

## SOLAR SYSTEM FLARE-UP

# An Interplanetary Imperative

by Benjamin Deniston

June 1—Mid-May featured a period of intense earthquakes and solar activity, bringing some long-standing questions into focus. The largest earthquake in over a year occurred on the morning of Friday, May 24—an 8.3 magnitude quake off the Pacific coast of Russia, in the Sea of Okhotsk. Just over a week earlier, the Sun unleashed two of the largest solar flares of the current solar cycle, an X2.8 on the 13th, and an X3.2 on the 14th. However, these were only the most intense outbursts (**Figure 1**).

As of this writing, these appear to have been part of a broader two-week period of increased Solar System activity, underscoring the need to move beyond simple Earth-based views, and situate processes on Earth within the larger context of our subsuming stellar system.

For example, did you feel the effects of these recent outbursts?

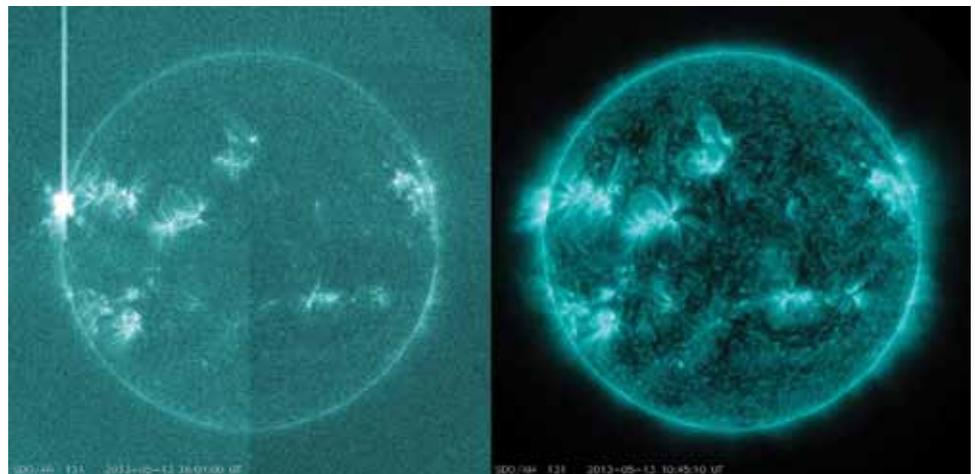
### A Magnetic Personality?

As a result of the Sun's flaring up, the Earth experienced two geomagnetic storms, one on May 18, and a

second on May 25. A geomagnetic storm occurs when the Earth's magnetic field enters a period of intense fluctuation, due to the impact of jets or clouds of plasma thrown off by the Sun. Did these events perhaps correspond to any strange moods you were unable to explain at the time?

Some might dismiss such a question as silly, but a 2003 research paper noted that "A large body of psychological research has shown that geomagnetic storms have a profound effect on people's moods."

FIGURE 1



*Images of the Sun during and after an X-Class solar flare on May 14, 2013. Taken with NASA's Solar Dynamics Observatory space telescope, using the Atmospheric Imaging Assembly instrument, at a wavelength of 131 Ångströms (ultraviolet).*

Was this an obscure scientific study from some students in need of a graduate thesis? Hardly. It turns out that this is a working paper for the Federal Reserve Bank of Atlanta, entitled, “Playing the Field: Geomagnetic Storms and the Stock Market.”<sup>1</sup> There are already so many decades of studies showing the effects of geomagnetic storms on human moods and behavior (many are in Russian) that these authors decided to look for the effects of these geomagnetic-induced mood shifts on the markets.

The paper concludes, “The authors find strong empirical support in favor of a geomagnetic-storm effect in stock returns after controlling for market seasonals and other environmental and behavioral factors. Unusually high levels of geomagnetic activity have a negative, statistically and economically significant effect on the following week’s stock returns for all U.S. stock market indices. Finally, this paper provides evidence of substantially higher returns around the world during periods of quiet geomagnetic activity.”

Obviously there are other factors that have larger effects of the markets (such as the looming collapse of the quadrillion-plus dollars in the derivatives bubble), and more importantly, while people may be biologically affected by such activity, the human species uniquely expresses a creative principle absent from all other forms of animal life. When being truly human, mankind is not controlled by such cosmic forces, but is destined to control them. The slender fingers of a solar-induced aurora point upward, the direction that must be pursued to expand that control.

## Earthquake Forecasts

For example, starting the week before the 8.3M temblor in the Sea of Okhotsk on May 24, the Russian press was filled with warnings of the possibility of a large earthquake in that region. A series of smaller quakes was catching the attention of local scientists and officials, and although nothing conclusive was declared, some, such as Victor Chebrov (the Director of the Kamchatka branch of the Russian Academy of Science’s Geophysical Service) were noting that these could be signs of a larger event to come, as reported by RIA Novosti.

Chebrov said that this activity came in the context

of longer-term forecasts for the region. In 2010, Sergei Fedotov and a small team with the Institute of Volcanology and Seismology of the Russian Academy of Sciences, issued a forecast that a large earthquake (magnitude 7.7+) would strike the Kamchatka region some time between September 2011 and August 2016. This was based on a method developed and successfully utilized by Fedotov beginning in the 1960s, analyzing cycles and gaps in seismic activity of a particular region.<sup>2</sup>

Alexey Lyubushin, with the Institute of Physics of the Earth, has issued a separate long-term forecast for the Pacific Ocean near Tokyo. Based on examining patterns in smaller quakes, Lyubushin is warning that the next Japan mega-quake could occur off the coast of Tokyo in the 2013-14 period.<sup>3</sup>

These longer-term forecasts have made the Kamchatka-Japan region a focus for short-term forecasting, using “non-seismic” methods, such as monitoring infrared emissions, irregularities in the ionosphere, earthquake clouds, etc., which can serve as precursor signals, warning of a coming temblor, days or weeks away. For example, the Moscow-based Research Center for Earth Operative Monitoring recently completed a year-long, short-term forecasting trial program for the Kamchatka-Japan region ([eng.ntsomz.ru/projects/earthquake](http://eng.ntsomz.ru/projects/earthquake)). They were testing a system that could become part of the proposed International Global Monitoring Aerospace Systems (IGMASS) program.<sup>4</sup>

However, it is not clear that the 8.3M earthquake on May 24 has satisfied the forecast for the Kamchatka region, and some are warning of a still-upcoming large quake. Yevgeni Rogozhin, the deputy director of the Institute of Physics of the Earth, Russian Academy of Sciences, noted that this was one of the deepest earthquakes ever recorded (over 600 kilometers), and cited

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2. S.A. Fedotov et al., “A long-term earthquake forecast for the Kuril-Kamchatka arc for the period from September 2011 to August 2016: The likely location, time, and evolution of the next great earthquake with M=7.7 in Kamchatka,” *Journal of Volcanology and Seismology*, April 2012, Vol. 6, No. 2, pp. 65-88.

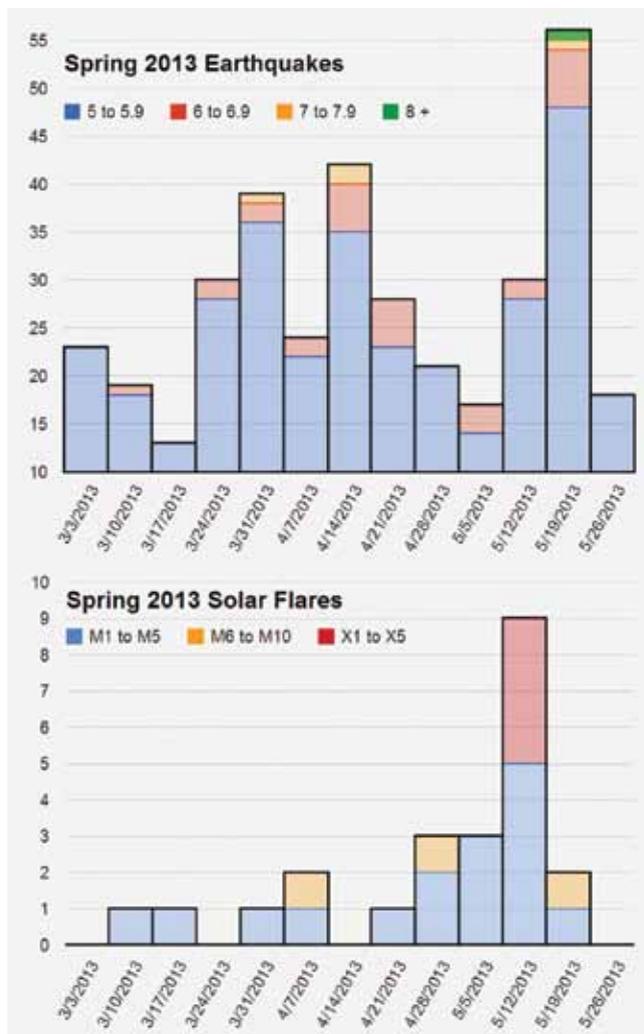
3. [Alexey Lyubushin](#), Institute of Physics of the Earth, Moscow; “Spots of Seismic Danger Extracted by Properties of Low-Frequency Seismic Noise,” presented at the European Geosciences Union General Assembly in Vienna, April 2013.

4. For more, see Benjamin Deniston, Pavel Penev, and Jason Ross, “International Global Monitoring Aerospace Systems: Toward Collaboration in the Defense of Mankind,” *21st Century Science & Technology*, Fall/Winter 2012-2013.

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1. Federal Reserve Bank of Atlanta [Working Paper](#), October 2003, by Anna Krivelyova, Boston College; and Cesare Robotti, Federal Reserve Bank of Atlanta.

FIGURE 2



Top: weekly earthquake totals from early March through the end of May, divided by magnitude range. Bottom: weekly solar flare totals from early March through the end of May. Solar flares are measured by the intensity of the x-ray flux produced, classified on a logarithmic scale as, A, B, C, M, or X-class (going from smaller to larger), so an X-class flare is ten times more energetic than an M-class, and 100 times more than a C-class. Each class divided into 9 levels.

the work of Kiyoo Mogi (a Japanese authority on earthquake prediction), who has said that very deep quakes can be a sign that shallower quakes are to follow in the same region.

Sergey Pulnits, a Principal Scientific Researcher with Space Research Institute, Russian Academy of Sciences, told Russian Chanel 1 television that the concern for future earthquakes in the Kamchatka region has not been eliminated, and that generally, earthquakes that used to occur once every 100 years, are now occur-

ring every 40 years: “The Earth is evolving ... the processes are ongoing.”

### A Solar System

So the areas around Kamchatka and Japan will continue to be watched, but the action is not limited to this region of the Pacific. During the same week (May 19-25), there was a spike in the number of earthquakes globally, with 56 being registered with magnitude 5.0 or higher—an increase over the previous weeks (Figure 2).

Starting one week prior to the earthquake spike, there was an intense flare-up of solar activity. The Sun released 10 significant sized flares between May 12 and 25, with four of them being the larger X-class flares. These four were the first X-class flares since October 2012, and the X2.8 and X3.2 flares on the 13th and 14th were the largest since March 2012—the third- and fourth-largest of the current solar cycle so far (which started in January 2008). Some of these flares released high-speed clouds of plasma toward the Earth, called coronal mass ejections, which can generate disturbances in the Earth’s magnetic field, affecting all kinds of Earth systems, biological and otherwise. Over this period, two geomagnetic storms shook the electromagnetic systems of the Earth, one on May 18, and a second on the 24th, the same day as the large 8.3M temblor cited above.

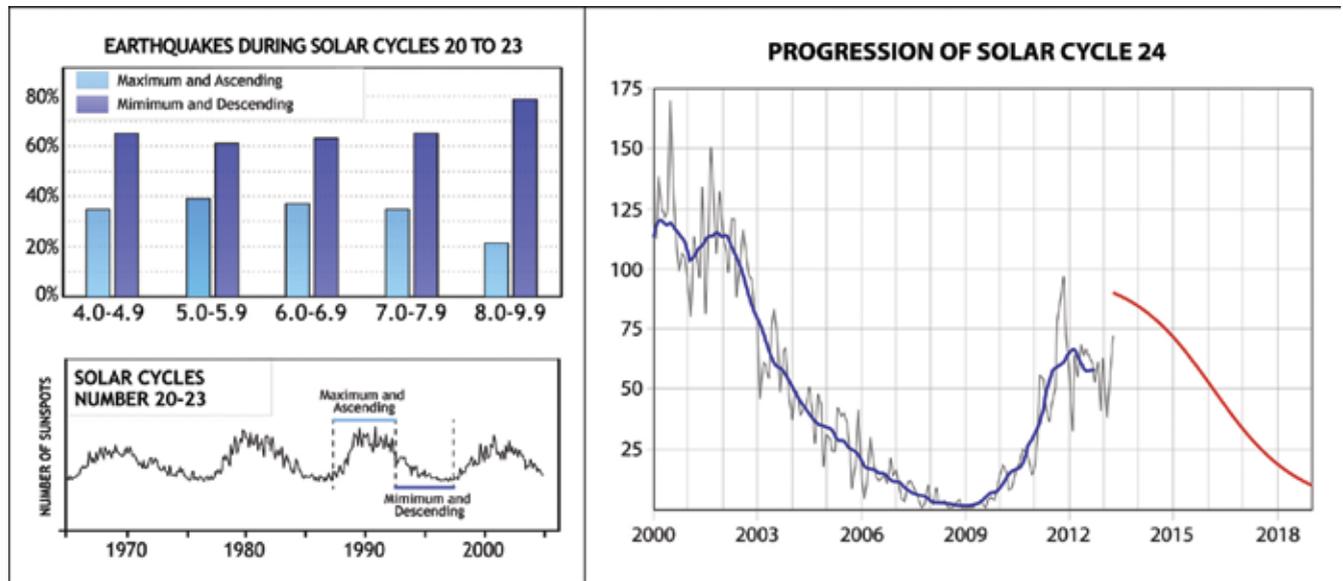
A direct, one-to-one, relationship between solar activity and earthquake activity is notoriously hard to predict. However, stepping back and viewing the larger picture, the evidence certainly points to a relationship. For example, recent studies have shown that the period of the descending half and minimum of the 11-year solar cycle appears to bring significantly more earthquakes than the ascending half and maximum (Figure 3). The discrepancy is greatest for large earthquakes.<sup>5</sup>

### Toward Controlling the Solar System

This is a practical matter, as we are currently rounding the peak of the present solar cycle (number 24), and soon entering the descending phase. What will the coming years bring in the way of large earthquakes? This is the time to put serious support into non-seismic

5. J. Huzaimy and K. Yumoto, “Possible Correlation between Solar Activity and Global Seismicity,” in *Proc. 2011 IEEE Int. Conf. Space Sci. Comm.*, Penang, Malaysia, pp. 138-141.

FIGURE 3



The division of earthquakes occurring in the maximum and ascending half of the solar cycle vs. those occurring in the minimum and descending half for solar cycles 20 to 23, along with an illustration of solar cycles 20 to 23, and the current status of solar cycle 24.

earthquake forecasting programs, which hold promise for saving countless lives by providing days or weeks of warning time that a quake may occur in a given area.<sup>6</sup> Unfortunately, the development of such systems have been slowed or blocked for political and ideological reasons.

The proposed IGMASS system mentioned above would be an excellent step in international collaboration to develop natural disaster forecasting systems, giving mankind a leg up on these threats before they strike. For threats we cannot yet avert, forecasting allows us to control our pre-response, and the consequences—e.g., defensive measures, such as moving people out of a region threatened with an imminent earthquake—before we have the means to control the processes themselves.

There are also catastrophes that can be completely prevented. Asteroid and comet impacts can conceivably be prevented, given the proper level of development of the inner Solar System (although the February asteroid impact over Chelyabinsk, Russia warns us that we are not prepared yet). The Russian proposal

for cooperation with the United States in a Strategic Defense of Earth is an offer we would be insane to ignore.

The challenge for the present and coming generations of mankind is to control the inner Solar System. It will be small and slow at first, but the principle of humanity as an interplanetary creative force will be undeniable. As we used to understand the greatness of vast landscapes of Earth changing under the guidance of man’s hand, we will come to view the conscious reshaping of the inner Solar System as the next evolutionary step in humanity’s destiny in continuously generating endless progress.

In the United States this defines an imperative to rid ourselves of Obama and his anti-science policies—the President who responds to natural disasters by saying “We can’t control them,” or “We couldn’t have known,” while presiding over the destruction of the capabilities of NASA and NOAA to defend us from exactly these threats.

The future will leave behind these backward views as ancient relics of an adolescent phase of humanity, and expand mankind’s control of the inner Solar System. So, as we fight for mankind’s maturation, keep an eye toward the Sun as we round the solar maximum and begin the declining phase of the cycle. You may want to watch for a jittery mood, and a shaky ground!

6. For more, see “Science Can Predict Earthquakes,” *21st Century Science & Technology*, Winter 2011-2012; and the interview with [Dr. Sergey Pulintsev, “A Multi-Parameter Approach to Earthquake Forecasting.”]