Aurora Watchers Field Guide

By John Flinn

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For those of us that live in the mid-latitudes, it is becoming easier to plan for the arrival of auroras. My favorite sites that provide aurora forecasts are:

SpaceWeather.com
AuroraSentry.net
Spacew.com

These sites will actually give predictions of aurora activity based on the latest satellite and earth based information. I find it also important to check the satellite weather maps as well because it is often possible to drive out of the clouds to clear skies. Because of the rain and snow "shadow" effect of the Oregon Cascades one can escape the overcast skies of Eugene with a two hour drive to the high desert near Bend. Similar situations occur in other mountainous areas of the world.

It becomes even more important to have a handle on long and short range aurora indicators when planning for a serious photo session. The most frequent time for auroras in any given year are during the weeks close to Spring and Fall equinox. I prefer early Fall before the onset of storm systems. Another long term consideration is the phase of the moon. By photographing during a quarter moon the landscape can become an integral part of the picture especially if there are snow covered mountains in the distance. The moon changes the color of the sky from black to a deep indigo and gives the film a boost by bringing the exposure up to the "toe" of the film response to light. This allows faint auroras to be seen more clearly than if shot without moonlight. The moon also causes some of the reds to shift towards magenta and the greens toward cyan. There is also evidence that planetary alignments; conjunctions, squares and oppositions cause an increase in solar activity. (See Cycles of Heaven).

The next level of preparedness allows about a week's warning. If there are large clusters of sunspots that are coming into view (due to the Sun's rotation), then the chances of an earth-directed Coronal Mass Ejection (CME)* are good for a time frame of 3 to 9 days. Even after a CME is released from the sun it still takes from 1.5 to 3.5 days for the high energy electrons and protons to contact the Earth's magnetosphere. The X rays from the solar event however, are registered within minutes because they travel at the speed of light. Particles from a CME travel *only* 300,000 to 2 million Km/hr. One of the best predictors of an impending auroral storm is the Xray Flux chart (seen at SpaceWeather.com or AuroraSentry.net). If the flux stays above the M level for several
hours and the CME is released near the center of the solar disk, the arrival of a very large stream of high energy particles from the sun is imminent. These "fat" flux peaks are much more important than the "skinny" Xray flux peaks of the same energy level.

The final warning gives about two hours at best to get to the site for viewing the aurora. This occurs when the satellite instruments record a sudden increase in solar wind velocity, magnitude and density. It is especially good for auroras when the planetary magnetic field is pointed southward. Once the CME has impacted the Earth's magnetosphere it is usually within minutes that fluctuations in the magnetic field of the earth are sensed by magnetometers. A sudden jump in the magnetic index called Kp from a level of 2 to a level of Kp5 is a very good indicator. The aurora oval indicator maps at the Aurora Sentry site (aurora.N1Bug.net) are very helpful in seeing the size and activity of the auroral oval that appear like luminescent rings around the northern and southern geomagnetic poles.. All three charts, the radio aurora oval, the visible aurora oval and the UV view of the earth are helpful in accessing the strength of the storm. When I know a large CME is on the way and it makes a sudden change in these measurements, I usually don't sit too long at the computer because some aurora storms can come and go in 30 minutes.

*a Coronal Mass Ejection is a large ejection of highly energetic charged particles from the Sun. This usually coincides with a solar X-ray flare. Very strong flares are classified as M type and the extremely strong flares are the X type flares.

Some helpful advice for the photographer…. Always check out your site *beforehand* in the daytime so that you know the road is open, the view to the North is scenic and unobstructed (i.e. no power lines, cars or ugly buildings) and your film and equipment is ready. Bring warm clothes, a sleeping bag and hot drinks. Be sure to check the weather satellite for cloud cover information. It is always better to be on the north side of cities in order to avoid the city lights. My favorite film are Provia 100F for my fast F1.4 35mm lens and Provia 400X for my slower F2.0 28 mm and F2.8 20mm wide angle lenses. These slide films can be push processed up to 1.5 stops with good results in order to increase the effective film speed. To avoid vibration I use a combination of cable release, sturdy tripod and mirror lockup. You can hang your camera bag or other weights on the tripod to make it more stable. The Nikon FM or FM2 will automatically lock up the mirror when the timer is used. Exposure times vary from 8 to 20 seconds on the "B" setting depending on the brightness of the aurora and the speed of the lens and film. It's always a good idea to use a range of exposure times. To avoid bloated and distorted stars, I always close down the lens at least one half stop from full open. Take off the lens filter in order to avoid interference patterns in the image because of the monochromatic nature of auroral light. Watch out for dew forming on the lens and use a lens hood. It is really nice to have two cameras, with one kept warm in the car or camera pack. Bring lots of film and a flashlight. Whistle occasionally to bring the aurora closer as do the Inuit of the far north.

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