**Climate Action
and
Light Pollution Threat**

CliC-PoLiT

**Project number:
KA220-SCH-A710136B**

Hands-on classroom activities
for light pollution monitoring

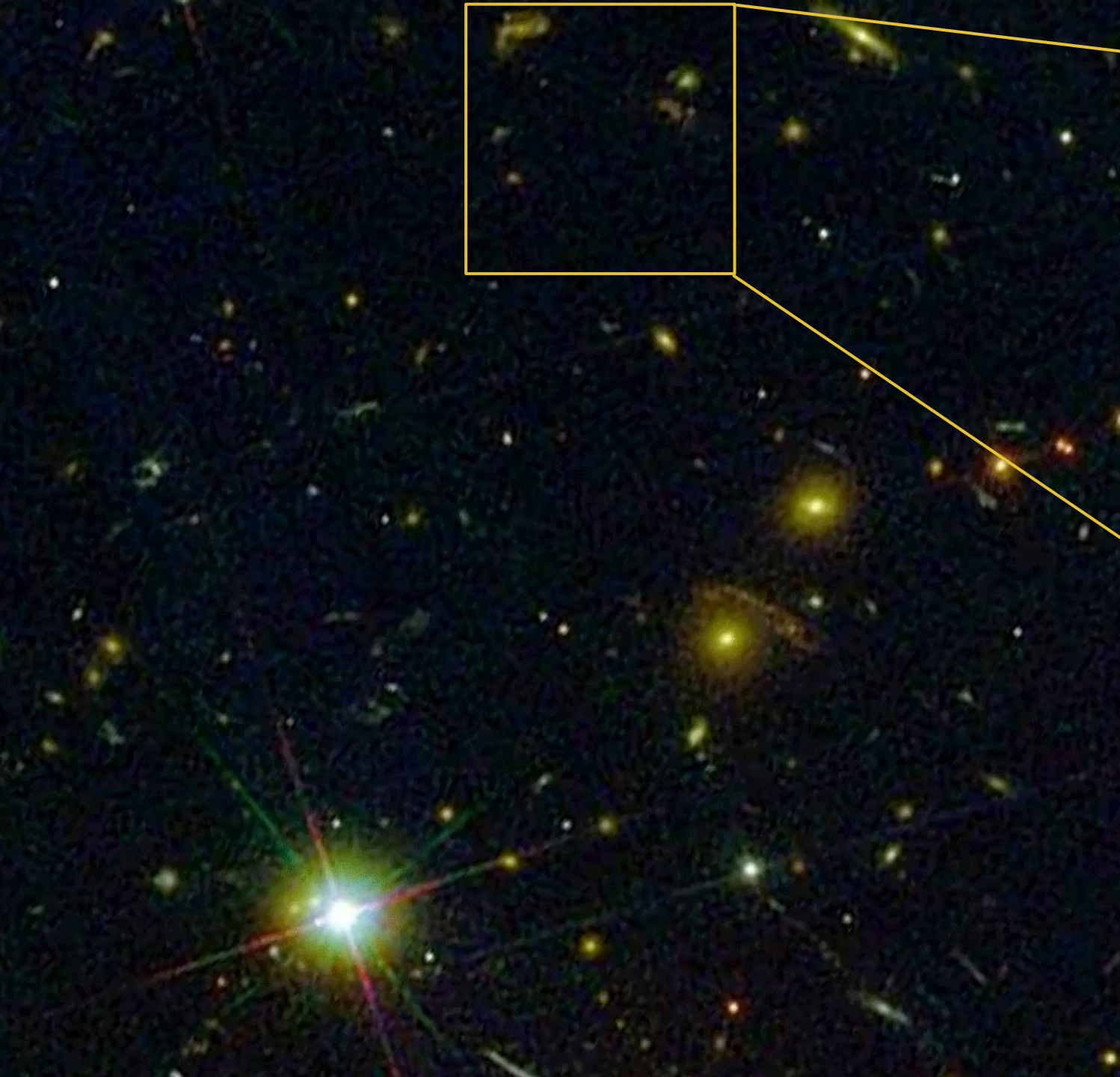Gustavo Rojas - NUCLIO

CliC-PoLiT Summer School
July 12, 2022

Before we start …

Webb's First Deep Field: Galaxy cluster SMACS 0723

Cluster light emitted 4.6 billion years ago

Current Distance 5 billion light-years

Hubble vs. Webb

2.4 m vs 6.5 m mirror

HST Deep Field - 10 days exposure

JWST First "Deep" Field - 12 hour exposure

Summary

Light Shielding

Van Gogh's paintings

Spectroscope

Recommended Sites and Apps

Limiting Magnitude

Light Shielding

Light Shielding

Connection with Arts
Van Gogh's paintings

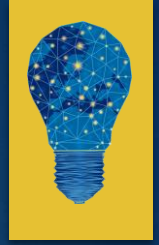*Starry Night over the Rhône (1888)*

Arles, 1888

Arles, 2008

Cafe Terrace at Night (1888)

Activities with a spectroscope

Low-cost spectroscopes can be built easily using household materials

- Compact disc (CD)
- Cardboard tube approximately 30 cm long and 10 cm diameter
- Cardboard
- Razor knife
- Scissors
- Tape

http://www.euhou.net/

Activities with a spectroscope

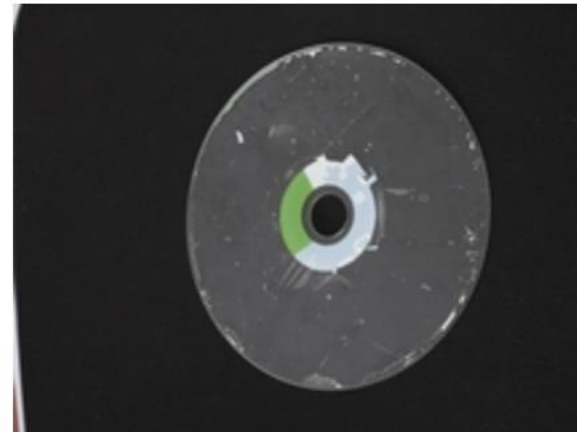Low-cost spectroscopes can be built easily using household materials

Scratch a bit of paint from the edge

Put a tape on the scratch

Remove the tape with paint

Ready !!!

Activities with a spectroscope

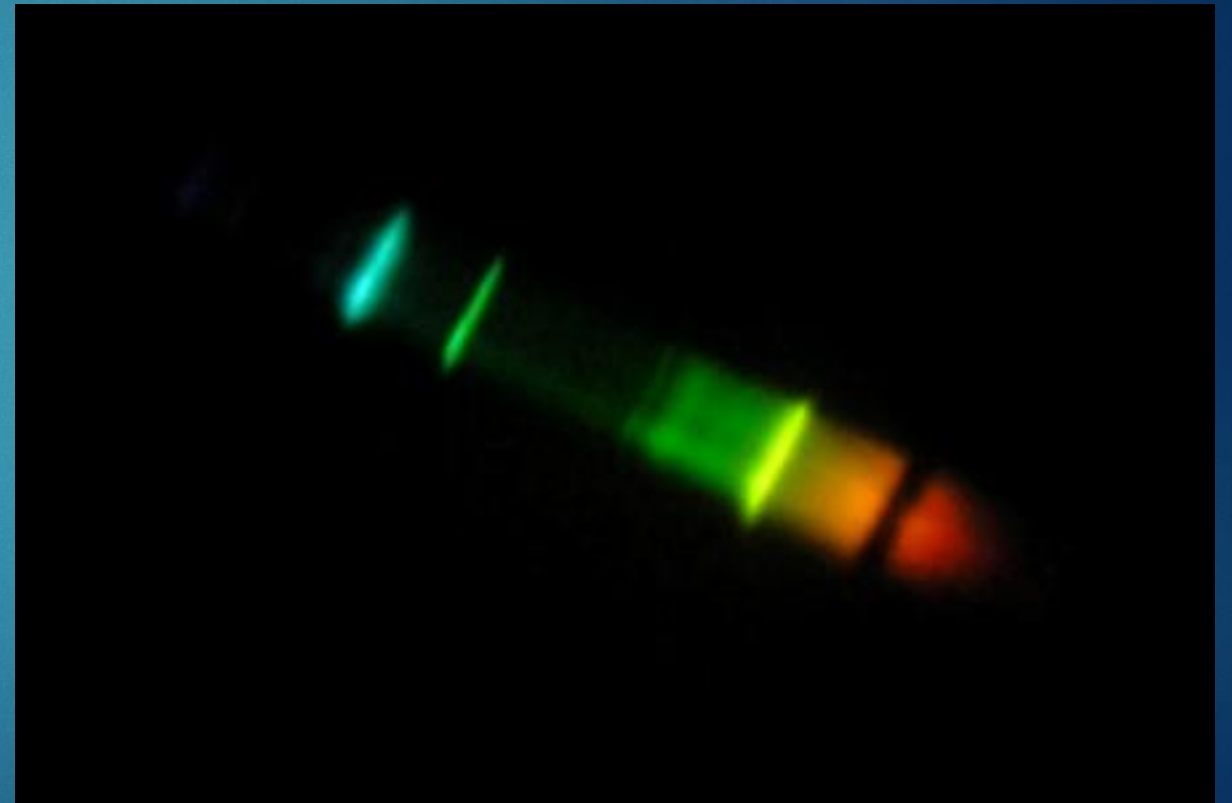Low-cost spectroscopes can be built easily using household materials

Position the CD at a 30-degree angle with the tube

Activities with a spectroscope

Low-cost spectroscopes can be built easily using household materials

Activities with a spectroscope

LPS**	Low-pressure sodium – a nearly monochromatic yellow-orange light source used mostly in areas near astronomical observatories and sea turtle nesting beaches.	1.0	0.4
HPS***	High-pressure sodium – A golden-yellow light source, widely used throughout the world.	2.4	1.0
FLED****	Filtered warm-white light-emitting diode – a straw-yellow LED lamp with a filter that removes most emission with wavelength shorter than 500 nanometers.	3.6	1.5
LED 2400K	Light-emitting diode with "correlated color temperature" (CCT) of 2400K – a "warm-white" LED. This type of LED has not seen wide use.	4.3	1.8
LED 4100K	Light-emitting diode with CCT of 4100K – a "cool-white" LED. This is a common LED type in recent LED area lighting installations.	6.4	2.7
LED 5100K	Light-emitting diode with CCT of 5100K – a "cool-white" LED. This also is a common LED type in recent LED area lighting installations.	7.9	3.3

Use the spectroscope to explore spectra from different types of light sources.

LEDs can light-pollute almost 8 times more than low-pressure sodium lamps!

Recommended Websites

- International Dark Sky Association - https://www.darksky.org/

- Globe at Night Campaign - https://www.globeatnight.org/

- Dark Sky Rangers - http://dsr.nuclio.pt/

- Light Pollution Map - https://www.lightpollutionmap.info/
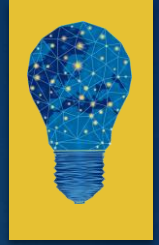
Recommended Apps

Lux Light Meter Pro

Light Pollution Map

Practical Activity TONIGHT!!!

Evaluate the limiting magnitude of this location

HOW?

- Use a constellation near the zenith
- With a reasonable range of magnitudes (1 to 5 in steps on 0.5 mag)
- Go to a site without direct incidence of artificial lights
- Adapt your eyes to the dark (10 - 15 minutes).
- Avoid using your smartphone. If essential, keep the screen brightness to minimum.
- Use a red-light flashlight (or app) to preserve low light eye adaptation
- Identify the faintest star you can see in the area and compare with the star chart

Practical Activity TONIGHT!!!

Evaluate the limiting magnitude of this location

CAVEATS

- Direct artificial light incidence
- Not enough time to adapt to the dark
- Moon
- Clouds
- Constellation not near the zenith

The sky tonight at 22:00
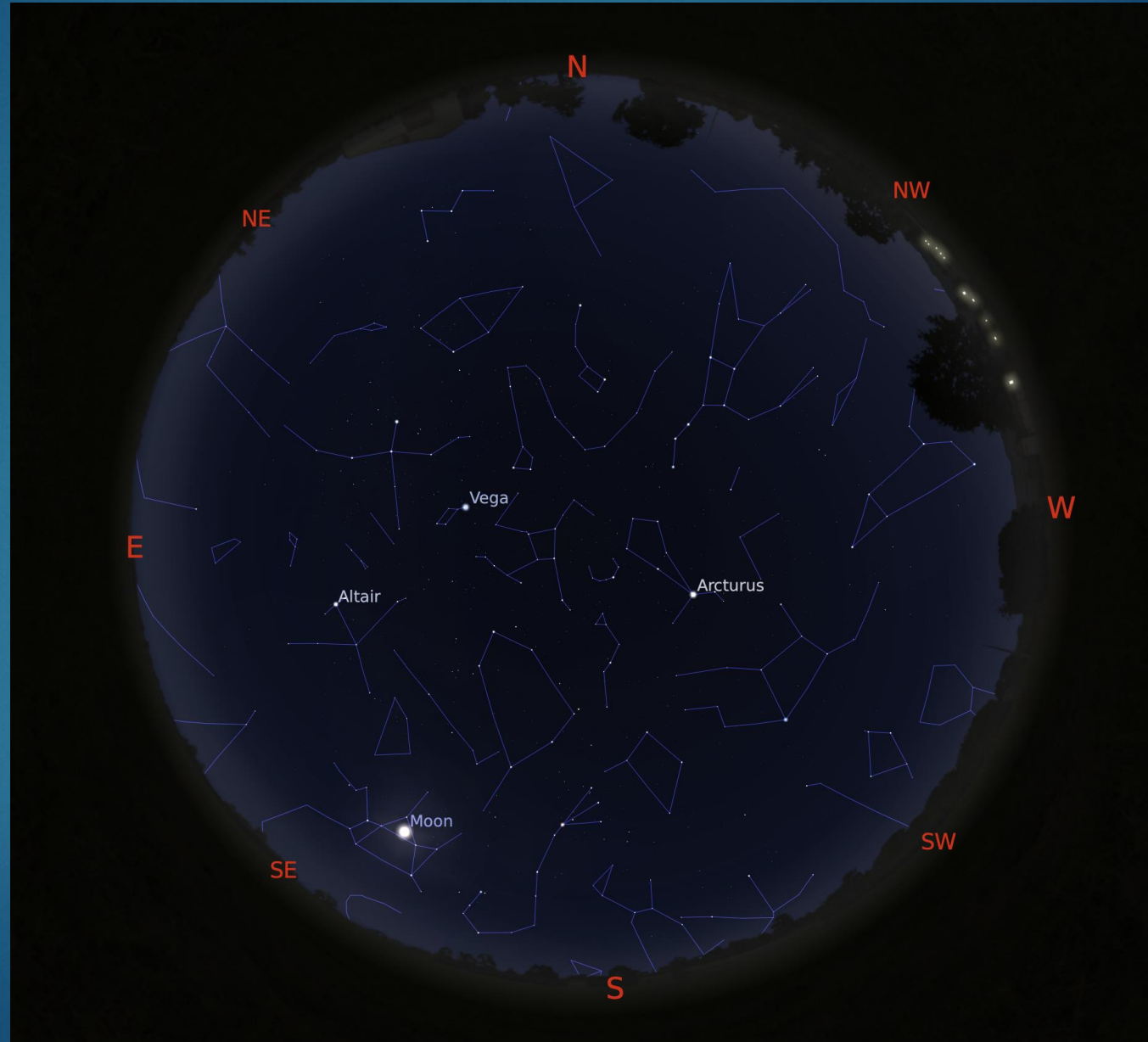
Practical Activity TONIGHT!!!

2 regions
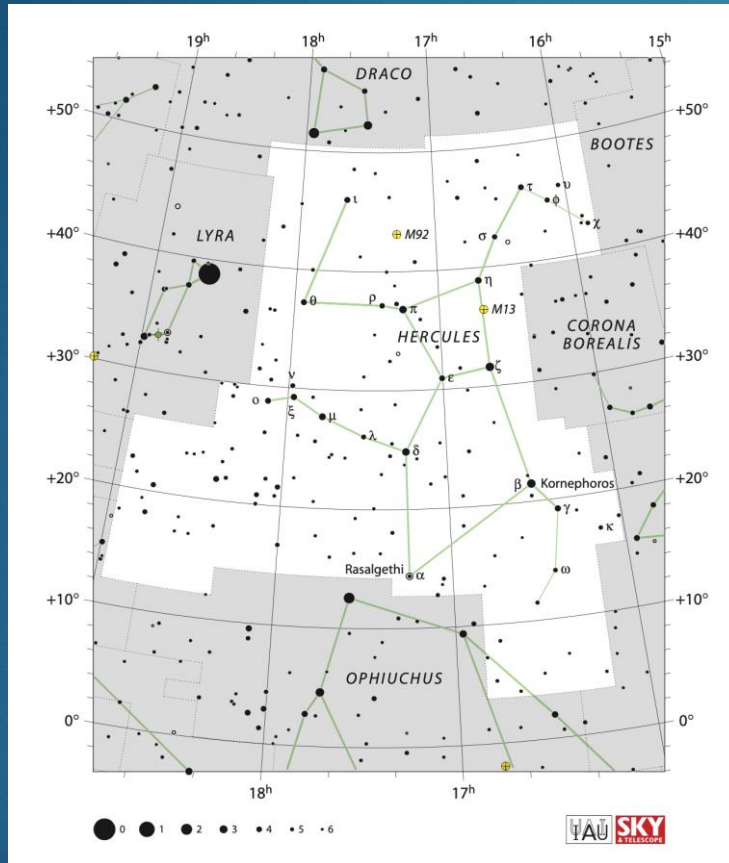
Hercules
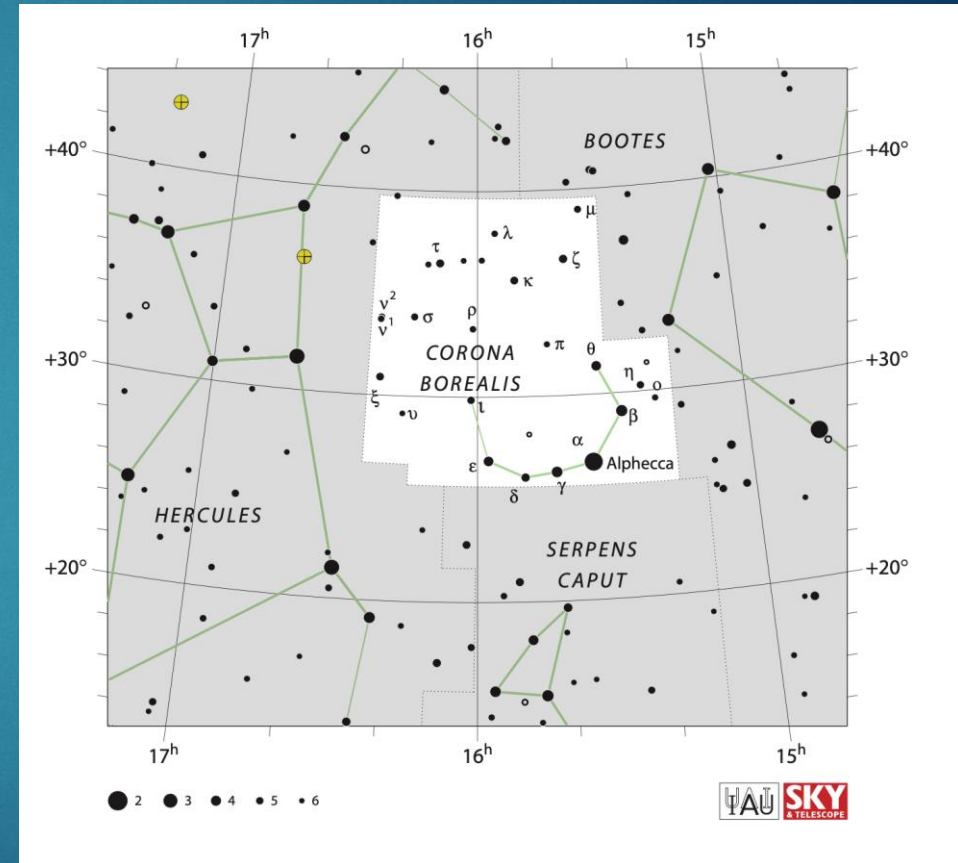
Corona Borealis

The impact of light pollution
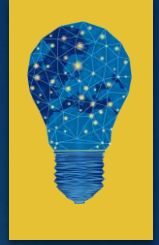
Limiting magnitude 1
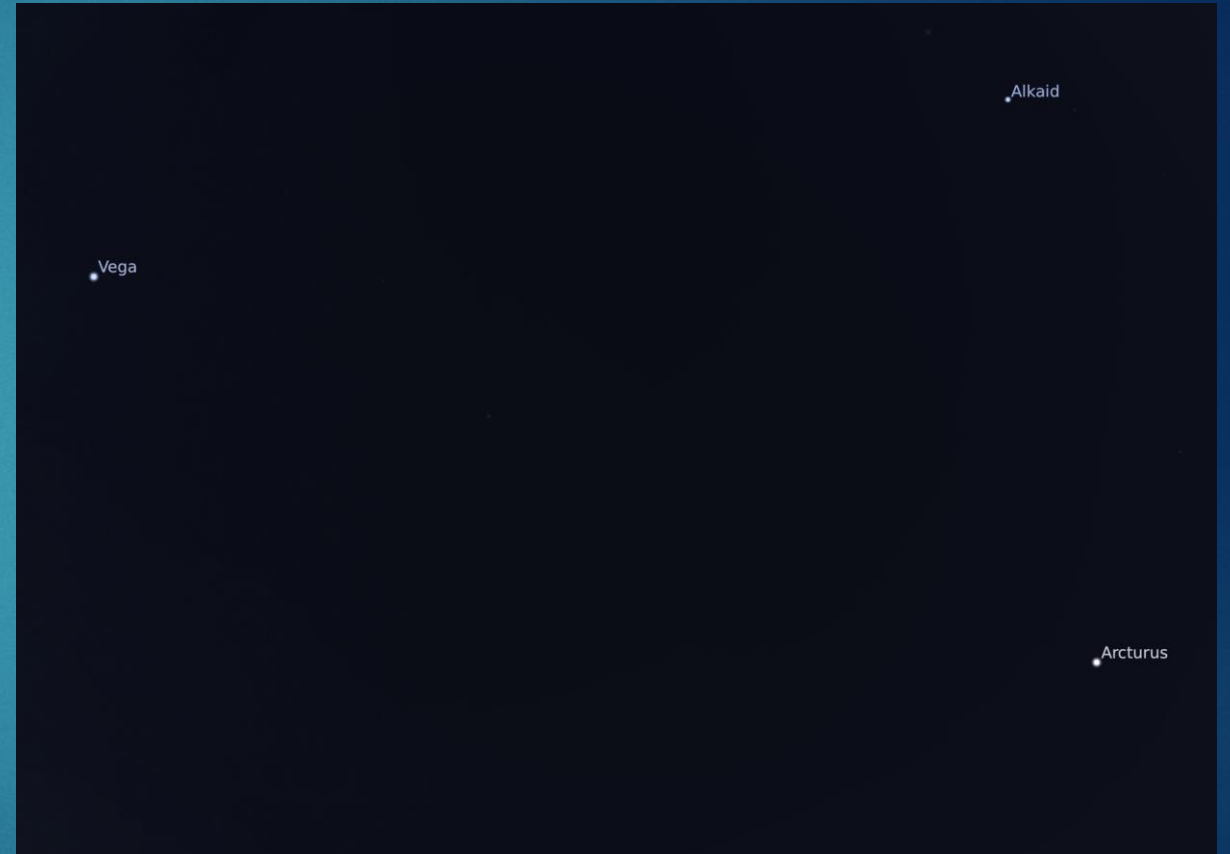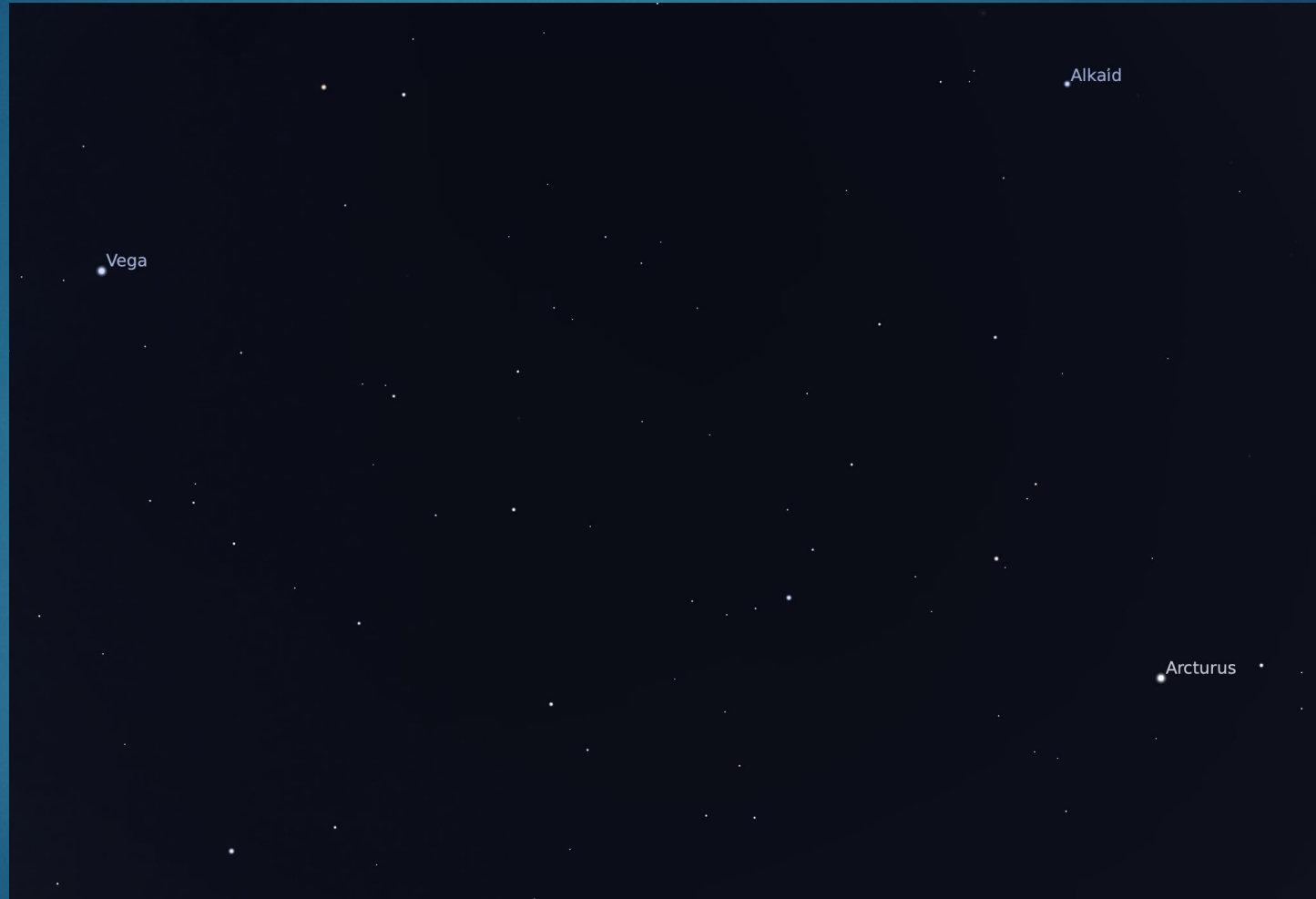
Limiting magnitude 2

The impact of light pollution
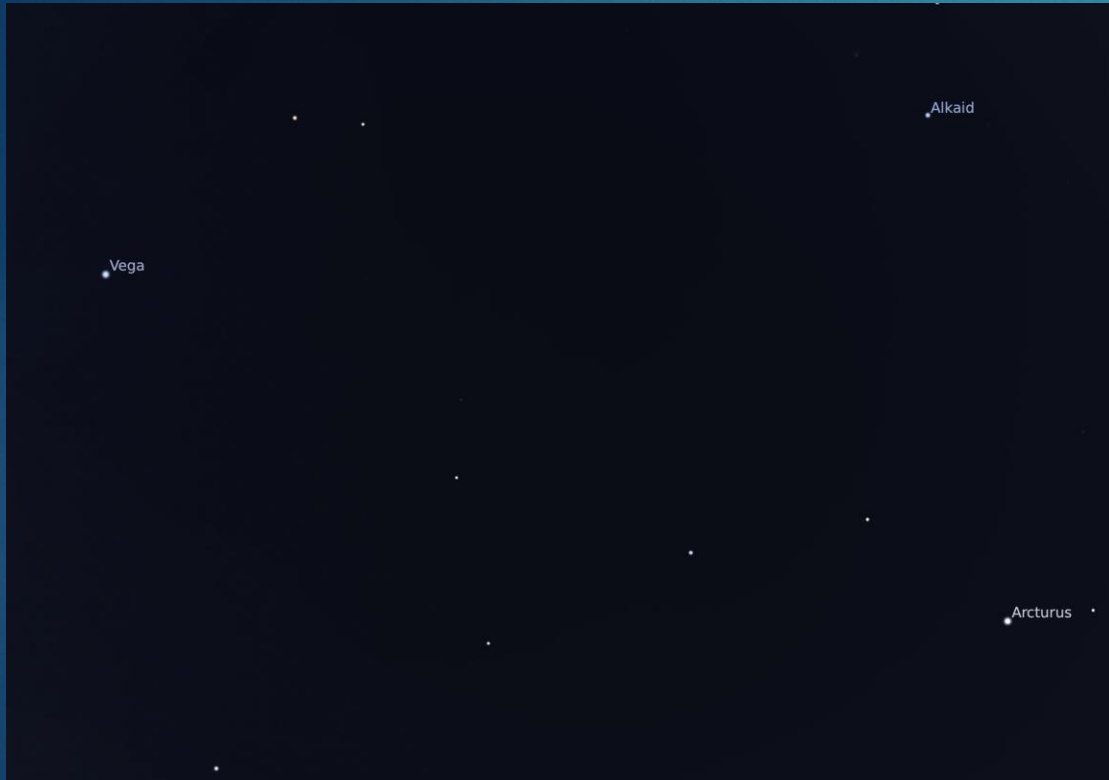
Limiting magnitude 3

Limiting magnitude 4

The impact of light pollution

Limiting magnitude 5

How many stars can you see by naked eye?

Limiting magnitude	Number of stars
1	6
2	45
3	150
4	540
5	1700
6	4900
7	14000

Simulating Light Pollution on Stellarium

Thank you!

CliC-PoLi