Over the Horizon

It is January 2013 and time once again to reassess the sun's transition into Solar Cycle 24. I just looked at the Ap Index Number for last month (December 2012) and it was 3. Unbelievable! Here we are nearing the Solar Maximum and the sun is acting like we are still in a Solar Minimum. What lies ahead just over the horizon?

What are Solar Cycles?

The sun goes through a periodic change around every eleven years where the polarity of the sun's magnetic field changes poles. Essentially the sun's magnetic north pole becomes the south pole and vice versa. This is a normal process. As these poles realign and the magnetic field is the weakest, there is an absence of sunspots and this period is referred to as a solar minimum. A solar cycle (or SC for short) is measured from one solar minimum to the next.

But even though the cycle repeats, the intensity of the solar cycle varies significantly. Scientists have been monitoring sunspots since the 1700's. Their observations have shown when the sun gets deafly quiet such as during the Maunder and Spörer Minimums; the world experiences great cold periods. These periods were so cold they were referred to as the *Little Ice Ages*.

What is different about Solar Cycle 24 and why is it relevant?

Since the sun has finally entered solar cycle 24 (SC24) with the resurgence of sunspots, most people have turned away from tracking the strength of the rebound. Had they looked, they would have found that the surge into this next solar cycle so far has been rather weak.

The Average Magnetic Planetary Index (*Ap index*) is a proxy measurement for the intensity of solar magnetic activity as it alters the geomagnetic field on Earth. It has been referred to as the common yardstick for solar magnetic activity. *Ap index* measurements began in January 1932. The quieter the sun is magnetically, the smaller the *Ap index*.

This solar minimum is rather unusual. If we define a period of quiet sun as those months that produced an *Ap index* of 6 or less and compare the total number of quiet months within each solar minimum, then the results would be:

Minimum Preceding Solar Cycle	**Number of Months with *Ap Index* of 6 or less**
SC17	11 months
SC18	2 months
SC19	2 months
SC20	5 months
SC21	0 months
SC22	0 months
SC23	3 months
SC24	36 months

Last month (December 2012) produced an *Ap index* of 3. Even though we have transitioned into SC24 and are approaching a solar maximum, the sun still remains relatively quiet.

The sun provides us with warm sunshine that keeps our planet from becoming an uninhabitable frozen wasteland. The sun's magnetic field protects our planet from cosmic rays that flood our galaxy. These cosmic rays are responsible for changing earth's climate by changing the degree that the earth is covered with clouds.

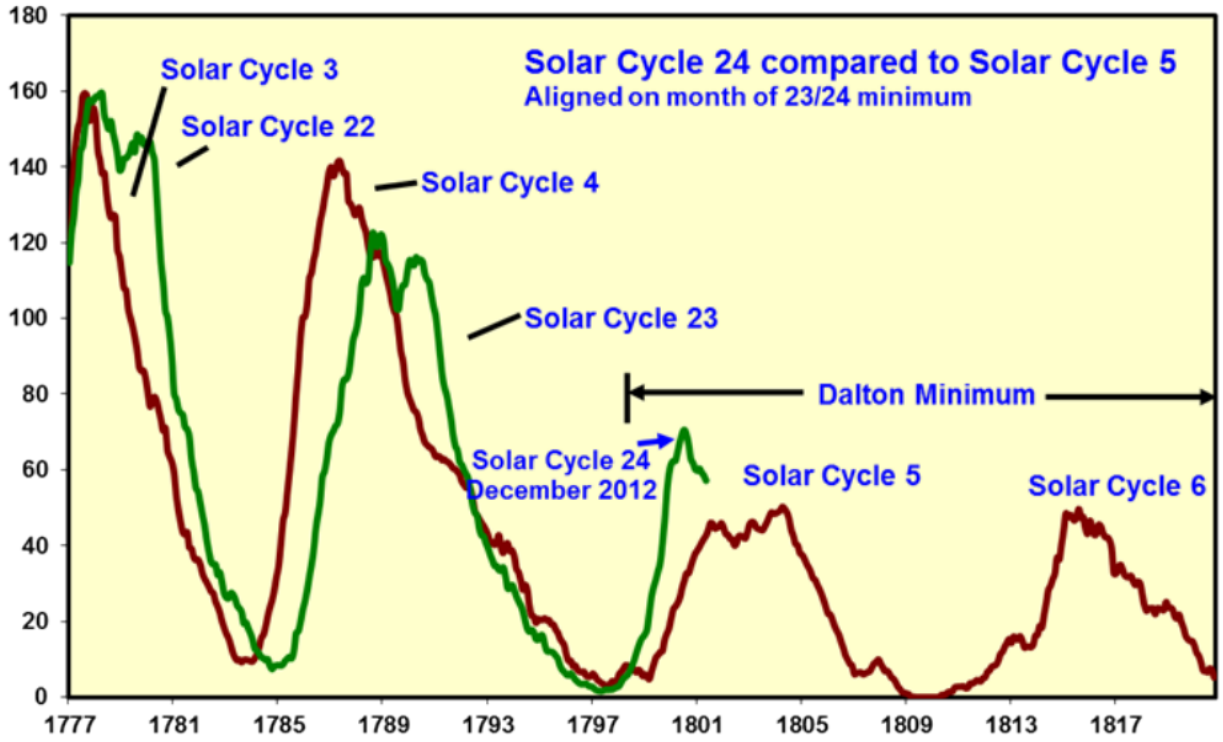
So the study of the sun's magnetic field is not an abstract field of research but rather one that has a direct effect on Earth's climate and weather. During the winter months in the past 4-year solar minimum, many places experienced some of the coldest, snowiest weather in decades at the same time the sun's magnetic field produced these 36 quiet months. This occurred in both the Northern and the Southern Hemispheres.

What is the assessment of various solar scientists?

There are some scientists that believe the sun, rather than leveling off into a new state in Solar Cycle 24, will continue to free fall throughout this solar cycle. Several scientists including David Hathaway (NASA), William Livingston & Matthew Penn (National Solar Observatory), Khabibullo Abdusamatov (Russian Academy of Science), Cornelis de Jager (The Netherlands) & S. Duhau (Argentina) and Theodor Landscheidt (Germany), have forecasted that the sun may enter a period similar to the Dalton Minimum or a more severe "Grand Minima" (such as the Maunder Minimum or Spörer Minimum), a decade from now in Solar Cycle 25.

A few scientists including David C. Archibald (Australia) and M. A. Clilverd (Britain) have warned this might even begin in Solar Cycle 24. We are at the transition into Solar Cycle 24 and this cycle has already shown itself to be unusually quiet.

I contacted David Archibald and requested an update of his (sunspot) graph that compares Solar Cycles 3-6 with Solar Cycles 22-24. David gladly obliged.



So what can we say at this point in time?

1. The solar minimum leading up to Solar Cycle 24 was the weakest observed in terms of *Ap index* since measurements first began in January 1932.
2. The sun has definitely undergone a state change.
3. Observationally, solar cycles 22-24, thus far, come very close to matching solar cycles 3-5. This supports the theory that the Earth is transitioning into a Dalton Minimum type event.
4. The winter weather has produced unusual snowfalls and cold weather in both the Northern and Southern hemispheres for approximately five years. This is what might be expected if the Earth was sliding into a new Dalton Minimum.

So what might be over the horizon?

I recently compiled an early weather chronology covering the years 1-1900 A.D. This 1100-page weather chronology is available at: http://www.breadandbutterscience.com/Weather.pdf Because this pdf file is 15.4 MB, it might take a little time to download. To answer the question about what might be over the horizon in regards to weather, review the chronology for the years 1798-1823, the approximate timeframe of SC5 & SC6 - the Dalton Minimum.