Space Weather and You

When you awaken each morning, one of the first things you probably do is check the weather. Is it raining or snowing? Is it hot or cold? Is it cloudy or bright? Is it windy or calm?

The answers to these questions will have a major impact on your day. Based on the weather activity you observe, as well as the day's forecast, you'll make several decisions about what clothing to wear, what outdoor activities you can enjoy (or not!), and even whether you should prepare for dangerous conditions.

The weather we experience in our atmosphere is driven by the energy produced by our nearest star — the sun. The sun drives the weather on every planet in our solar system. It even influences the weather on distant Pluto.

But in addition to stirring up our atmosphere, the sun creates a different, and equally dynamic, environment in outer space. While it may seem empty to us, space is filled with particles that leave the sun and race through the void at fantastic speeds. As they arrive in our region of space, they can disrupt the magnetic field that shields our planet, and also disturb our *ionosphere* — the portion of our atmosphere that we depend upon for long-distance communication at HF frequencies (see the January/February 2020 issue of *On the Air* for a discussion of "The Ionosphere: The Great Radio Prism in the Sky").

In addition to particles, our nearest star pours forth various kinds of radiation — much more than just the light we see with our eyes. This radiation also has a major effect on how well the ionosphere propagates radio signals.

All this solar activity is referred to as *space weather*. And just as with weather here on Earth, it's a good idea to keep informed about space weather conditions and forecasts.

The ARRL website has an abundance of links and other information about space weather and propagation in general at www.arrl.org/propagation. When looking at current space weather data, pay particular attention to the following:

SFI: Solar Flux Index: A number that roughly summarizes the sun's overall level of radiation output, as measured at 2800 MHz. An SFI of 69, for example, is considered low, resulting in mediocre or poor conditions for long-range communication on our higher HF bands (15 meters, 12 meters, and 10 meters). On the other hand, an SFI above 200 is high, and the ionosphere will respond by increasing its electron density and bending more HF signals back to Earth, which is a good thing! You can look forward to elevated SFI conditions in the years to come. See the article, "Here Comes the Sun" in this issue for more information.

K-index: Solar observatories measure our planet's magnetic field conditions every 3 hours and translate the results into a set of numbers known as the K-index. When the sun isn't hurling lots of particles at us, the K-index tends to be low, typically around 1 or 2. But when we're caught in a mighty blast of solar wind, the K-index can rise to as high as 9 (which would be a severe storm that shuts down all HF communication). The higher the K-index, the worse conditions will be on the HF bands.

A-index: This represents a daily average of magnetic activity. An A-index between zero and 7 means calm conditions, but if it spikes above 40 or 50, you have a geomagnetic storm under way.