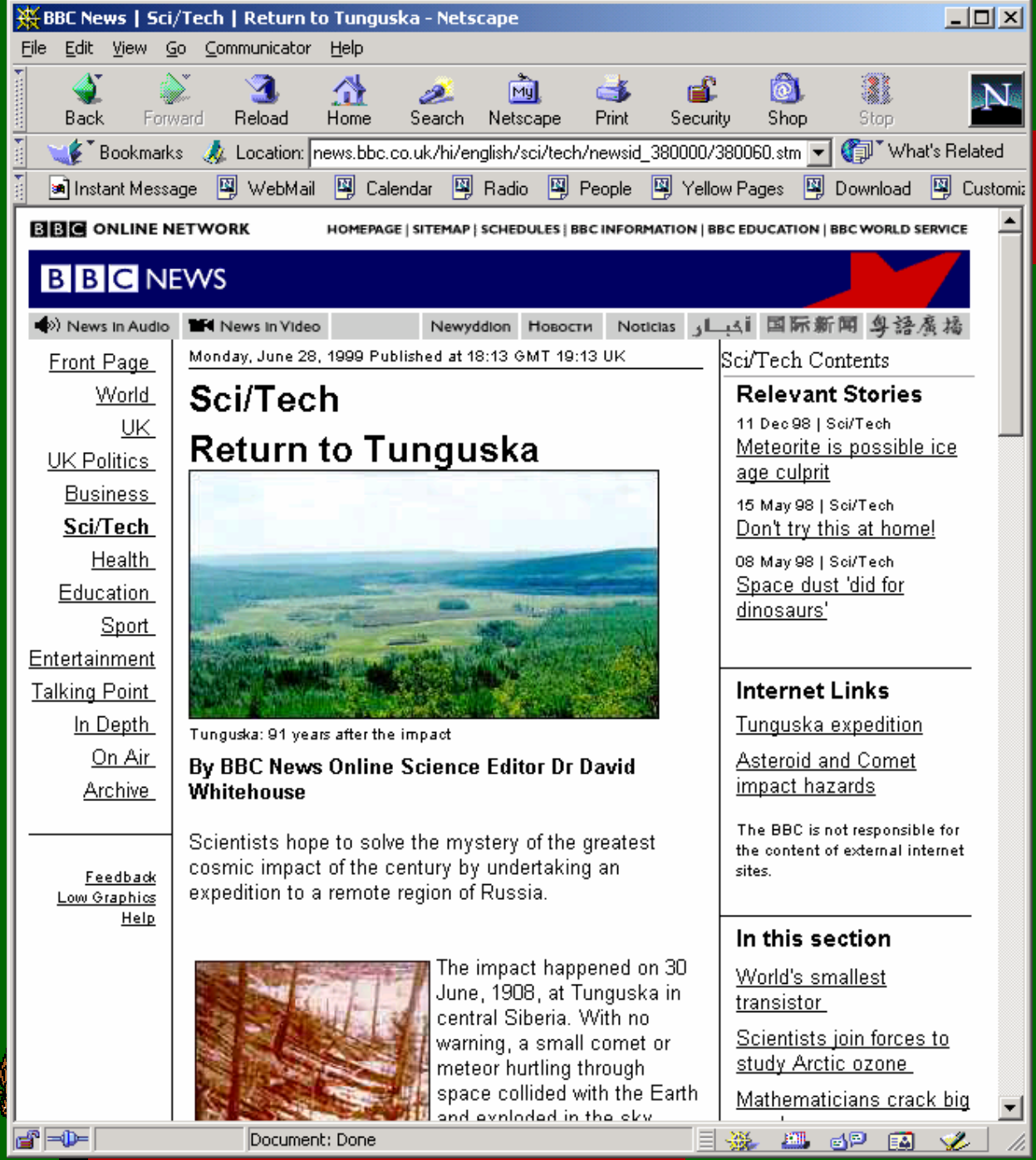
This is not just a “theoretical” problem.

Consider what happened in June 1908….

In 1908 Earth experienced the largest explosion in “recorded history”…

…. The trouble was that it wasn’t recorded by many people at all.

Tunguska, Russia on 30 June 1908 -- (an artist's impression).



There are now recent scientific expeditions to investigate what happened on June 30, 1908. *

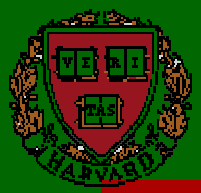
Recent Events

The *Don Quixote* Mission.

We have other cosmic “issues”

But what of other cosmic “issues,” closer to home in both time and space?

What about our nearest neighbors -- beyond the moon -- upon which all life on Earth’s surface depends?



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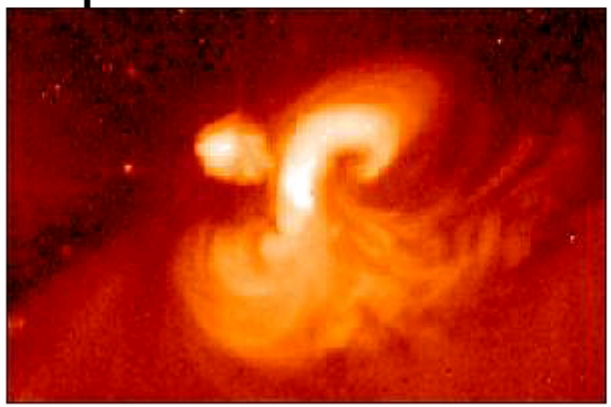
Scientists to forecast sun eruptions



S-shaped swirls on the Sun's surface spell danger

Colossal solar storms which can destroy communication satellites and knock out power grids on Earth may be predictable.

Scientists have found that unusual

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What are “sun eruptions”? Why should we care?

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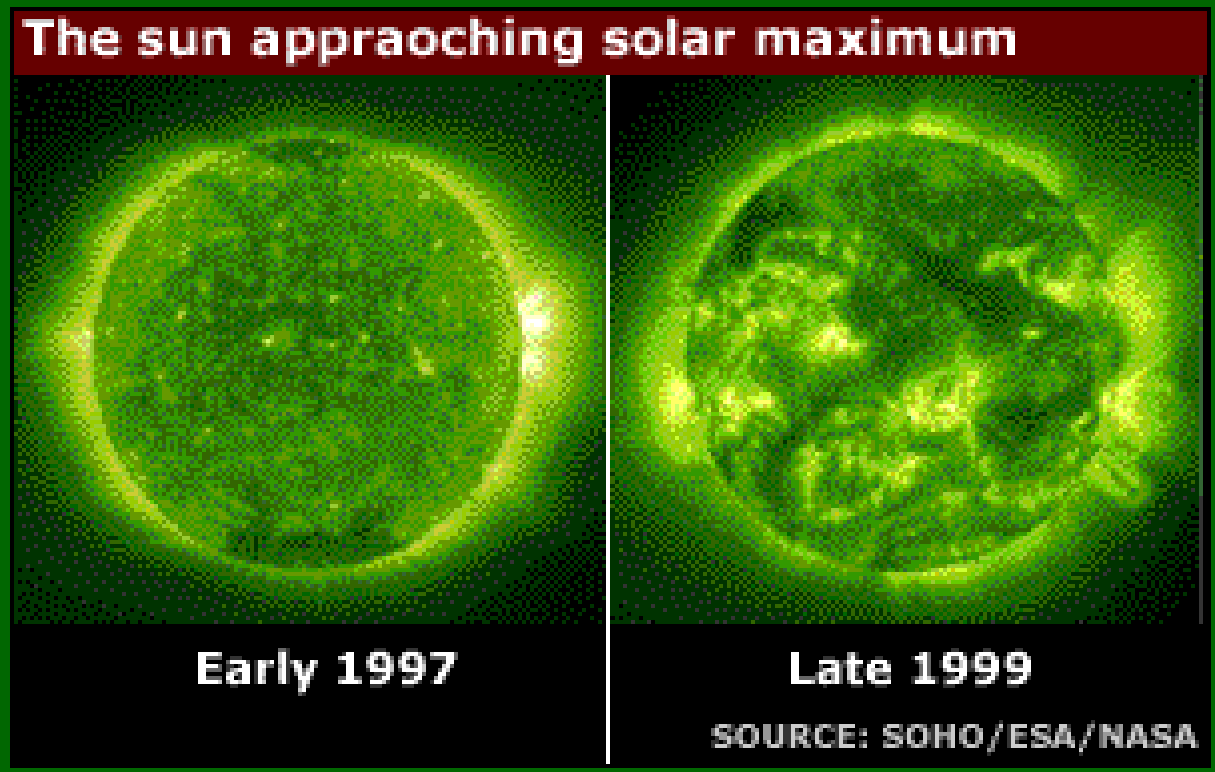
The sun appraoching solar maximum
Early 1997
Late 1999
SOURCE: SOHO/ESA/NASA

The sun most certainly affects climate -- in ways we do not fully understand.

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Last Updated: Friday, 7 November, 2003, 17:32 GMT

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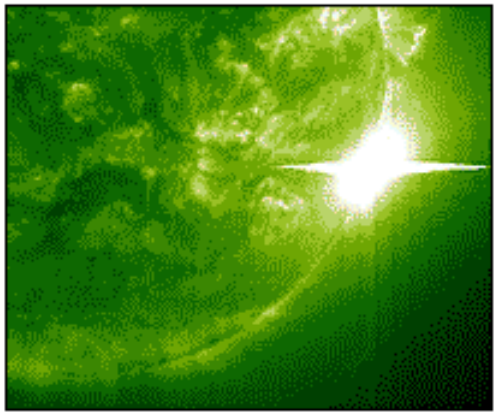
Solar flare confirmed as biggest

By Dr David Whitehouse
BBC News Online science editor

Solar scientists have confirmed that Tuesday's explosion on the Sun was, by far, the biggest flare ever recorded, capping an energetic solar period.



The largest flare since regular monitoring began

Powerful flares get an "X" designation. Prior to this week, the biggest ever seen was X20. Last Tuesday's was X28.

The blast sent billions of tonnes of superhot gas into space - some of it directed towards our planet.

In the past fortnight, space weather forecasters have been busy tracking the impact of geomagnetic storms on Earth.

Huge energy

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  30 Oct 03 | Science/Nature
- Earth put on solar storm alert
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Last Updated: Wednesday, 17 March, 2004, 01:27 GMT

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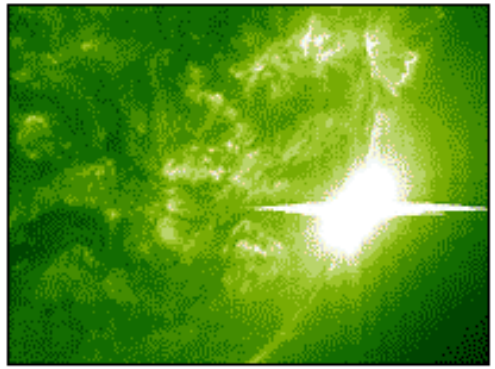
Sun's massive explosion upgraded

By Dr David Whitehouse
BBC News Online science editor

The massive solar flare that erupted from the Sun last November was far bigger than scientists first thought.



The flare overloaded detectors

At the time, satellite detectors were unable to record its true size because they were blinded by its radiation.

But University of Otago physicists say they have now estimated the probable scale of the huge explosion by studying how X-rays hit the Earth's atmosphere.

They tell Geophysical Research Letters the X45 class event was more than twice as big as the previous record flare.

Fortunately, the Earth did not take a direct hit from this immense blast of radiation and matter.

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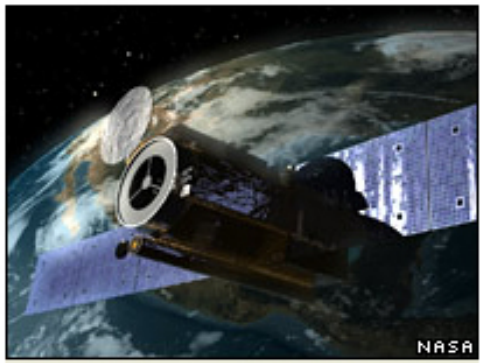
Japan launches Sun 'microscope'

By Jonathan Amos
Science reporter, BBC News

Scientists have high hopes for Japan's Solar-B mission which has been launched from the Uchinoura spaceport.



Solar-B's orbit gives it a near-continuous view of the Sun

OPEN Enlarge Image

The spacecraft will investigate the colossal explosions in the Sun's atmosphere known as solar flares.

These dramatic events release energy equivalent to tens of millions of hydrogen bombs in just a few minutes.

The probe will attempt to find out more about the magnetic fields thought to power solar flares, and try to identify the

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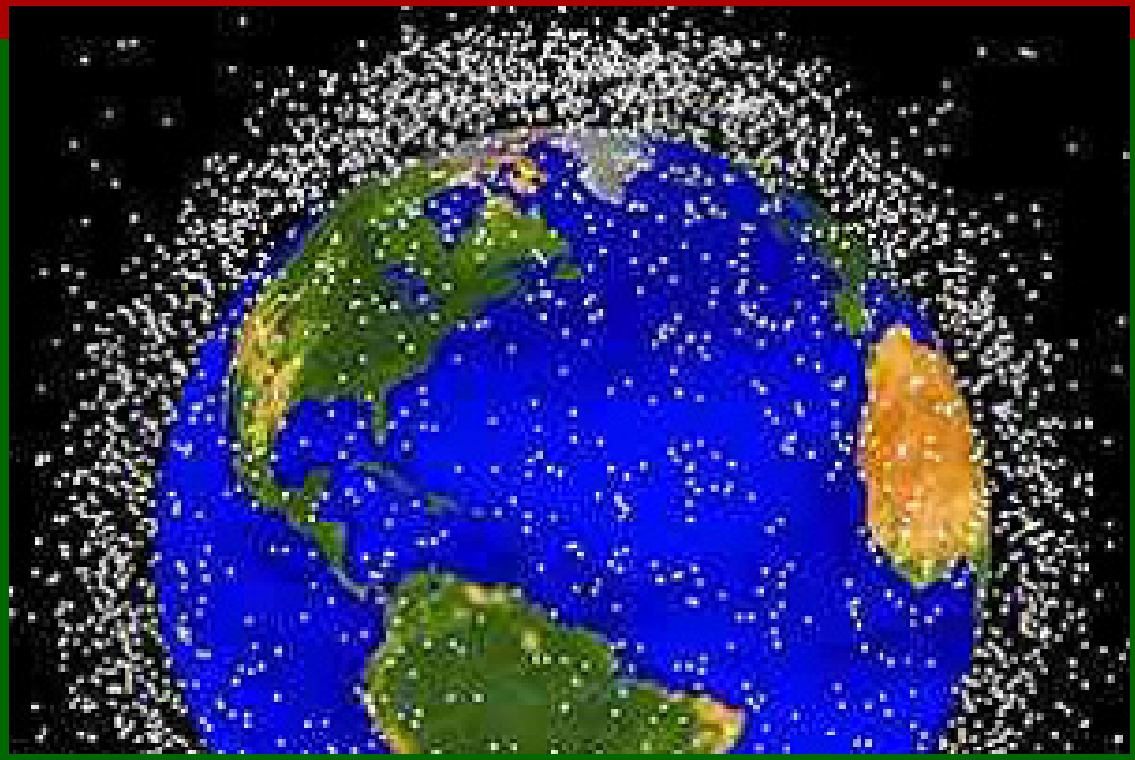

The sun's "weather" also affects us quite directly in terms of how we communicate and "protect ourselves on earth.