A Beginner's Guide to Aurora Chasing

An e-book by Vincent Ledvina

THE AURORA GUY

Here's what you need to know to *successfully* chase the aurora:

- The best time of the year
- The best time of the night
- The best place in the world
- The best place near where you're staying
- How to forecast and predict the aurora
- How to photograph the aurora

Let's cover these concepts in-depth! Read on! By the end of this e-book, you will know everything needed to see the aurora!

About the author

Vincent Ledvina - *The Aurora Guy*

I'm an aurora chaser, photographer, and aurora scientist based in Fairbanks, Alaska. I've been chasing auroras since I was 16 years old living in Minnesota. I've been all over the U.S. and Canada to see the lights, and over many years, thousands of hours in the field, millions of photos captured, and intense research into space physics, I consider myself an *expert aurora chaser.*

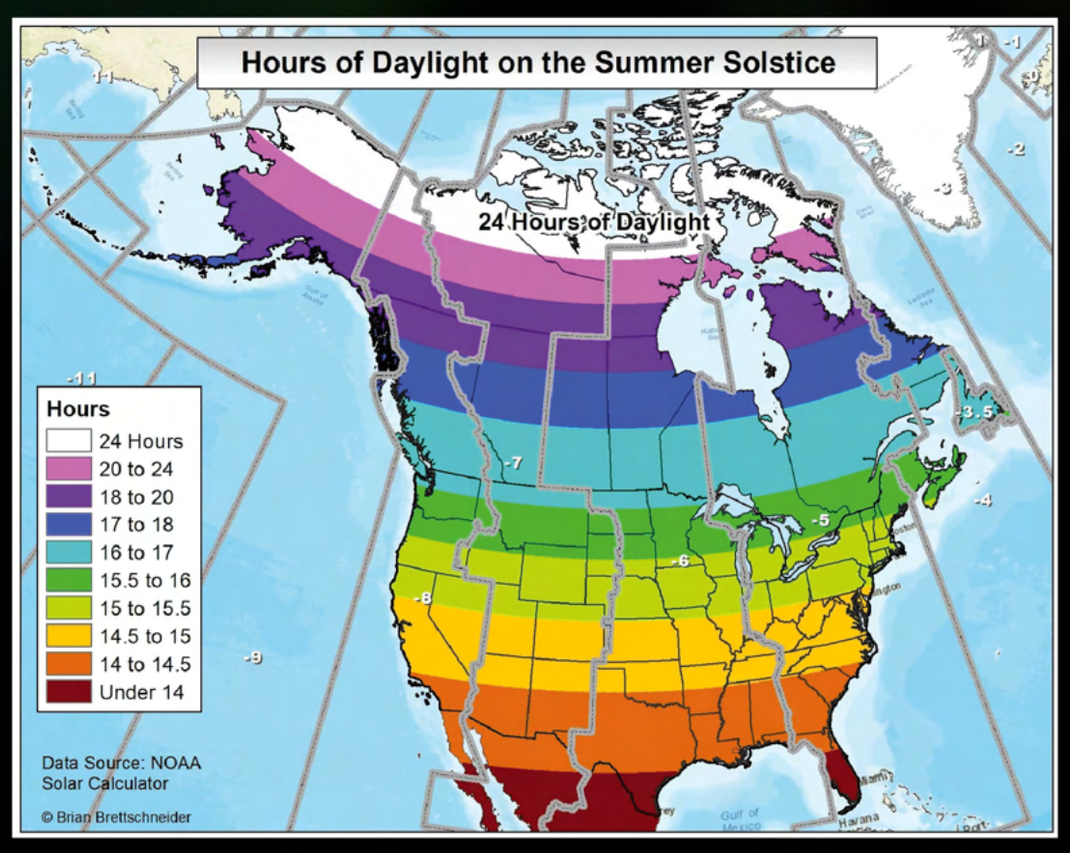
My philosophy is simple - I want others to enjoy the aurora and feel inspired just as I was. What sets me apart from other photographers is I actually live where I can see aurora regularly. This has allowed me to perfect my techniques and carefully observe how the aurora behaves.

Furthermore, I have extensive knowledge of auroral science. As of writing this book, I am currently a Ph.D. student at the University of Alaska Fairbanks studying auroral beads.
I understand the aurora inside and out, and you can trust me and my knowledge.

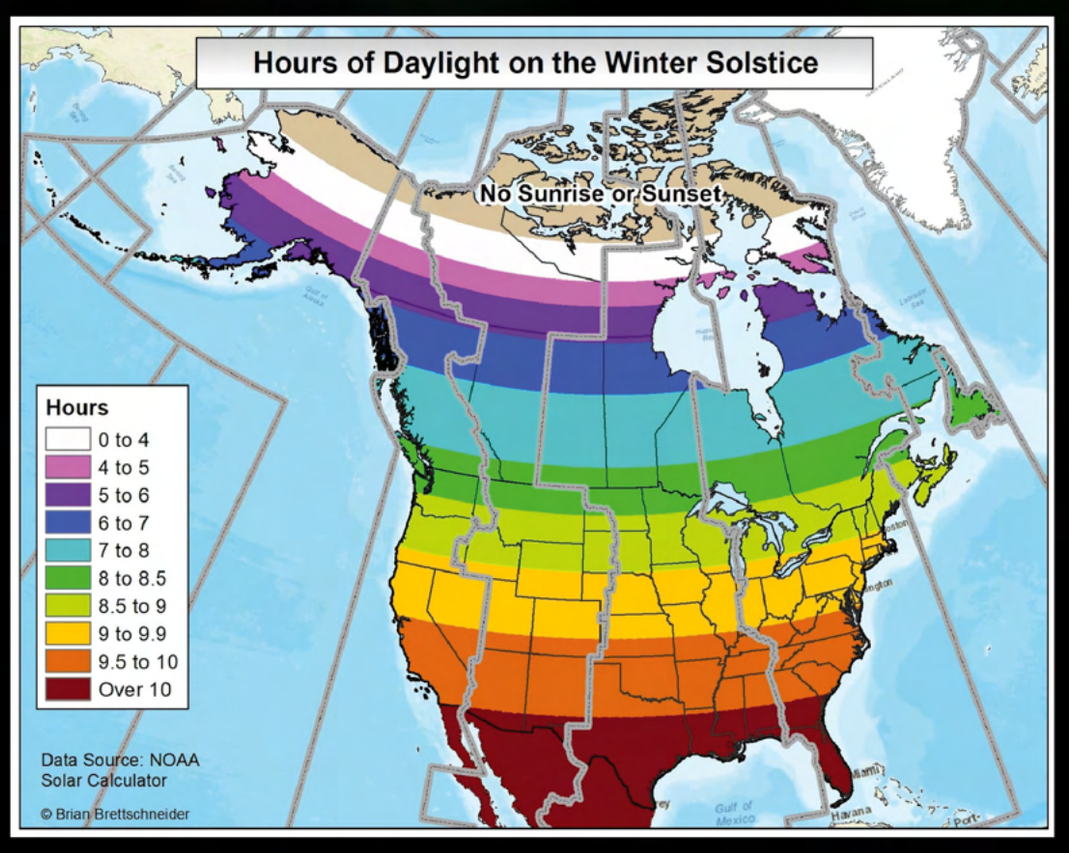
The best time of the year

The bottom line:
September during a new moon phase is the best time to plan your trip.

There are two main factors to consider: amount of darkness and amount of cloud cover. In the arctic, it never gets completely dark in the summer, and the higher in geographic latitude you go, the more extreme the effects. In Fairbanks, Alaska for example, it becomes fully dark at night starting in September until the end of April. September to April is thus considered “aurora season,” but it is possible to see aurora in August and May if it is strong enough.



In the summer in the arctic, the sun does not set long enough (or not at all) for it to become fully dark! Aurora can’t be seen unless it is dark.



In the winter, there are long nights, sometimes up to 24 hours, great for viewing auroras which only appear at night!

The best time of the year

Another factor to consider is the moon phase! During a full moon, weaker aurora will have a hard time showing up to your eyes, but colors will be ehnahced.

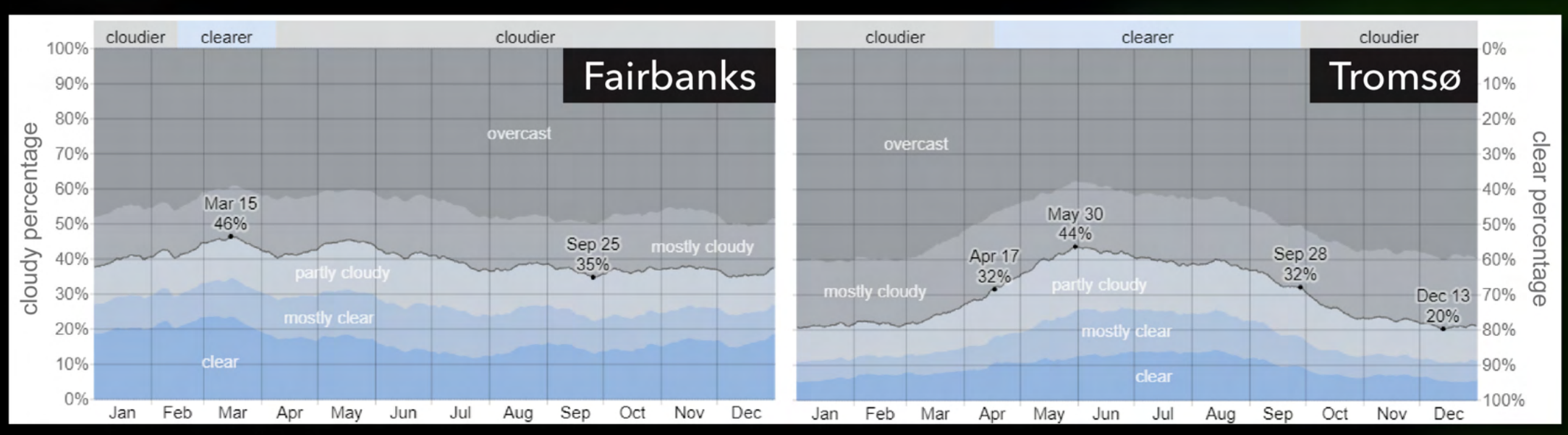
This is because your eyes lose color vision in low light. If there is a moon out, the added ambient light triggers more of the color-sensitive cells in your eye, allowing you to see more colors in the aurora.

Phone cameras also tend to produce better images when there is more light in the sky from a full moon.

If you are a serious photographer, then I would recommend traveling during a new moon or first quarter phase. This is because a camera doesn’t have eyes but rather a digital sensor. The sensor will always see the colors in the aurora regardless of how bright they are. Our eyes can’t - dim auroras appear grey. Then, it’s betteer to photograph the aurora during a smaller moon so more details can be seen.

The best time of the year

When you’re choosing the exact month to travel, make sure to look at the climatology for your location. Auroras occur above the clouds, so you want to find a time when there is a seasonably low amount of clouds. In Fairbanks, Alaska for example, the clearest month is March. Also, the general cloudiness of a location is important! Look at how Fairbanks compares to Tromsø!



credit: weatherspark.com

Due to the Russell-McPherron effect, auroras are also stronger around the equinoxes. This can make a noticeable difference, especially on low-activity nights. Besides choosing the month of the year, there is not much more you can do to plan when to travel. Remember, there is no way of reliably knowing the strength of the aurora more than a few days in advance!

The best time of the year

Why is September the best month?

Most importantly, it’s not cold. The Arctic gets cold, and too many times I’ve seen tourists think they could handle the extreme temperatures when they really could not. Just avoid the winter months if you don’t already live in a cold climate. Trust me.

September is also an equinox month. This means that the Russell-McPherron effect will be in play, naturally increasing auroral activity.

Lastly, September is typically a drier month for most locations meaning cloud cover shouldn’t be as much of a factor. The dead of winter (December and January) is also typically clear since it’s so cold, preventing cloud formation, but it’s common to get weather patterns that create on-off weeks of clear and cloudy skies. Travel just in time for a cloudy spell, and you may not see aurora for a week. Last year, I didn’t see aurora for 11 days straight in January because of clouds. The September prior, I saw auroras 23 days in that month.

The best time of the night

The bottom line:
The best time to see the aurora is around 11 pm - 3 am. Don’t go to bed too early.

When should you head out to see the aurora? The scientifically best time to see the aurora regardless of activity is right before “magnetic midnight.” The time of magnetic midnight is based on your location relative to its time zone and the auroral oval. For Fairbanks, Alaska, magnetic midnight is around 2:30 am, but for Churchill, Manitoba, it’s around 12:00 am. If you don’t know when magnetic midnight is for your location, just imagine you have the best chances between 11:00 pm and 3:00 am.

A common mistake people make is going out too early to see the aurora! In the winter, while it’s sufficiently dark in the arctic to see the aurora for 16-20 hours per day, aurora only occurs during normal nighttime hours.

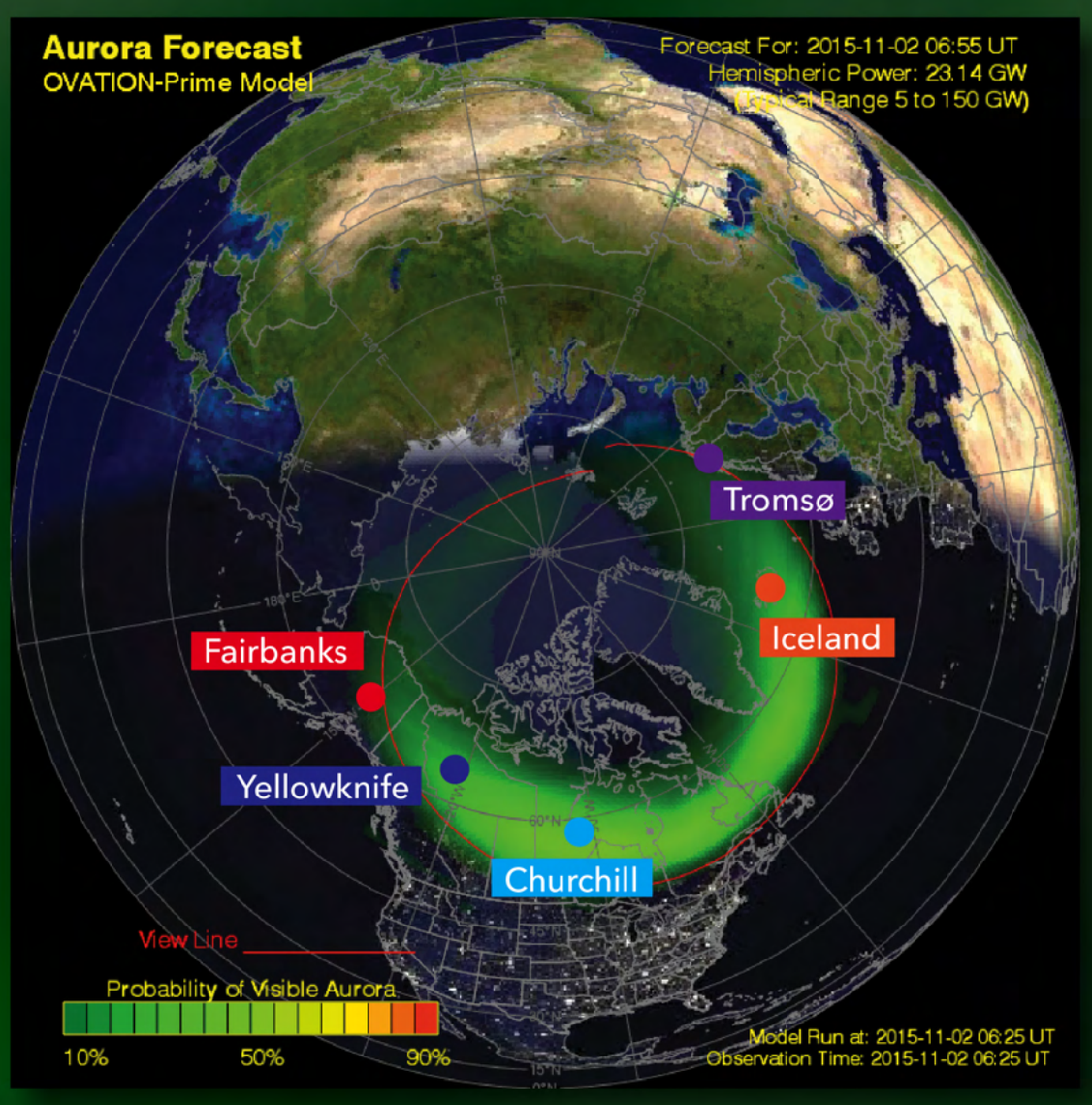
On higher activity nights, you might see the aurora appear earlier in the night, and on quiet nights, your best shot will be to go out from 11 pm to 3 am.

The best place in the world

The bottom line:
You should travel to the Arctic and position yourself within the auroral oval.

Where you go will directly affect your chances of seeing the aurora. Let's begin by talking about the world as a whole. The aurora is out every night somewhere in the world no matter what! The strength of the aurora depends on many factors, but under "quiet conditions" the aurora will always be seen in the "auroral oval." The auroral oval is roughly 5° latitude in width, centered around 68° *geomagnetic* latitude.

Places like Churchill, Yellowknife, Tromsø, Fairbanks (more or less), and Iceland are all situated in the auroral oval, so the aurora will be visible in some capacity from those locations *every night!*



A model of the auroral oval in the northern hemisphere.
Source: NOAA OVATION Prime

The best place near where you are staying

The bottom line:
You need to get out of the city away from light pollution.

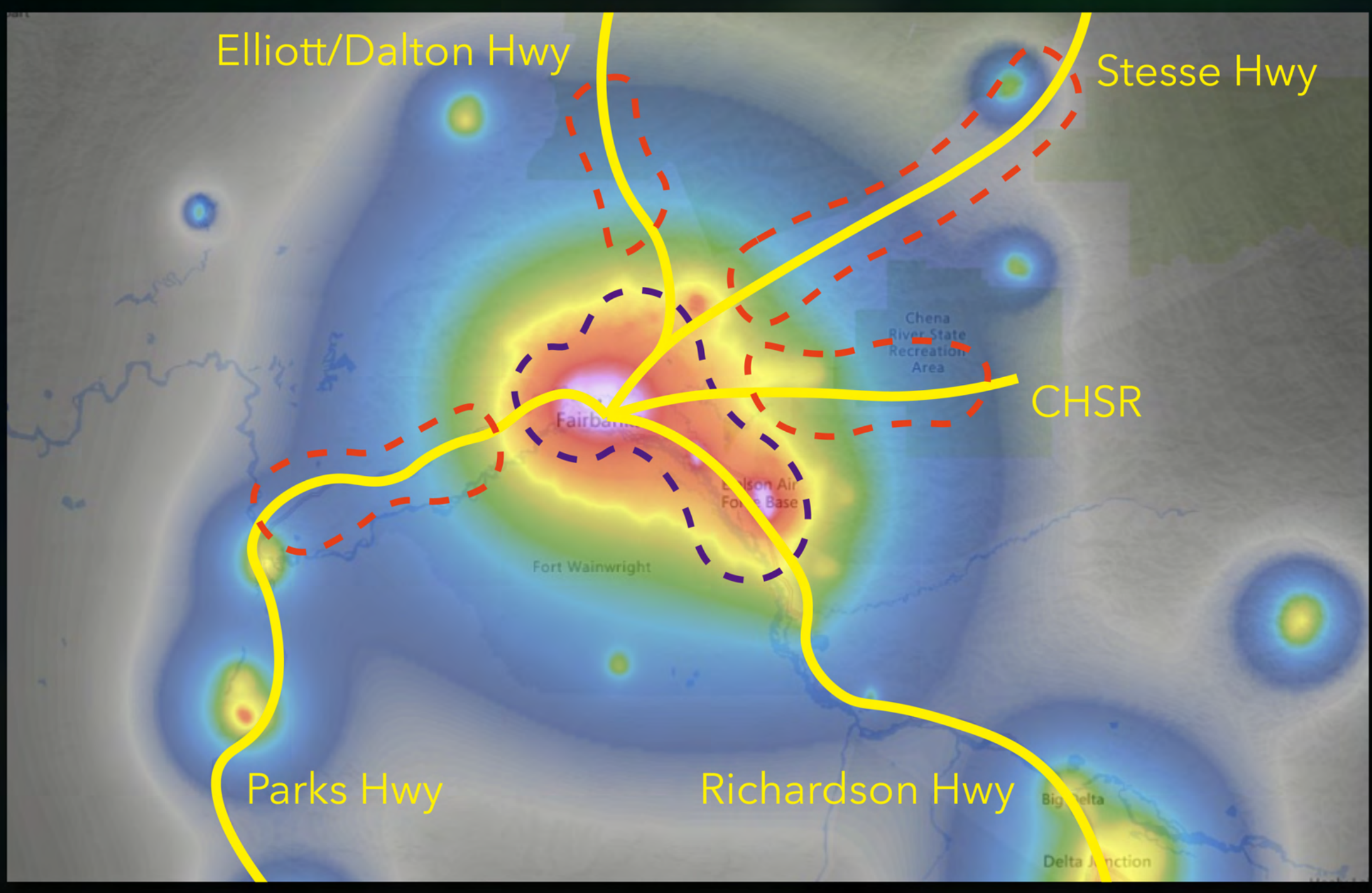
Just because you traveled somewhere to see the aurora doesn’t mean your work is done! The aurora is best viewed from a clear, dark area.

If you are chasing further away from the auroral oval, you will need to look north (if you’re in the northern hemisphere) or south (southern hemisphere) to see the lights. Making sure you don’t have large cities in those directions is important.

Under the auroral oval, the best views will be right above you. If you’re staying in a very populated area like Fairbanks, Yellowknife, Anchorage, or Reykjavik, you should drive at least one hour away from the city to get dark skies.

The best place near where you are staying

One of my favorite websites to check for light pollution is called lightpollutionmap.info. Night sky brightness is measured on the Bortle scale (1-9; 9 is most light polluted). I try and aim to end up in at least a Bortle 5, the lower the better. Here's where I like to go when I aurora chase in the Fairbanks area:



The purple contours show where light pollution hinders aurora viewing. Orange contours along the major roads out of Fairbanks are where I recommend traveling to.

How to forecast and predict the aurora

The bottom line:
Watch the Kp index for long-range forecasts, never for real-time info. Use NOAA's Ovation PRIME model for a simulation of the auroral oval in real-time. Look for the AE index to rise above 500 nT for strong bursts of aurora.

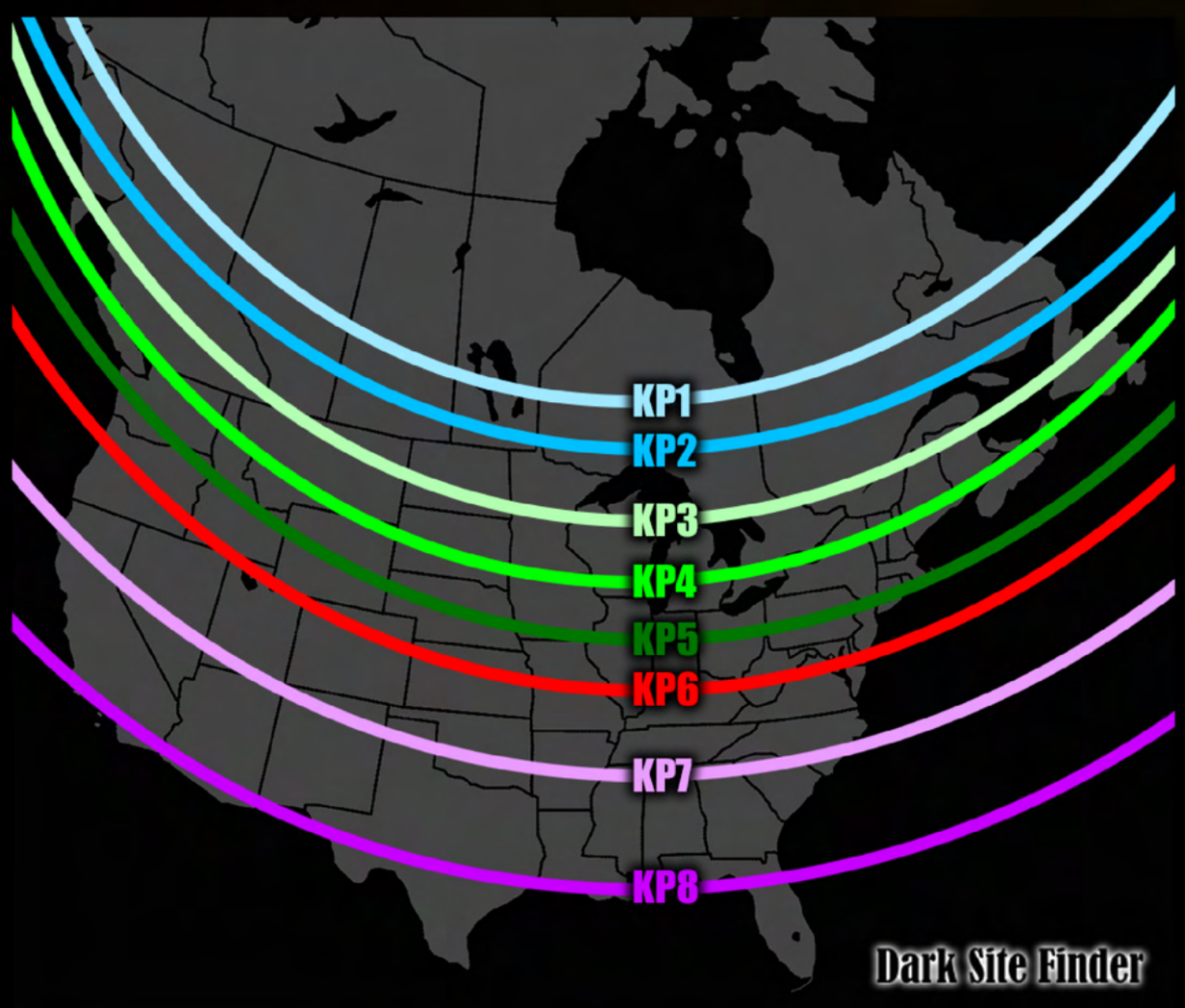
Predicting the aurora is hard, but half the battle is not being misled. Many aurora guides and photographers don't really understand how the aurora works. I'll tell you what I know as someone who is a published scientist and experienced aurora chaser.

First off, it is impossible to predict the aurora with 100% accuracy, ever. The only definitive information you get about auroras is from reports in the field. However, with the right tools and knowledge, you can predict the aurora's behavior within about an hour. Some forecasts can give you up to a three-day warning of activity. Let me teach you the right way to forecast the aurora.

How to forecast and predict the aurora

Have you heard of the Kp index? It stands for K-planetary. The Kp is a 3-hour average of past magnetic activity around the world.

Pay careful attention to the words **“three-hour average of past activity.”** Kp is useless for real-time monitoring of the aurora. It can only tell you if activity is *generally* enhanced. Kp is also used in many NOAA and NASA forecasts to give estimates of geomagnetic activity and aurora potential. Combined with charts that show what Kp you generally need to see aurora at your given location, you can know if you have low, okay, or good chances.



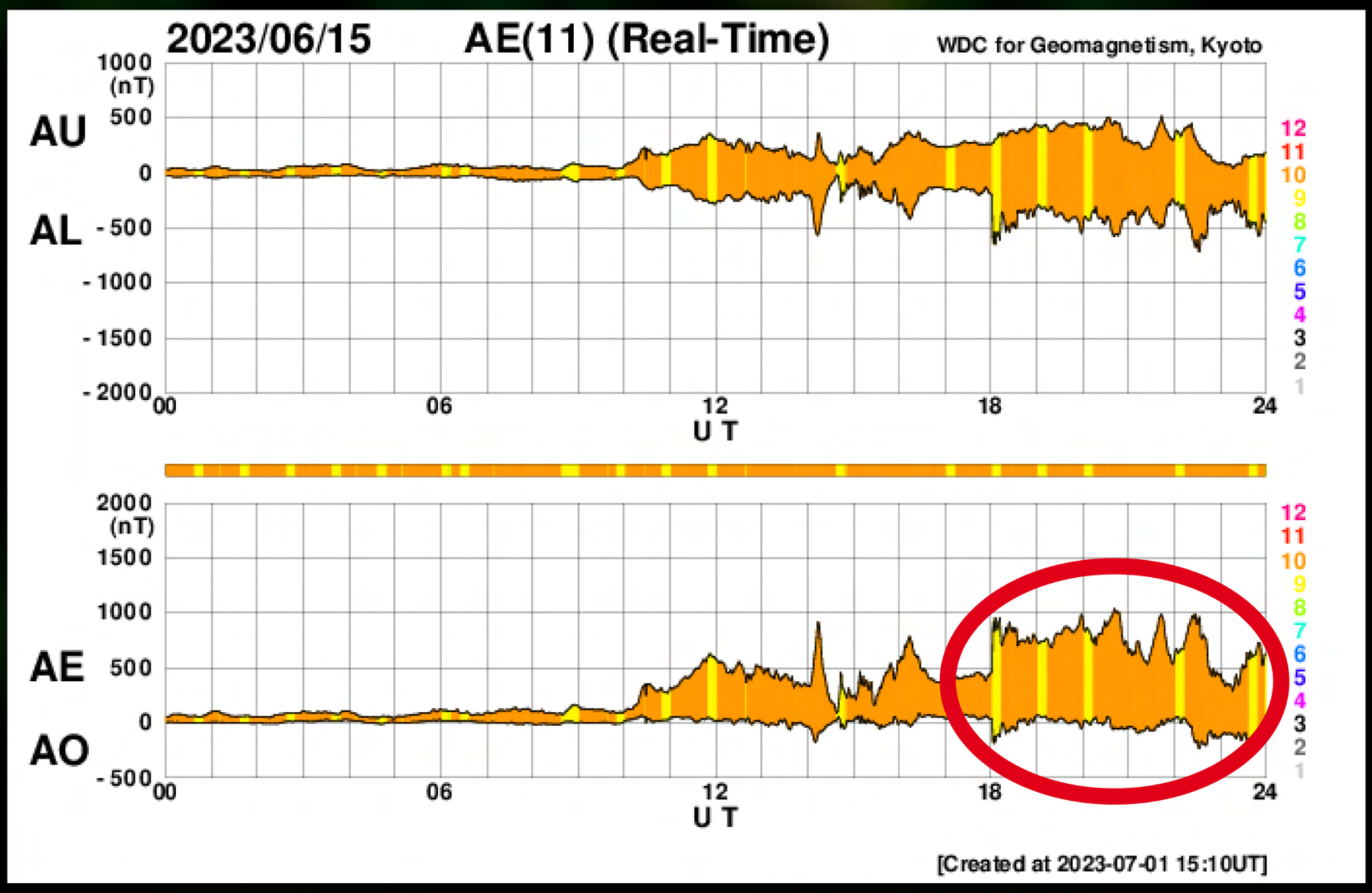
Probability of seeing aurora based on the Kp index. This chart (and others) are useful when interpreting aurora forecasts that use Kp. However, you should not take these charts literally. They are just good for context.

credit: Dark Site Finder

How to forecast and predict the aurora

So, if Kp isn’t the best, what should you use?

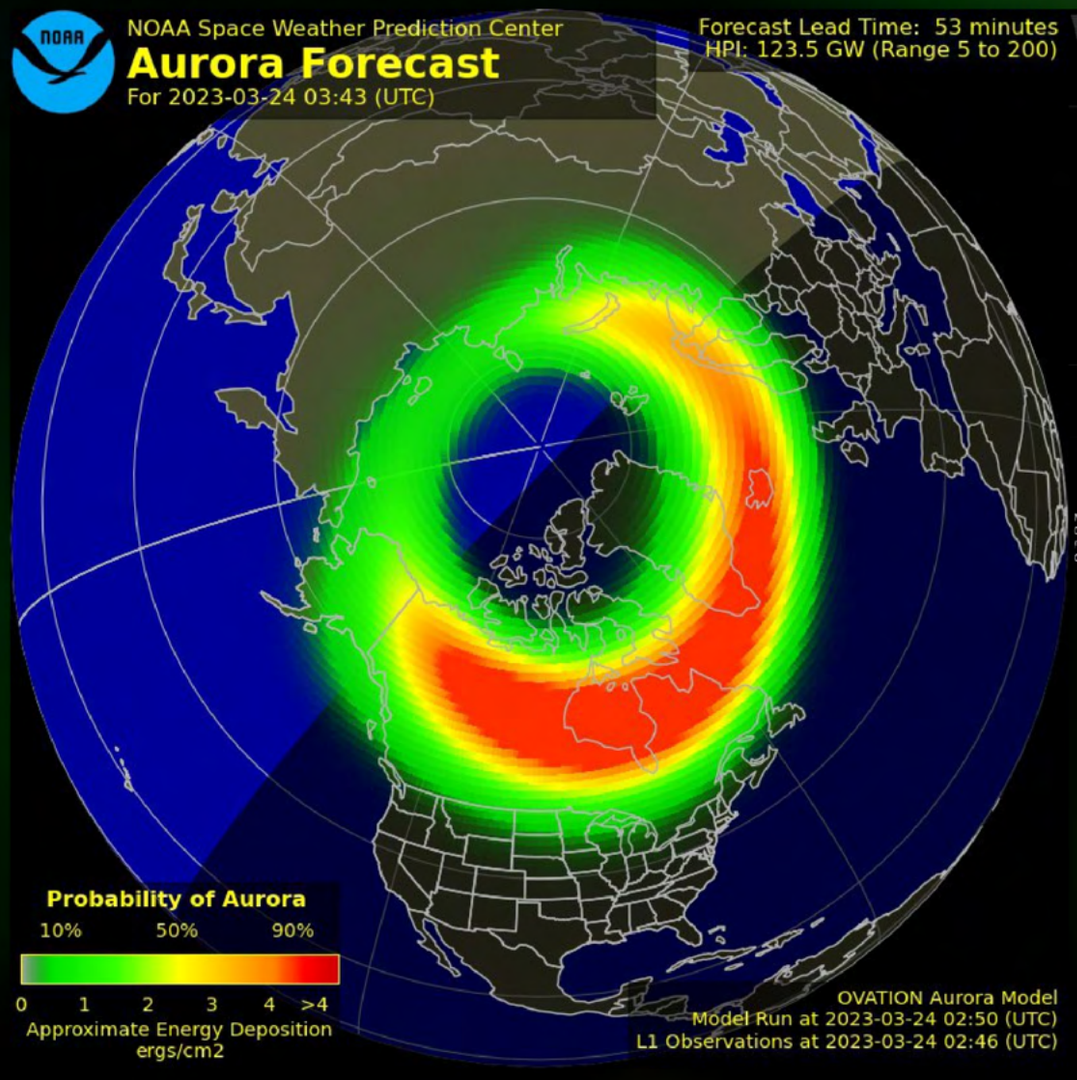
I recommend using the AE index. It is better than Kp since it is a real-time measurement and more targeted to auroral activity vs. worldwide magnetic activity. Look for values over 500-1000 nT. This indicates that the aurora is enhanced. Typically, if you see a big jump in AE, the aurora will respond quickly.

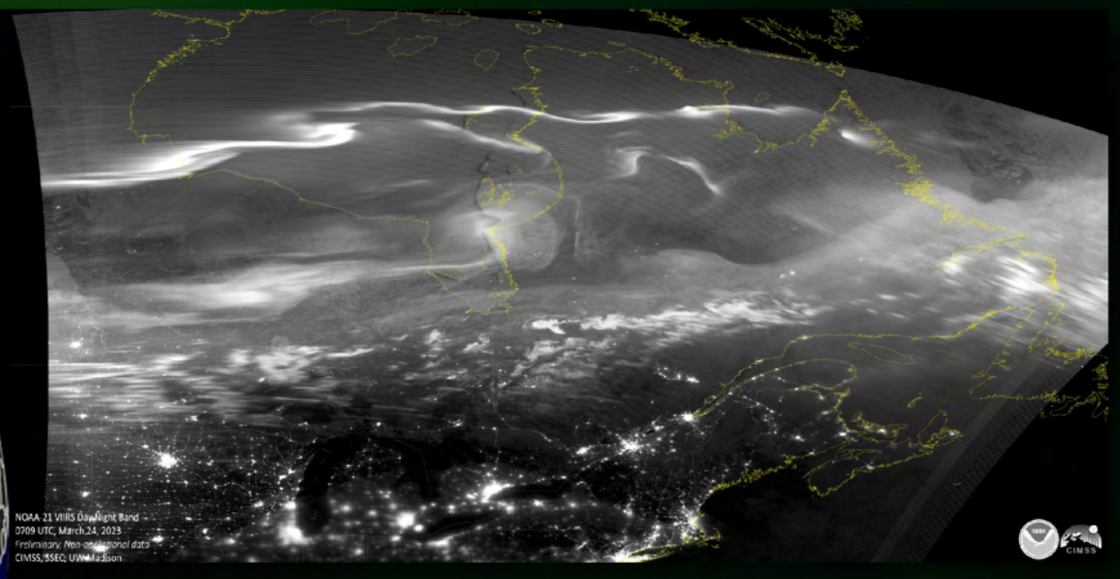


A period of enhanced auroral activity indicated by AE indices above 500 nT.
The higher the number, the stronger the aurora will be, usually.
For the latest readings: https://wdc.kugi.kyoto-u.ac.jp/ae_realtime/today/today.html

How to forecast and predict the aurora

There are some other tools worth mentioning. First, NOAA's Ovation PRIME auroral oval model is good at giving you an idea of where aurora can be seen about 30 minutes in advance. However, this model should not be taken literally. See the example below:





Left: The NOAA Ovation PRIME aurora model seen during a severe geomagnetic storm. The aurora looks like a big donut.

Right: the aurora (bright patches) around the same time, but in real-life.
Notice how it is more structured?

Second, if you are familiar with solar wind data, a period of negative Bz around -5 or lower (lower is better) for more than 30 minutes means the aurora is likely to become enhanced. Check out my other e-books for more info on this. For solar wind data, visit https://www.swpc.noaa.gov/products/real-time-solar-wind

How to photograph the aurora

The bottom line:
All you need is a smartphone. Make sure your flash if off. Use your phone's "night mode" or long exposure mode.

Almost all modern smartphones can take pictures of the aurora. Your phone should automatically change to a "night" mode that uses a long exposure. Make sure to hold still or put your phone on a tripod. This will eliminate any blur from the image. For information on how to take photos with professional cameras, check out my other e-books!

On an iPhone, you should see a little icon pop up when trying to take a photo at night. This means night mode is being used.

In this example, the phone is going to take a photo with a shutter speed of 3-seconds (3s).

The right image was taken with my iPhone in Iceland.

Wrapping it all up...

What is it?

The Sun's energy reacts with Earth's magnetic shield and particles in our atmosphere. Different colors relate to different gases being ionized.

Where is it?

The aurora occurs in the "auroral ovals" centered around Earth's poles. Under the ovals, you see auroras directly overhead, but even from hundreds of miles away, you can see auroras on the horizon. Some good places to travel are Fairbanks, Reykjavik, Tromsø, Churchill, Yellowknife, and Rovaniemi.

When is it?

In the arctic, it is dark enough to see auroras from September to March. The best time of the night is around 11 pm - 3 am.

How do I predict it?

Kp is not good in real time, but okay for forecasts and general context. AE >500 nT indicates a good burst of activity. Ovation PRIME shows you a current model of the auroral ovals. Negative Bz below -5 for around 30-60 minutes allows the aurora to charge up.

How do I photograph it?

Smartphones will automatically switch to a "night mode" when you try and take a photo of the aurora. Just make sure to keep your hands still. A tripod helps. For tips on DSLR/mirrorless cameras, check out my other e-books.

Thanks for reading!

If you have any questions, feel free to contact me at vincentledvina@gmail.com

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