June 2012 Vol. 37, No. 6

World Reports Covering Climate, Behavior, and Commodities Original Papers Historical Perspectives

BROWNING NEWSLETTER

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A Fraser Management Publication

SUMMER – HURRICANES AND HEAT

IN THIS ISSUE

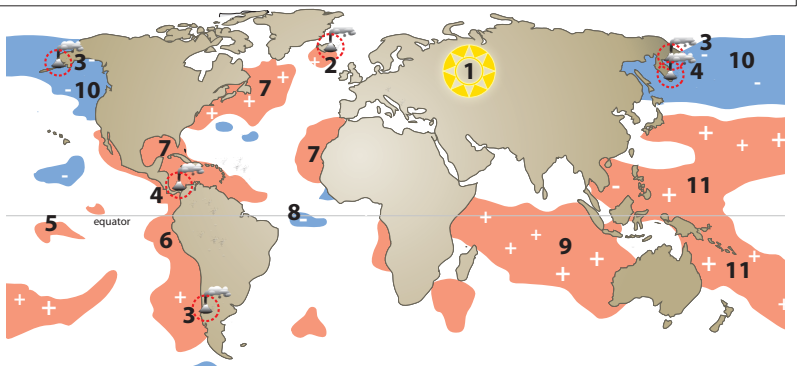
- The warming Atlantic and patterns in the Pacific, from the short Madden Julian Oscillations to the evolving El Niño, will create an active early Atlantic hurricane season that slows down, especially in October and November making it probable that this season will have a near normal number of storms.
- Typically, these conditions tend to torque the tropical storms eastward. In similar years, the Western Gulf saw relatively little activity after the early part of the season. Florida and the East Coast are at increased risk, particularly from subtropical storms.
- The same hot Atlantic water that shaped a warm winter will be shaping a hot early summer for the central and eastern portions of North America. There is a high risk (80%) of drought continuing in much of the Southeast.
- The threat of a solar storm damaging satellites and electrical grids is real and will probably happen over the next four years. The polarity of these storms make them riskier than they were at the peak of the last cycle in 2000.
- Electrical grids in North America, China, Australia and Scandinavia face the greatest threat. Pipelines in those countries and Russia could also face some disruption.
- Utilities and nations around the world responded properly to solar threats last cycle and during the medium-sized incident last March. They are not prepared for any event as large as the 1921 storm.

SUMMARY

Both the Atlantic and Pacific are warming up. This will create a busy early Atlantic Hurricane Season and a hot early summer. If El Niño arrives late summer or early autumn, it will bring a quiet end to the hurricane season and cooler, rainy conditions in the US grain belt. It would also encourage summer drought in the Southeast.

For the first time, according to the National Hurricane Center, both the Atlantic and the East Pacific have had tropical storms form before the opening of hurricane season! The reason for these storms is the same reason for the Memorial Day Weekend heat wave – hot water.

Natural Factors Shaping Spring and Summer's Weather



1 The sun is entering the active phase of the solar cycle.

2 The large eruption of Grímsvôtn has distorted Arctic winds.

3 Large volcanic eruptions put climate-changing debris in the stratosphere in 2009 and 2011.

4 Several volcanoes continue to have small and medium-sized eruptions.

5 The tropical Pacific is neutral but appears to be warming.

6 The MJO created favorable winds for cyclone development.

7 The Gulf Stream is flowing fast and the North Atlantic is very warm.

8 The tropical Atlantic waters that were cool in April have warmed to neutral.

9 The warm Indian Ocean Dipole is developing a weak negative Indian Ocean Dipole.

10 Cool water in North Pacific and off the West Coast.

11 Warm water off Asia and Australia (a cool PDO/IPO).

fig. 1

CONTENTS

This newsletter contains articles, observations and facts to support our contention that man is significantly influenced by the climate in which he exists. Our calculations show the climate, over the next term, will cause dramatic changes in our social and economic patterns.

We feel that the reader, attuned to the changes that are occurring, may develop a competitive edge; and, by understanding his now and future environment, can use the momentum of change to his advantage.

After threatening to cool, the Gulf Stream is once again raising Atlantic temperatures to a simmer. The current offshore temperatures are more typical of July. Similarly, we are seeing temperatures rise in the Pacific. The Tropical Pacific is warming and threatening to develop an El Niño.

These hot waters will shape this summer.

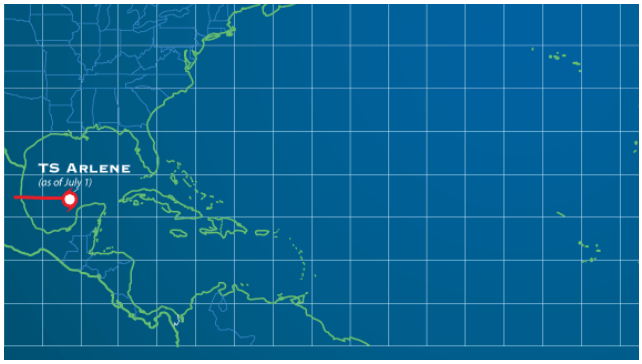


fig. 2 **Alberto and Beryl make pre-season debuts** ©Browning Newsletter

Hurricanes

The Atlantic Hurricane Season officially begins today, even if the Tropical Storm Alberto and Tropical Storm Beryl did not wait.

A number of services have already forecast the season, with the consensus (NOAA, the UK Met. and the Tropical Storm Risk consortium) being that it will be a near normal season. This means:

All of the services are looking at the same major factors – water temperatures and winds. Basically, to create a tropical storm, you need three components:

1. A storm, either a cool subtropical storm or a hot tropical disturbance,
2. Warm water with temperatures over 79.7 °F (26.5 °C) down to a depth of at least 50 m (160 ft.), to energize the storm, and
3. Favorable winds, some of which are shaped by conditions in the Pacific.

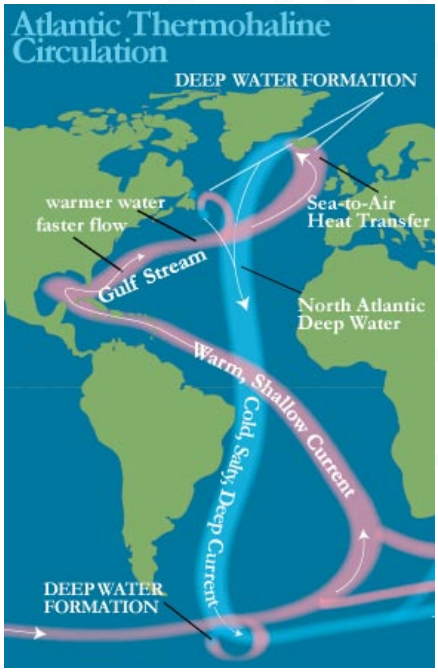
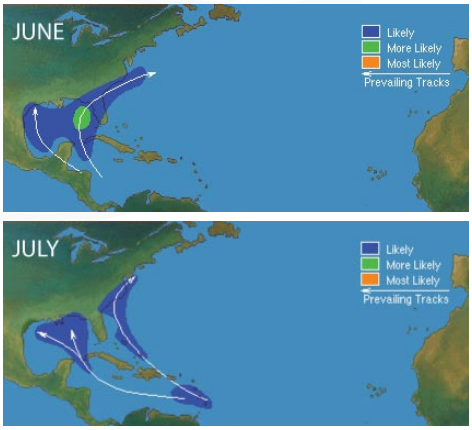


fig. 3 ©Browning Newsletter

In April, both the Atlantic and the Pacific were in transition. The Tropical Atlantic was cooling and the Tropical Pacific was warming. This May, both oceans are warming. This should create an energetic early hurricane season and, if a warm El Niño develops in the Tropical Pacific, a quiet late hurricane season.

Different agencies observed the changing ocean temperatures and based their hurricane forecasts on their observations. A slow warming of the Atlantic or a rapid warming of the Pacific will reduce the number and size of Atlantic hurricanes.

The Atlantic is in the middle of a warm phase of a long-term climate cycle, called the Atlantic Multidecadal Oscillation. The Gulf Stream and other tropical currents, collectively called the Atlantic Thermohalene Current, are in a decades long period of flowing rapidly, carrying warm tropical water north. Historically, this warm phase of the Atlantic Multidecadal Oscillation is ideal for storm formation. It not only provides warm water but it creates favorable winds over portions of the ocean where storms develop. This year the Gulf Stream has been flowing remarkably fast. The waters off the Gulf and East Coast are as warm as they would normally be in July.



figs. 4-5 **Likely tropical storm origins and tracks, by month. June,** *top*, **and July** http://www.nhc.noaa.gov/climo/

Subtropical Storm

A cold weather storm that on the bottom has acquired swirling tropical characteristics.

We have felt the warmth from these offshore waters surge through the central and eastern portions of North America all winter and spring. They will continue through early summer. While there has been some sign of this rapid flow of the Atlantic current carrying cooler waters from the South Atlantic into the tropics, it has not affected the waters off the US coast. Since these offshore waters are the nursery for tropical storms in June and July, we have an ideal environment for storm development. As a result, we have seen two cyclones, Alberto and Beryl form off the East Coast.

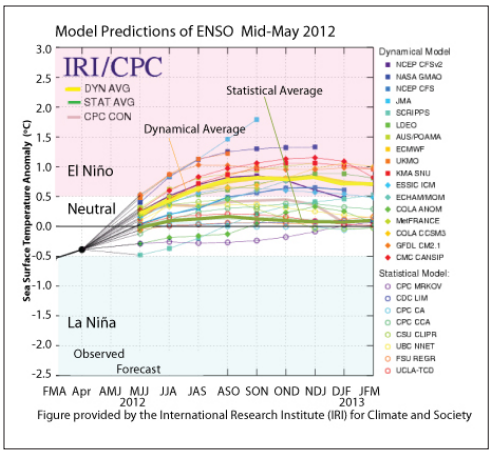


fig. 6 **Dynamic models forecast a developing El Niño**
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

The other part of the equation for the hurricane season is the favorability of the winds. This is where the warming conditions in the Pacific play a role. Typically, if the Tropical Pacific warms enough to form an El Niño, more than 0.5°C (0.9°F) above average, it heats the atmosphere above it, altering air pressure. Air pressure shapes wind patterns and since the El Niño is so large, it alters tropical wind patterns around most of the globe. High altitude winds over the East Atlantic become very strong and westerly.

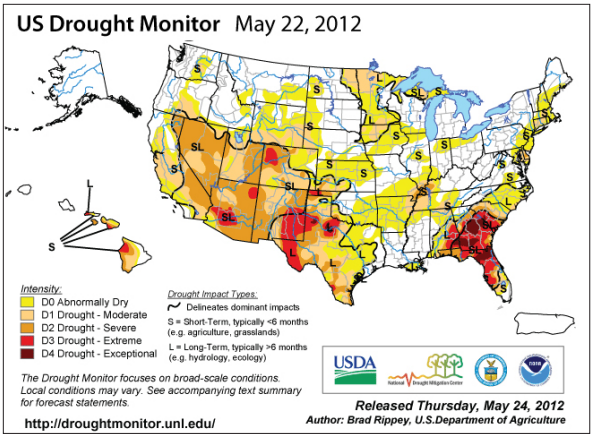


fig. 7 *http://droughtmonitor.unl.edu/*

This is the opposite of the low-level tropical Atlantic winds, which are easterly. At a minimum, the high-level winds tend to torque developing Atlantic storm westward. More typically, they sheer the tops of the storms off before they can become hurricanes.

If an El Niño develops, it will quell the Atlantic Hurricane season. According to most international models, it appears that the central Tropical Pacific is warming and most scientists expect El Niño. The big question is when. Will it develop in late summer or fall, when it would affect the hurricane season? Will it develop in late fall or winter, when it will have little influence. Most dynamic models forecast a late summer event while statistical models suggest it may not develop at all. Looking at the models and knowing their overall history of accuracy, it seems very probable that an El Niño should start in early fall, during the peak of the season.

Currently, both heat and wind conditions are ideal for Atlantic and East Pacific storms. These conditions should continue into early June. It is likely that a short-term pulse of the Pacific Madden Julian oscillation will affect the Caribbean in late June/ early July slowing the season. By mid-to-late August, the MJO should be more favorable for storm development, providing an El Niño has not developed.

Heat

The same hot Atlantic water that is shaping the hurricane season baked the Central and Eastern US through winter and spring. Marine air masses surged inland from the Gulf, causing a humid Memorial Day heat wave. Despite scattered showers, high temperatures are causing rapid evaporation. As a result, 62% of the US is dry or in drought. Roughly, half of that land is in drought, a bit less than was drought stricken three months ago.

This has created ideal conditions for planting in most of the Great Plains and Midwest. Even areas that are officially dry or enduring moderate (D1) drought are mostly dry due to long-term shortfalls from last year's La Niña. Unfortunately, what is good for plants is unpleasant for people, so expect high cooling demands in major Midwestern and Eastern metropolitan areas.

Looking towards the future, the Gulf Stream has brought some cooler waters from the South Atlantic and they are flowing through the tropics. This means the off shore waters will cool slightly, going from hot to merely warmer than normal as summer progresses. Meanwhile the Pacific shows signs of becoming a hot El Niño by early autumn. Typically, this creates warmer temperatures off the West Coast, a stronger Southwestern Monsoon. It also correlates with warm weather and timely rainfall through most of the Great Plains and Midwest. It also correlates with fewer hurricanes and less rainfall, even drought, in the Southeast.

There is one more factor shaping the weather. Around the Pacific, we are seeing a number of moderate volcano eruptions. The aerosols (ash and chemicals) tend to collect water and form clouds which eventually rain out hundreds, even thousands of miles away. Currently Sheveluch on Russia's Kamchatka Peninsula has been active, with a 9.5 km (5.9 miles) high eruption cooling fronts that hit the Canadian and US West Coast. Meanwhile, volcanoes in Central America have been more restless, with Fuego in Guatemala having a 5 km. (3.1 miles) plume. The Central American eruptions need watching since the debris from larger plumes would interfere with hurricane development.

Conclusions

- The Atlantic is slowly warming in the East and very hot in the West. This will create a very active early hurricane season.
- Patterns in the Pacific, from the short Madden Julian Oscillations to the evolving El Niño, will slow down the Atlantic season, especially in October and November making it probable that this season will have a near normal number of storms. The Colorado State University scientists defined this as roughly 12.1 tropical storms, 6.4 hurricanes, and 2.7 major hurricanes. This may be less if the El Niño fully develops during September, the peak of the storm season.

Cool	Cold	Warm	Dry	Wet
2°C or more lower than normal temps.	5°C or more lower than normal temps.	2-4°C or more higher than normal temps.	75% or less of normal moisture	125% or more of normal moisture

figs. 8-10*, *below,* **Moderate eruptions in the North Pacific will bring more moisture to the west**

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- Typically, these conditions tend to torque the tropical storms eastward. In similar years, the Western Gulf saw relatively little activity after the early part of the season. Florida and the East Coast are at increased risk, particularly from subtropical storms.
- The same hot Atlantic water that shaped a warm winter will be shaping a hot early summer for the central and eastern portions of North America.
- There is a high risk (80%) of drought continuing in much of the Southeast.

SCARY SOLAR STORMS

SUMMARY

The sun is approaching the peak of the sunspot cycle, which is increasing the risk of large solar storms and violent space weather. These storms pose a considerable risk to satellites, electrical grids, pipelines and communication systems. Are we adequately prepared?

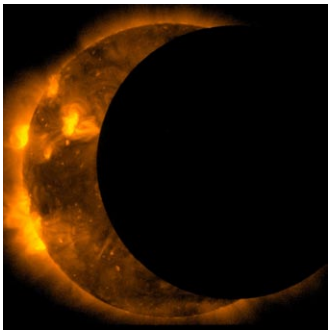


fig. 11 **"Ring of Fire" eclipse**
May 20,2012 *courtesy: NASA/Goddard*

Do you think a giant hurricane is scary? It's nothing compared to a solar storm. From the Wall Street Journal and New York Times to the Financial Times, we have seen a growing number of stories warning us of the possible consequences of space weather. From "Global Katrina" to "Fukushima – type meltdowns" some of the rhetoric is dramatic, even hysterical. Let's take a careful examination of the subject. How much risk do we actually face from solar storms?

The answer is that there is a real financial danger. As the sun reaches the peak of its sunspot cycle and during the following three years, there will be a flurry of violent space weather. This produces enormous flares of hot ionized gas that can hit the earth and interfere with global technology. The current explosions of gas are more likely to penetrate our atmosphere than the explosions we saw in the late 1990s and 2000s.

We are beginning to see solar activity reach a peak and for the next three to four years, we will be dealing with space weather.

Let's examine what will be happening and which technologies are at risk. Additionally, let's separate the rhetoric from the real risk.

The Science

The sun is a spinning ball of hot magnetized gas and plasma. As it spins, the magnetic force lines in the sun become tangled. After a few years, the twisted magnetic fields are so tangled that they stick out in giant loops through sun's surface – creating sun spots. When the sun is covered with giant storms and sunspots –something has to give.

For the three years following the "solar maximum", the peak of activity, something does. Like a rubber band stretched beyond

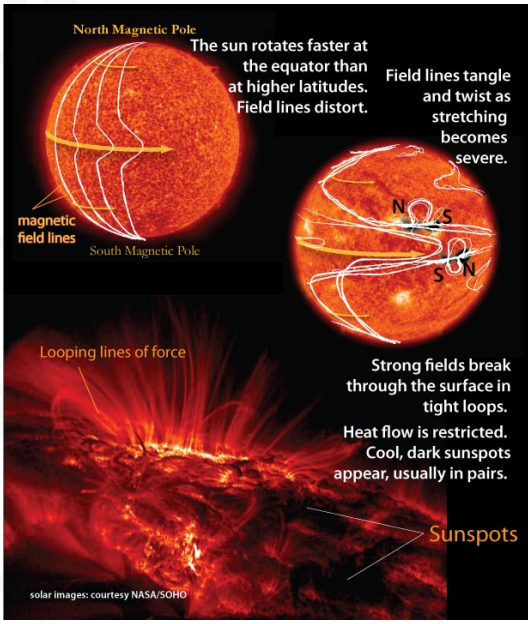


fig.12 **How sunspots are thought to form.**
© Browning Newsletter

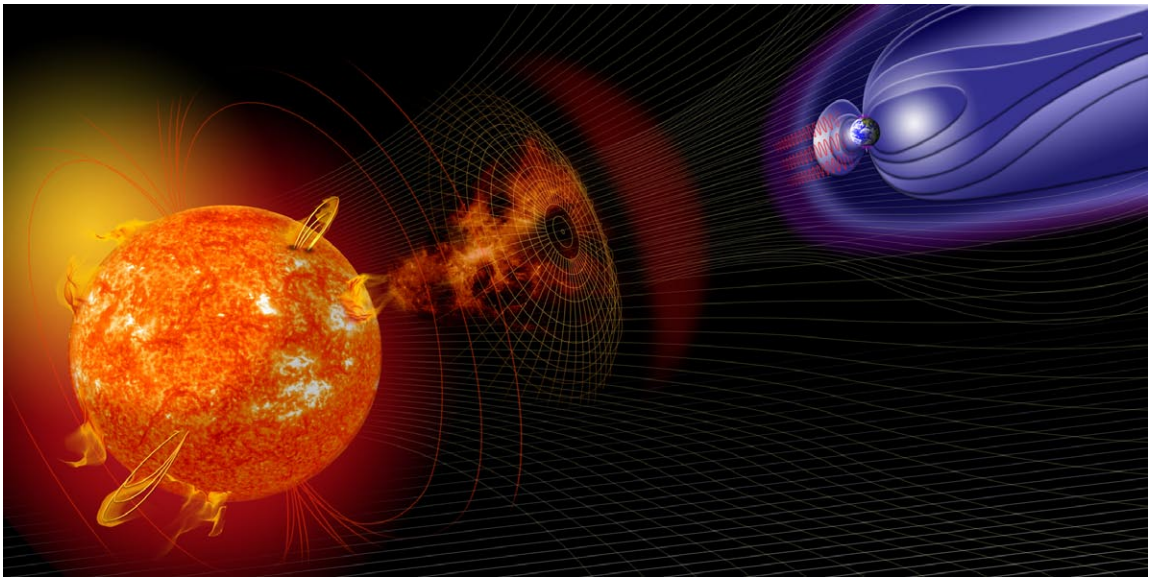


fig. 13 **Coronal Mass Ejections pound Earth's magnetosphere**
courtesy: NASA

http://www.nasa.gov/images/content/525022main_FAQ12.jpg

endurance, the magnetic fields snap and break. This splatters large hunks of the solar gas and plasma out into space. We call the snapping "solar flares". The splatters are "Coronal mass ejections" or CMEs

This cycle of spinning, tangling and finally snapping is an eleven year cycle. The current cycle, Cycle 24, is getting very active and will peak next year. From 2013 to 2015, the sun will be alive with sun spots, solar flares and CMEs. The Earth will be splattered with the magnetized solar gas.

Here's where it gets complicated. The solar polarity reverses every eleven years. The process is still being studied. **Here's what we know – at the peak of the solar cycle, when the magnetic fields are the most tangled and stretched, the "magnetic dynamo" in the sun's core flips.** Instead of generating a magnetic field with northward polarity, the core begins to generate a southward field. Then, in another eleven years, at the peak of the next sunspot cycle, it flips back again and generates a northward field. This is a 22 year solar magnetic cycle.

Why is this important? It is because the Earth's magnetic field has north polarity. Opposites attract. If the sun is generating a southward field, it can really rip our magnetosphere. In the words of NASA:

> ***"The Earth's magnetic field is then peeled open like an onion allowing energetic solar wind particles to stream down the field lines to hit the atmosphere over the poles."***

In other words, every other solar cycle, the solar storms that hit the Earth can really blast us. Last solar cycle, Cycle 23, the polarity of the CMEs were north and even strong solar flares had relatively little impact on the Earth. They damaged satellites, but did little damage to technologies located on Earth. The cycle before,Cycle 22, had CMEs with south polarity At the peak of the cycle, in 1989, a solar storm caused the collapse of the Hydro-Québec power grid, leaving millions of people without power for nine hours. It cost the region an estimated $2 billion.

We are facing another cycle that is generating CMEs with a south polarity like Cycle 22.. **This means the solar storms can inflict enormous damage, much more than in the last cycle.**

The Impact on Earth

A number of technologies are extremely vulnerable to solar storms.

SATELLITES: The satellite industry is the most endangered sector of the economy. The dangers come from above and below. Above, the Coronal Mass Ejections are hot (269,540°F or 149726.7°C) radioactive clouds of plasma that can fry the satellite's equiptment. Computer chips, especially miniturized chips, are vulnerable to even a single particle of radiation. Below, the radiation heats the upper layer of the atmosphere, causing it to puff up like a marshmellow, causing additional atmospheric pull to slow down satellite orbits. This causes them to lose both speed and altitude, shortening their orbital life.

Components can be hardened to protect them from this radiation, but it adds weight, making the satellite more

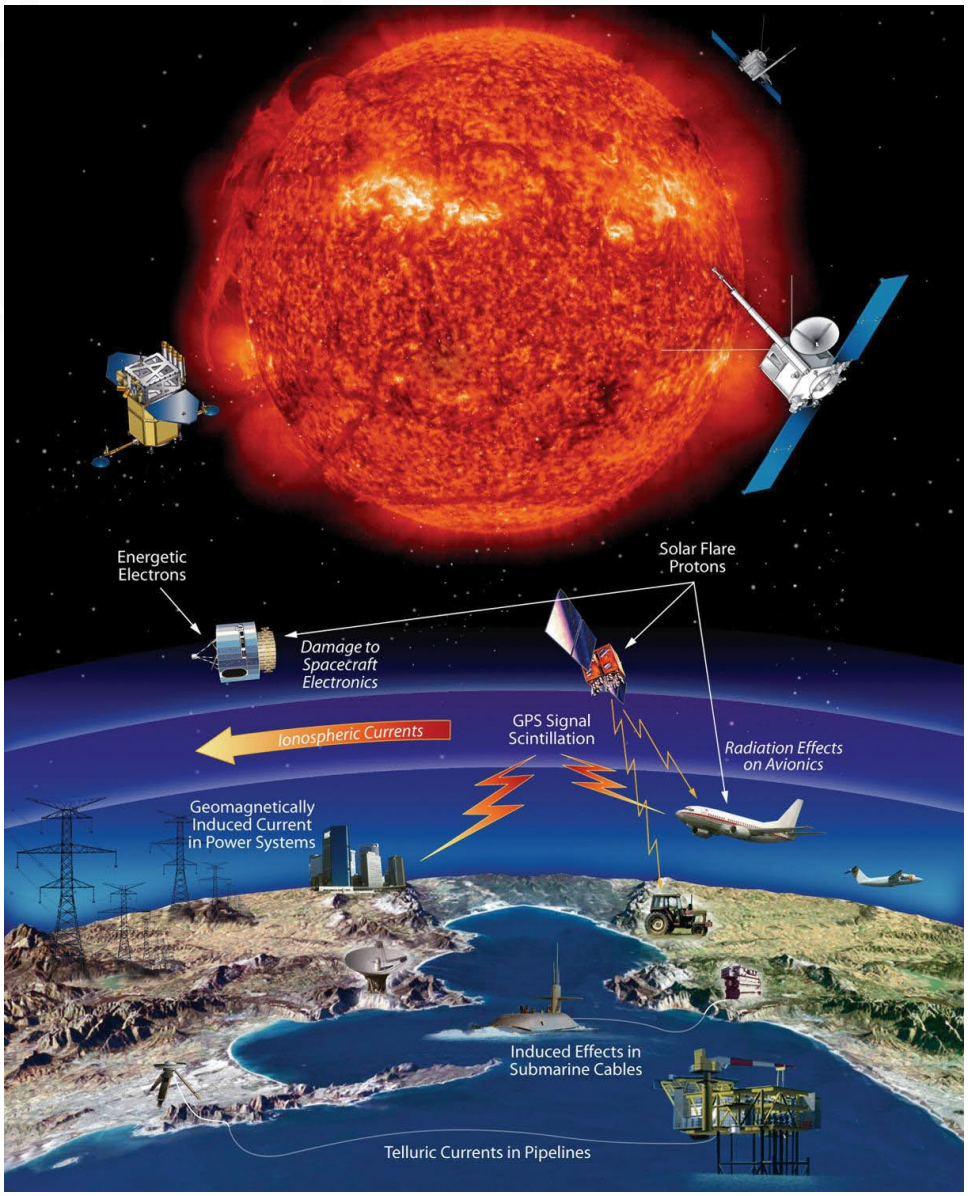


fig. 14 **CMEs can damage both terrestrial and orbiting technologies.**

http://www.nasa.gov/images/content/525001main_FAQ13-orig_full.jpg

expensive to launch. Even hardened components can fail as they did on March 2012 when a large solar storm knocked out two military satellites, forcing them to reboot. Commercial satellites economize more and face higher risk. Last cycle, Cycle 23, we saw multiple satellite failures in (two Japanese satellites, Telstar 401 and probably Galaxy IV, Tempo-2, Adeos research satellite and seven Iridium satellites). During Cycle 22, which was southward like our current cycle, a single solar storm in 1989 not only caused satellite failures, but it also caused the North American Aerospace Defense Command to lose track of 1,600 space objects. They found them again, but for a few days they didn't know where they were. The current cycle will be even more dangerous and the global economy has become even more dependent on satellite technology.

ELECTRICAL GRIDS: The most catastrophic casualty of a major solar storm would be national and international electrical grids. According to international scientists at last year's AAAS (American Association for the Advancement of Science) meeting, a large solar flare would be a "global Katrina" costing over two trilllion dollars!

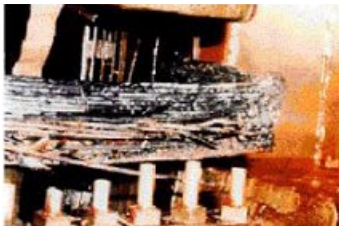
As noted earlier, opposites attract. The ionized gas from a CME with interacts with the Earth's magnetosphere, and energy pours into the Earth's atmosphere through the North and South Magnetic Poles. We see this energy as "Aurora Borealis" and "Aurora Australis", northern and southern lights. When the strorms are even stronger, the energy/electricity reaches the Earth's surface and flows through it. We call this a "geomagnetic storm".

The geomagnetic energy flow surges through transmission wires as well, creating a current. Very long transmission lines, (electricity, telephone and telegraph) are especially vulnerable to damage. This will particularly affect the grid systems of China, North America, and Australia, especially in more modern high-voltage, low-resistance lines. The European grid consists mainly of shorter transmission cables, which are less vulnerable to damage.

The extreme surges of current are particularly harmful to generators and transformers. The coils and cores heat up. This heat can disable or destroy them, even inducing a chain reaction that can overload and blow transformers throughout a system. This is precisely what happened on March 13, 1989: in Québec, as well as across parts of the northeastern U.S. It took just 90 seconds for electrical surges to leave 6 million Canadians without power for up to nine hours, costing the Canadian over 2 billion dollars .

PIPELINES: Rapidly fluctuating geomagnetic fields can produce electrical currents in pipelines. This can cause multiple problems. Flow meters in the pipeline can transmit erroneous information, and the corrosion rate of the pipeline is dramatically increased.

NAVIGATION SYSTEMS: Solar activity disrupts the signal propagation of GPS, LORAN, and other navagation systems. During geomagnetic storms, the solar activity causes sudden variations in the density of the ionosphere, causing the GPS



figs. 15-16 **PJM Public Service Step Up Transformer** *top* **Severe internal damage caused by the space storm of 13 March, 1989** *above*
http://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare/

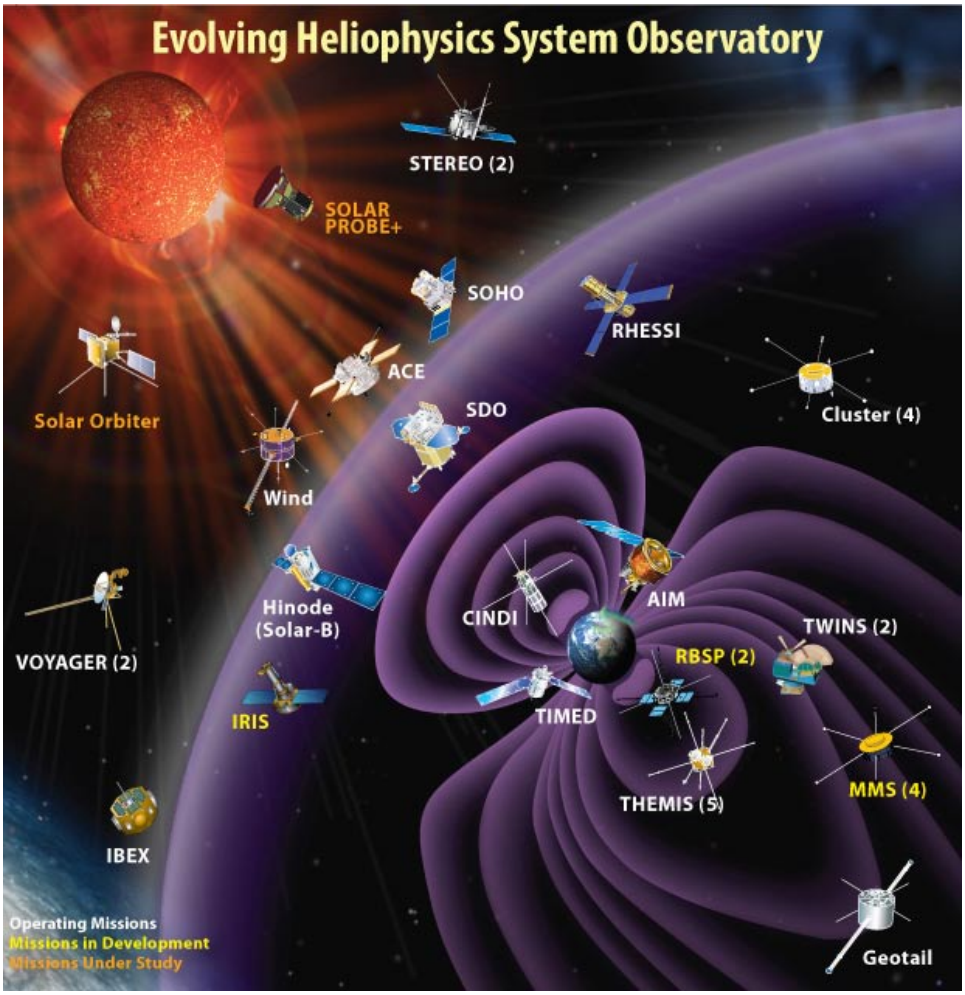


fig. 17, *right*, *http://www.nasa.gov/images/content/525200main_FAQ18.jpg*

signals to scintillate (like a twinkling star). This causes the systems to give navigators information that is inaccurate by as much as several miles for airplanes and ships.

COMMUNICATIONS: Between damaging satellites, disturbing the ionosphere layer of the atmosphere and interferring with transmission lines, a large solar storm disrupts telephone, television, radio, and Internet links. Telephone and cable lines, including undersea cables can be damaged unless they are fiber optic. The National Academy of Sciences reported in 2008 that there will be a strong potential of widespread communication disruption in the 2012–2013 solar peak. This includes military detection or early warning systems.

Probabilities

It is important to understand that our current knowledge of space weather is at the approximate level of our understanding of global weather 50 years ago.

What understanding we have is due to the space industry launcing a number of solar observation satellites in an attempt to avoid another Hydro-Quebec incident. Currently space agencies from 25 nations are monitoring the sun and can issue alerts if a large solar storm is coming. While the initial light from the solar flare arrives in 8 minutes, it normally takes between 30 – 72 hours for the CME to arrive, giving satellites and electrical utilities time to prepare. Satellites can change their orbits and electrical utilities can lower output so that the surges caused by these storms will not short out the electrical grid. Power companies can minimize damage to power transmission equipment, by momentarily disconnecting transformers or by inducing temporary blackouts.

So far, these measures have been successful. During the largest earth-hitting solar storms of the last cycle, the July 14, 2000 Bastille Day event and the 2003 Halloween storms, electrical grids and satellites took protective actions. While the Bastille Day storm created auroras that could be seen as far south as Florida and damaged several satellites, only one system in Sweden was crashed. However, it should be noted that both of storms had north polarity, causing less penetration of the Earth's magnetosphere.

The question is – will these measures be as successful during large storms with south polarity? Will they work if we have a storm as big as the 1989 Hydro-Quebec incident? What about other, larger storms? We have seen much larger storms before the 1980s.

The largest storm since the beginning of the industrial age was the Carrington Event of 1859. It was three times bigger than the 1989 storm and fried telegraphs around the world. The surges were so strong that they set the papers in the telegraph offices on fire. It lasted for days, sending auroras as far south as the Caribbean. A recent National Academy of Sciences report estimates that such a storm could wreak the economic disruption of 20 Katrina-class hurricanes, costing one to two trillion dollars in the first year alone and taking a decade to recover from. It would fry more transformers than the power companies keep stockpiled, leaving millions without light, potable water, sewage treatment, heating, air-conditioning, fuel, telephone service, or perishable food and medications during the months it would take to manufacture and install new transformers. A recent estimate published in the International Journal of Research and Applications says that there is **a one in eight chance of this happening within** the next decade.

In 1921, the largest storm in the 20th century , and smaller than the 1859 Carrington stom, occurred. IAccording to a study by Metatech Corporation and , John Kappenman of Storm Analysis Consultants, a similar 1921 solar storm today would turn out the lights in over half of North America. It would destroy more than 300 transformers and leave over 130 million people without power, with a cost totaling several trillion dollars. Even more disturbing, a 2011 report by the Oak Ridge National Laboratory states that losing power for weeks would overwhelm the emergency electrical power systems at nuclear generating plants, potentially causing one or more Fukushima-type meltdowns.

When assessing these threats, it is important to realized that politics are a factor. Space survaillance and grid preparedness both require government aid, and funding for space and electrical systems have not fared well under the current US administration. Some of the warnings that we are currently hearing have, as a result, become rather shrill.

Conclusions

- The threat of a solar storm damaging satellites and electrical grids is real and will probably happen over the next four years.
- It is also probable that over the next two years there will be a storm as big as the Hydro-Quebec event. Events of that magnitude happen one or two times per cycle. It will have southward polarity and present a greater risk to global systems than the 2000 Bastille Day event. Most national elecrtrical grids can cope with an event the size of the 2000 incedent but may have some problems with an event as big as 1989.
- Electrical grids in North America, China, Australia and Scandinavia face the greatest threat. Pipelines in those countries and Russia could also face some disruption.
- The likelihood of a Carrington Event like 1859 is low and likely being exaggerated. While an event as large as the 1921 storm will probably not happen this cycle, incidents of this size usually happen every century.
- Utilities and nations around the world responded properly to solar threats last cycle and during the medium-sized incident last March. They are not prepared for any event as large as the 1921 storm.

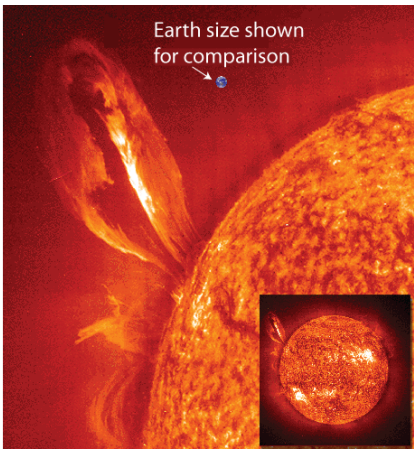


fig. 18 **Solar storms can be enormous.**

http://sohowww.nascom.nasa.gov/classroom/images/sunearth.gif

News Notes

When Tropical Storm Aletta began to spin off the Mexican coast, it broke a record. According to the UK Met Office, the formation of Aletta ends a 41-day streak without a tropical storm anywhere in the world. The 41-day storm-less period is the longest span Earth has gone without a tropical storm in at least 70 years.

The South China Sea summer monsoon (rainy season) has broken out early, during May 16 to 20. The rain belt starts at Hainan Island in the South China Sea and will move from south to north. If the monsoon is relatively weak, the moisture will flood Southeast and Eastern China and not reach drought-stricken Southwest China. This year, the monsoon should be stronger than last year and, when El Niño arrives, bring good rainfall throughout Southern and Central China. Currently, areas in Guangxi and Southeast China are seeing heavy rains, even flooding. Drought stricken Yunnan, where the headwaters of the Yangtze, Pearl River tributaries and Southeast Asian rivers are located, is finally getting some rain.

A recent study traced where the ash from Iceland's 2010 Eyjafjallajökull volcano eruption landed. The explosion's ash and chemical debris caused massive air travel disruptions across Europe. In order to eliminate any needless air travel interruptions in the future, researchers led by Arantxa Revuelta of the Spanish Research Centre for Energy, Environment and Technology have conducted a massive investigation of where the debris landed.

They found that different types of particles spread over different regions at different times. The heaviest particles, which are the most dangerous for airplane engines, landed in central Europe in April. In May, very fine sulfur-rich particles fell over Spain and Portugal. These fine particles are more dangerous to people on the ground because the particles are small enough to enter respiratory and circulation systems. Using this information, the team is designing a model known as Fall3d, which will help airlines and transportation officials make correct decisions during future eruptions.

The worst drought in a half-century is gripping northeastern Brazil. The drought is affecting more than 1,100 towns, even triggering fighting in rural areas. An average of one person a day is being killed in "water wars" in rural areas. Livestock and crops are dying, with some areas losing half their output. Local dams are running dry and the Brazilian government has reduced forecasts for corn, soy and bean crops. This drought will have severe political consequences as there are reports of water truck drivers making deliveries - but only if customers promise to vote for certain local candidates. According to weather experts, warm Atlantic temperatures and El Niños cause droughts in this region, so do not expect any short-term relief.

We constantly hear of the endangered or newly extinct species of the world. What we seldom hear about are the new species that are constantly being discovered. On May 23, the International Institute for Species Exploration at Arizona State University and a committee of scientists from around the world announced their picks for the top 10 (out of 200) new species discovered/described in 2011. Among the new species are:

- The Myanmar snub-nosed monkey (Myanmar) – raindrops dripple into its upturned nose, so it always sneezes in the rain;
- The Bonaire banded box jelly (Bonaire Island in the Caribbean) – a colorful, venomous jellyfish that is shaped like a box kite;
- The Devil's worm (South Africa), the deepest dwelling multicellular organism on the planet ;
- The SpongeBob SquarePants mushroom (Borneo) – it looks like a sponge;
- Bulbophyllum nocturnum (Papua New Guinea) – the only night-blooming orchid in the world;
- Sazima's tarantula (Brazil) – a iridescent blue, hairy tarantula and
- Crurifarcimen vagans, (Tanzania) – a thick, giant millipede about the length of a breakfast sausage

The opinions expressed are those of the writer, and although they are based on extensive studies of physical data and phenomena, many statements published here are not entitled to be regarded as rigorously proved in a scientific sense. Some decades must pass before these issues are resolved.

Meanwhile, decisions must be based on the best available information and estimates.

This newsletter will **not** contain:

- *Analysis of, or recommendations concerning, any investment possibilities.*
- *Recommendations on any particular course of action.*

The **Browning Newsletter** is published monthly at an annual subscription rate of $250 for print OR email version, $270 for both formats. Subscriptions should be directed to:

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