

## GUIDE TO SEEING THE NORTHERN LIGHTS

The northern lights are one of the most beautiful and intriguing natural phenomena on this planet Earth: the night sky comes alive with moving green lights of varying shapes and intensities, complemented by shades of dark red and purple at times; it's surreal, mesmerizing and feels like you're on another planet.



Seeing the lights is not straightforward: you need to know where and when to go to see them in their best light (so to speak) or to see anything at all. You'll find the necessary info, recommendations, resources and photography tips in this guide.

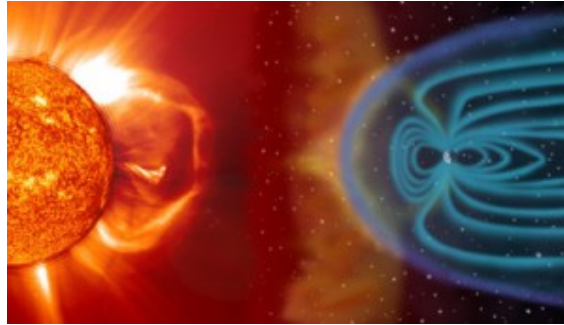
Do your research like I did and you'll stand a very good chance of enjoying the show - I saw the lights for four nights in a row and took some decent pictures; show up like the clueless tourist at a random date in some random place where it's cold and dark and you'll just enjoy the cold and darkness.

### WHAT ARE THE NORTHERN LIGHTS?

The northern lights (also called the Aurora Borealis) are a naturally-occurring luminous glow in the upper atmosphere that is (thankfully) visible from Earth under the right circumstances.

Streams of energetic charged particles (electrons and protons) originating in the Sun's upper atmosphere (the solar wind) are directed by the Earth's magnetic field into our atmosphere. As this happens, the charged particles collide with oxygen and nitrogen atoms in the upper atmosphere of Earth, releasing light in the process: what you'll see is mostly green light from collisions with oxygen atoms (more common) and red & blue light from collisions with nitrogen atoms (usually seen as purple light on Earth; more rare).

The Earth's magnetic field lines guide the particles and direct them towards the two poles - there's the Northern Lights/Aurora Borealis in the North Pole region and a corresponding Aurora Australis / Southern Lights in the South Pole area. Here's a nice picture from NASA showing the process in action:



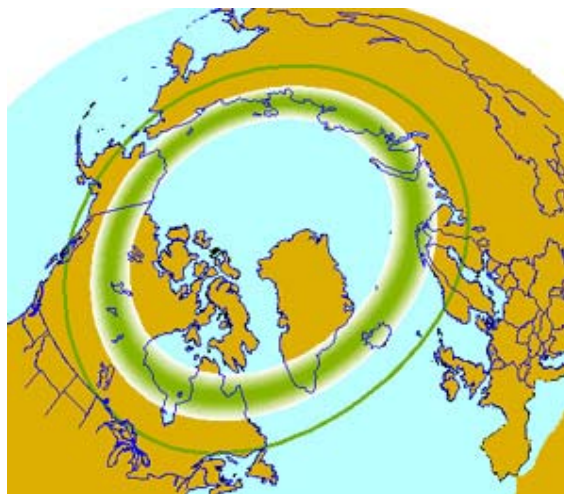
## HOW CAN YOU SEE THE NORTHERN LIGHTS?

The aurora is a continuous phenomenon and it's always on display somewhere on Earth. **This does not guarantee you'll see it.**

While an element of luck is involved, you need to know when and where to look to maximize your chances of seeing the elusive natural lights show. Rest assured, I've got you covered: there's a lot you can do to improve your odds and there are very good resources available to help you out.

## WHERE WILL YOU SEE THE LIGHTS?

**LOCATION, LOCATION, LOCATION:** The northern lights are visible in a ring-shaped region centered around the Earth's north magnetic pole (image courtesy of Geophysical Institute/University of Alaska Fairbanks):

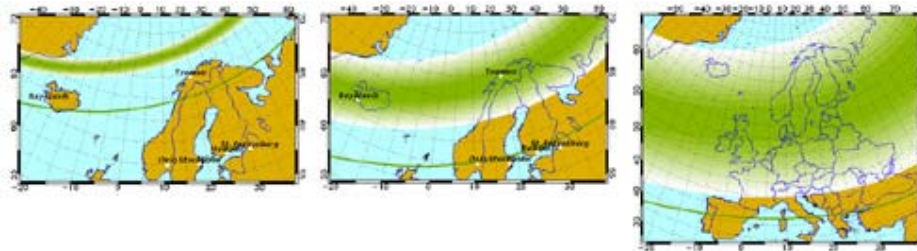


As is apparent, there are a number of places to see the lights in the Northern Hemisphere: Iceland and Northern parts of Finland, Sweden and Norway in Europe; Southern part of Greenland, Alaska and some places in Canada in North America; Northern parts of Russia. Locations of southern lights are mostly in inhospitable Antarctica and sometimes in New Zealand, Tasmania, Argentina and Chile.

But there's a catch. The display's intensity and brightness vary. More specifically, the thickness of the ring pictured above will change from day to day and from hour to hour. This means that sometimes

you'll get a ring that covers larger areas (aurora displays in all locations covered by the ring and those closeby), and (most) other times you'll have a thinner ring converging fewer locations (hence aurora shows in fewer places). You need to be as close to the action as possible, otherwise you won't see much if intensity is low.

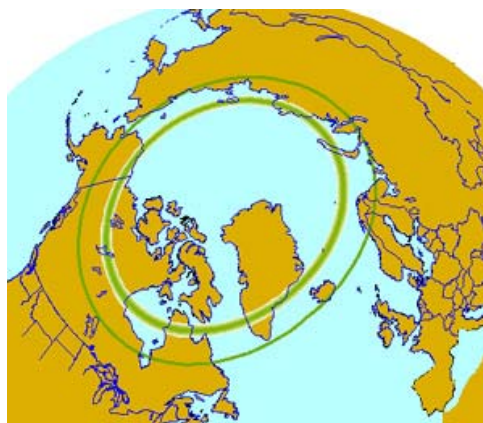
There's a geomagnetic activity index called Kp that can be forecasted to some extent and which tells us who gets to see the aurora (more on forecasts later). The index can take values between 0 and 9 on a quasi-logarithmic scale. This is what it all means (Geophysical Institute pictures for Europe):



The first picture above shows the aurora range for the minimum value of Kp=0 (defined as minimum auroral activity), the second for Kp=3 (moderate aurora activity) and the third for the maximum of Kp=9. While you may think you could go to Paris or Frankfurt to enjoy the lights, this only happens once every decade. A Kp value of 3-4 is more common and provides wonderful displays at the right locations (on the medium ring above), while values of 1-2 or even 0 are by far the most common and provide shows only in a few select locations (on the thinnest ring or close to it).

To sum it up, you need to go to a place on the thinnest aurora ring or close to it to get a chance at seeing the lights irrespective of the value of the Kp index when you get there; location should be on the ring or close to it, not in the center or inside the ring!. The map below shows the Kp=0 ring with locations which almost guarantee that you see the lights every day, if other conditions mentioned here are met (weather, etc).

To further complicate things, on the map below there are two rings; the inner ring is the most important one - in places on this ring you will see the full extent of the lights directly above you; the outer ring is the range to see the lights at the horizon:



**My recommendation** for a good location in Europe is the Norwegian city of Tromso (sometimes called the Northern Lights Capital of the World or of Europe by clever marketing specialists). Apparently there's a 90%+ chance of seeing the lights in Tromso if other conditions presented below are met. Bonus: Tromso, the largest city in Northern Scandinavia, is very charming and there's stuff to do and see during the day as well. Check out [this page](http://www.visit tromsø.no/en/) (<http://www.visit tromsø.no/en/>) of the Tromso Tourist office for activities, sights and accommodation in town.

Obviously you can choose many other locations to try and spot the lights, but remember: the farther away you get from the inner ring in the picture above, the lower the odds you get to see a good show (or anything at all). If you get outside the outer ring, your odds are even lower.

**LIGHTING:** you need darkness to properly see the aurora as city lights will drown it out and you'll see far less or nothing at all. Rent a car to drive out of the city or get on one of the many organized tours available.

This is the [list of northern lights tours](http://www.visit tromsø.no/en/Activities/Northernlights/) (<http://www.visit tromsø.no/en/Activities/Northernlights/>) available in Tromso. If you pick a different location, check the site of the local tourist office for tours (if there's no local tourist office then it's a small place and you may get bored to death during the day).

Choose a tour based on duration, comfort, price and added bonuses (guides, refreshments, etc). Longer tours mean more hours driving around in the bus to different locations which may or may not improve your odds; it all depends on other conditions described in this guide (mainly weather). After you choose your tour(s), don't forget to inquire if you need to book in advance - they may be full once you get there; some of the more popular ones are fully-booked months in advance.

If renting a car you need to know where you're going and you will drive on icy roads (no added bonuses like hot tea or guides either).

**My recommendation** for a tour in Tromso is the [Tromso Friluftsender](http://www.tromso-friluftsender.no/eng/welcome.htm) (<http://www.tromso-friluftsender.no/eng/welcome.htm>) - effective, convenient and very friendly. I used them for three nights in a row and got to see the lights in all three (also saw some faint lights in Tromso proper in the fourth night without a tour). You may want to book different tours for different nights instead of sticking with one company, depending on conditions and on personal preferences. Some tours can get unjustifiably costly.

## **WHEN WILL YOU SEE THE LIGHTS?**

**TIME OF YEAR:** as mentioned previously, you need darkness to see the aurora. Keep in mind that summer at northern latitudes means continuous daylight and/or short and not-so-dark nights. You need to go in the winter.

The main season for the northern lights is between September and April. Since the aurora takes place in the upper atmosphere (80-100 km), you also need clear skies. Take into account weather patterns for your selected location when choosing a date; e.g. October is historically the wettest month in Tromso, so I'd skip that (more on weather later).

**My recommendation:** you can't go wrong with either January or February, stick with one of those two.

**THE MOON:** Get a [Moon phases calendar](#) and aim for a new Moon. While a full Moon will not cancel the show, the darker the general conditions, the better. You do not want the Moon interfering with the lights.

**My recommendation:** go during a new moon. Easy!

**TIME OF DAY:** well, it has to be night but don't wait too long. The show may start as early as 7:00 or 8:00 PM. I've seen the highest intensity around 9:00 - 10:00 PM and the show continuing towards midnight. On a good night it's not uncommon for the show to on until 5:00 AM (on and off).

**My recommendation:** As patterns shift continuously and might come and go over the course of one night, better start your hunt early (i.e. 8:00 PM). You can use some of the resources that I'll present later to time your hunt. Most organized tours start early as well, around 6:30 - 7:00 PM.



## HOW TO SEE THE LIGHTS?

We've covered location, lighting, the Moon, calendar dates and time of day. But there's more.

**WEATHER:** weather conditions are of the utmost importance if you want to see the lights. A cloud here and there might make for better pictures, but if the sky is filled with clouds or it's snowing you won't see anything. Clouds block the aurora so your only chance is a clear sky or large gaps between the clouds.

There are many weather forecast services available. I used [weather.com](http://www.weather.com/) (<http://www.weather.com/>) and [accuweather.com](http://www.accuweather.com/en) (<http://www.accuweather.com/en>) to check weather conditions. Accuweather has a nice app for the iPhone that you can use to check weather on the field in realtime. Be sure to check the hourly forecast not just the daily one, as conditions change rapidly.

[Weather.com](http://www.weather.com/) (<http://www.weather.com/>) has historical monthly precipitation averages (select your location, click on *Monthly* in the menu, and then on *Averages*); be sure to check them for your selected location to assist in selecting a date/month.

Weather patterns may vary in terms of temperature as well, raising another problem: it gets very, very cold on your aurora hunting trips. Locations on the coast may be warmer than inland ones, sometimes with a difference of 20 to 30 degrees Celsius (centigrade). -10 or -15 in Tromso could mean -40 inland at the same latitude.

**DURATION:** How long will you stay? Don't drop by for one day and hope for the best. I've heard stories of unfortunate souls trying to see the lights on three different trips with no success.

You can control many of the conditions presented here such as location, date or lighting. But you can't control weather. Forecasts aren't accurate when you need to book plane tickets and tours months in advance.

**My recommendation:** The minimum recommended stay in a good viewing location such as Tromso is five nights (and you need to go aurora hunting every night or at least until you satisfactorily see it). I stayed four nights and got lucky, but anything less than that and you're tempting the odds. Also, the further you are from a good location the lower the odds and the longer you should stay.

**COMFORT:** You want to be comfortable to enjoy your trip. Tromso is only 2,200 km south of the North Pole; if you choose a different location, chances are you'll be close to the same latitude. Bottom line: it gets very, very cold.

If you're not used with Arctic weather, you will be unprepared. Get many layers of clothing, including lots of thermal undergarments and socks, good boots, wind stopper, warm and light sweater, gloves, hat, etc.

You'll spend a lot of time outside in the cold admiring the show or waiting for it without moving much (even moreso if you want to take pictures). In a couple of hours the cold will get to you if you're unprepared.

Your location will obviously affect your comfort, but don't let that stop you from selecting the best one. As mentioned earlier, locations on the coast tend to be warmer than inland sites.

If you go on a tour, check what is on offer: can you warm yourself in the bus? Will they make a fire? Is there any hot chocolate?

**My recommendation:** If you have no experience with cold weather go to a mountaineering shop, tell them when and where you'll be going and ask for advice - you'll thank them later (I did). Bring more layers than you think you'll need; after your first cold night you'll end up wearing all of them.





## HOW TO PHOTOGRAPH THE LIGHTS?

First off, there's nothing wrong if you just go to admire the show without taking pictures. Your everlasting memories are more important (the tour company may even provide pictures for you, but ask first).

If you want your own pictures (and bragging rights proof) you need to know a few things; aurora photography is not the same as snapping quick pictures of flowers and pretty landscapes. It's harder and there are many things to keep track of.

The aurora will get very bright if you're lucky, but it's not as bright as the sun. You'll need a camera that allows for manual settings of exposure time, aperture (f-number) and ISO. You will also need a tripod and a remote.

**ISO** is your camera's sensitivity to light and has settings such as 200, 400, 800 or 1,600; you'll need a higher setting (more sensitivity), but higher settings introduce noise in pictures (less in newer cameras) so there's a trade-off.

**EXPOSURE TIME** is the time light is allowed to hit the sensor. A setting of 50 might be standard for a camera; this only means 1/50 of a second, so you'll need a lot more. The trade-off? Any movement of the camera will show up in the pictures with longer exposure times.

**APERTURE** (or f-setting) sets how wide the hole through which light passes to the sensor will be. For our purpose, the lower the setting (i.e. 1.8) the better (lower settings mean a wider hole). Lower settings mean you need to pay more attention to focusing (more on that later). For a good low setting more expensive lens may be needed.

**WHITE BALANCE:** just use the *Auto* setting. Some people also recommend the *Direct Sunlight* setting.

**My recommendation:** go as low as you can with your f-setting. 1.8 is great if you have it; 3+, not so much. Then, use either one of the following setups: 1. ISO 200 or 400 and a longer exposure time, i.e. 8-10-15 seconds - this will allow for smoother pictures, but any movement in the scene will be blurry,

and you'll get small star trails due to the Earth's rotation around its axis. 2. Alternatively, use ISO 800 or 1,600 and a smaller exposure time, i.e. 3-4 seconds - you'll get noise due to the higher ISO, but no blurs and trails.

You really need to experiment with different settings until you get it right. Your results will depend on your settings as well as general conditions - intensity of aurora, Moon light, any clouds partially obscuring the lights, etc.

**FOCUSING** is very important in aurora photography. Your auto-focus function will not work with the northern lights and your pictures will be blurry. How can we fix that? First, use your auto-focus function to focus on a star (shutter half-pressed) if your camera will allow it; if this doesn't work, focus on any distant object such as the Moon, lights from a really distant city, building, bus, car, etc (even though you should be as far away as possible from those and there should be a new moon - tough one!).

After you've auto-focused on a distant object, switch your focus to manual and leave it that way. If nothing works, just manually focus in increments until you get it right. In any event, always check picture sharpness by zooming in in the preview screen.

**CAMERA STABILITY:** when using longer exposure times (even if longer means 1-2 seconds) your camera needs to be as stable as possible. You *will* need a tripod if you're serious about your pictures. I know it's a pain to carry it around, but there's no other way. Holding your camera in your hand will ruin your pictures through movement even if exposure time is half a second. If you use your camera's default short exposure times, you won't see much of the aurora in your pictures.

Even with a tripod, you will move your camera when pressing the shutter button. Use your delayed shutter release function, or better yet get a remote for your camera.

**COMPOSITION:** the aurora may be great, but your pictures will be a lot nicer if there's more in them than pretty lights. Include mountains, water, distant cities or villages, passing cars, electricity poles, houses and buildings, fires, stars, clouds, etc. Experiment with different settings and compositions.

**My recommendations:** do not forget about focusing or you'll ruin your pictures. Do not use flash - it will ruin your pictures. Use a tripod and a delayed shutter release or remote so your camera won't shake. Pay attention to composition. Have a small flashlight to adjust settings on your camera - hopefully it should be very dark where you're at. Charge your battery every night before you go out - cold affects batteries. Bring spare memory cards.

**Tip:** take multiple sequential shots with the same settings and composition that you can later animate into short movies to observe aurora movement.





## RESOURCES

There are many resources and forecasting tools available for the dedicated aurora hunter. Find some useful ones below (in addition to resources already provided throughout this document):

- [Aurora forecast](http://www.gi.alaska.edu/AuroraForecast) (<http://www.gi.alaska.edu/AuroraForecast>) from the Alaska Geophysical Institute - very good and straightforward tool providing forecasts for 3-4 days in advance on the Kp scale. Choose your region from the left-hand side of the page ("Select a Map" box) and use the *Next* button (top-right) to navigate. A Kp of 3 is more than enough and you'll be lucky to get it. There's also a short-term forecast (top-right, hourly updates), lots of info on auroras and forecasting, and a handy mobile version for the iPhone that you can take with you on the road
- [Current aurora activity](http://www.swpc.noaa.gov/pmap/index.html) (<http://www.swpc.noaa.gov/pmap/index.html>) from the US National Oceanic and Atmospheric Administration
- Past activity [for the last seven days](http://flux.phys.uit.no/Kindice/) (<http://flux.phys.uit.no/Kindice/>) and [for the last month](http://flux.phys.uit.no/ActIx/) (<http://flux.phys.uit.no/ActIx/>, includes historical mean values) from the Tromso Geophysical Observatory
- [Tromso all-sky camera](http://polaris.nipr.ac.jp/~acauro/auro/auro/Tromso/) (<http://polaris.nipr.ac.jp/~acauro/auro/auro/Tromso/>) from the Japan National Institute of Polar Research. Good tool that provides snapshots of the Tromso sky taken every 30 seconds. Really helpful to check when the aurora display starts above Tromso to better time your nightly trip (if you're not using a tour)
- Detailed [cloud cover forecast](#) for Tromso from the Norwegian Meteorological Institute
- [Location comparison](http://www.swpc.noaa.gov/Aurora/index.html) (<http://www.swpc.noaa.gov/Aurora/index.html>) from the NOAA/Space Weather Prediction Center. Choose a location closest to where you intend to go from the dropdown in the first table; check the resulting corrected magnetic latitude against data in the second table and see what intensity (Kp index) the aurora needs to be so you can see it from you intended location (remember, you're very lucky to get a value of 3-4, choose a location where the aurora is visible at 2-3). If in doubt, go to Tromso.

## THE MOST FREQUENTLY ASKED QUESTION OF ALL

*Q: Are the northern lights as bright as you see in pictures or is that a result of photoshopping and clever camera settings?*

A: The short answer is yes, they will be just as bright as in pictures though not all the time.

The slightly longer answer: intensity of light display varies continuously. At times activity can be very weak and will only look like a slight fog in the night sky to the naked eye; yet even under these circumstances a photo may show much brighter lights due to longer exposure times, sensitivity of sensor, etc. You can get entire nights with very low, very short activity.

At other times aurora activity will be at its peak; lights will be just as bright as you see in pretty pictures - no kidding! Bright green shapes and patterns moving continuously, appearing and disappearing, strikingly vivid even to the naked eye. This peak intensity may not last very long, or may come and go.

And most of the time intensity will be somewhere in between, as patterns shift rapidly.

I saw very bright wonderful green patterns in two of my four nights; overall, intensity alternated between very bright, medium, low and zero. Some parts of the sky may be brighter while others are dim.

Finally, it obviously helps if your eyes are used to the dark (which could take up to 20-30 minutes): do not expect to see bright auroras after someone shone a flashlight in your face.

## SUMMARY

- Location: on the ring-shaped region around the magnetic North Pole or close to it (count on the thinnest ring or Kp=0-1 to improve your odds)
- I really enjoyed Tromsø in Northern Norway, which is regarded as a very good spot to see the lights. There's also stuff to do in daytime
- Wherever you decide go, get far away from city lights. Avoid the full Moon, aim for a new Moon. You need darkness
- Use one or more guided tours, check duration, reviews, price and added bonuses. Check to see if you need to book in advance. Don't be late, they will leave without you
- Go during January or February. Check historical weather patterns and precipitation, cloud cover forecasts
- Even if you select a good location and date, weather can be your biggest enemy. You need clear skies. Use weather forecasts
- Light shows may start as early as 7:00-8:00 PM. Don't miss out
- Plan to stay for at least 4-5 nights and go aurora hunting every night until you're satisfied with what you see
- It will get very cold, especially if you're not used to sitting around in -15 degrees centigrade for hours. Get lots of warm clothes, check what your tour can do to keep you warm
- Manually adjust camera settings for photos: high ISO, low f-setting, 3 to 10 seconds exposure time depending on the previous two
- Use a tripod and a remote for your camera. Do not use flash. Don't forget to focus properly. Pay attention to composition. Remember to charge batteries and get extra memory cards.



**My recommendation: go and see the aurora, you'll fucking love it.**

### **CONTACT**

Questions about seeing the northern lights? Comments, additions or corrections to this guide? Drop me a line by e-mail at [razvan@worldtravels.ro](mailto:razvan@worldtravels.ro).