Since prehistoric times, humans have struggled to find explanations for events that seemed to have no rational cause. What may have started with interpreting patterns in tea leaves and animal entrails graduated to tarot cards, mystic beads, crystal balls and more. The methods were different, but the goals were the same — to summon some small sense of order out of everyday chaos.

Thankfully, amateur radio is purely rational. We deal only with inflexible facts and equations. Power equals current times voltage in all times and places — period. When it comes to the conditions of the atmosphere into which we launch our signals, we speak with the same confidence.

Well...sort of.

Truth is, while we've figured out electricity pretty well, we still have a long way to go in the propagation forecasting department. This isn't to say that our level of knowledge hasn't advanced considerably in the last century or so, but a huge margin of uncertainty still exists.

If the sun belches out a torrent of energetic particles, we can predict when they will slam into Earth's magnetic field and subsequently render some of our HF bands nearly useless — but how long they will remain useless is hard to say. We can also predict that as the sun's overall output intensifies, the higher frequency HF bands are *likely* to propagate signals over greater distances — but notice that we're dealing once again with probabilities; an HF propagation prediction is never iron clad.

At VHF frequencies and above, the task of forecasting becomes even more challenging. Take the somewhat spooky propagation mechanism known as *sporadic E*, which can suddenly bust the 6-meter band wide open for long-haul contacts. We know that it tends to occur during daylight hours between May and September, but exactly when and where is a mystery. (You may as well ask the crystal ball!) On the 2-meter band and above, weather systems have a large influence. Layers of air can create so-called "ducts" that can transport signals over hundreds of miles or more. Like the rest of the weather, however, these can be difficult to predict.

Forecasting Tools for HF

The good news is that there are internet tools that will provide reasonably good predictions of what to expect on your favorite bands — if you know how to interpret their "tea leaves." For conditions on the HF bands, one of the most popular tools is the Solar-Terrestrial Data widget created by Paul Herrman, NØNBH (see Figure 1). It appears on many websites such as QRZ.com.

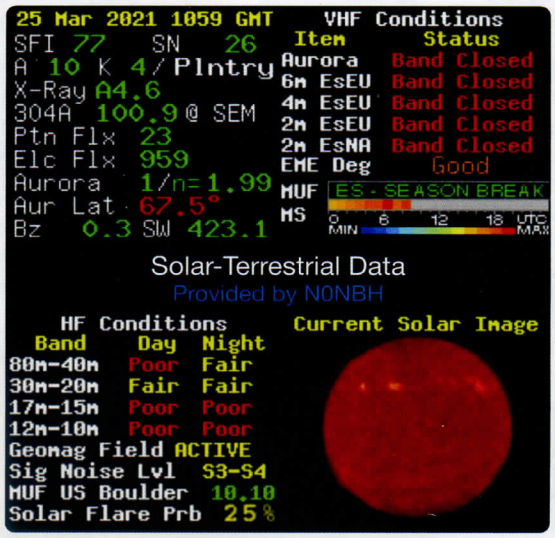

Figure 1: This propagation forecast tool created by Paul Herrman, NØNBH, can be found on many amateur radio websites. It is primarily intended for the HF bands, although it provides some VHF information as well.

The widget is packed with rather cryptic-looking information, but here are the most important numbers:

SFI – The *Solar Flux Index*, a number that roughly summarizes the sun's overall level of radiation output. When this snapshot was taken, the SFI was 77. That's considered low, although not as low as it could be. It means that the high HF bands were not likely to be productive that day.

K – Better known as the *K-Index*, this is a measure of our planet's magnetic field conditions, and it is updated every 3 hours. When the sun isn't hurling lots of particles at us, the K-Index tends to be low, typically between 0 and 2. But during a geomagnetic storm, it can rise to as high as 9, which indicates a severe disruption to the HF bands. According to Figure 1, the K-index on that day was 4. That means conditions are disturbed, but not greatly so.

A – The *A-Index* represents a daily average of magnetic activity. An A-Index between zero and 4 means calm conditions, but if it spikes above 40 or 50, you have a solar storm under way. In Figure 1 the reading is 10, so like the K-index, it indicates mild disruption.

Note that the NØNBH widget takes all this information and more, and attempts to forecast conditions on several frequency ranges and labels the results as "Good," "Fair," or "Poor." Be careful not to take these predictions too literally, especially the "Poor" forecasts. A "Poor" forecast for, say, 12 and 10 meters doesn't mean that communication is impossible on those bands. It only means that the likelihood of long-range communication is low; using CW or digital on those bands may improve your odds.

You'll also find propagation information on other amateur radio websites. The data may not be displayed as colorfully or comprehensively as it is within NØNBH's widgets, but most will at least include the latest SFI, A, and K numbers.

VHF/UHF Forecasting

To get a sense of conditions at 2 meters and up, one of the best tools is William Hepburn's Tropospheric Ducting Forecast page on DX Info Centre at dxinfocentre.com/tropo.html. At this site you can select colorful maps (see Figure 2) that predict the probability of band openings caused by ducting in the part of our atmosphere known as the *troposphere*. (This is where our weather takes place.)

Select your region of interest in the upper left corner of the page. You'll soon see a map that is painted with colors indicating areas where ducting may occur. The lowest probability is indicated by no color at all, magenta is "marginal," and the rainbow progresses to light pink, which is "extreme." If your area is forecast to fall within a "Strong" area or higher, it's a good time to fire up your VHF or UHF transceiver.

Each time you click your cursor on the map, the forecast advances by 3 hours. You can use these maps to forecast as much as 6 days in advance. As with the HF propagation forecasts, these forecasts represent estimates based on the best information available. While no propagation forecast is 100% accurate, our modern tools are far preferable to making inquiries of crystal balls!

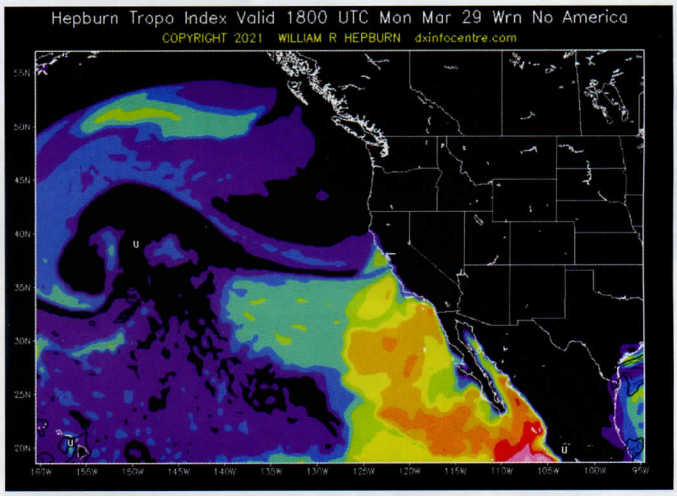

Figure 2: You can predict when the VHF and UHF bands may open in your area by using the color-coded maps at William Hepburn's Tropospheric Ducting Forecast page on DX Info Centre at dxinfocentre.com/tropo.html. This particular map predicts conditions in the western United States.