



**SPACE::LAB**



# SLOVAKIA

<https://www.youtube.com/watch?v=uc9-Rm6L1xY>

# Space science in Slovakia

- Sun - Earth relations
- Interplanetary bodies
- Variable stars and exoplanets



# SPACE::TALK



SPACE::TALK je pravidelný meetup záujemcov o vesmírny výskum a inžinierstvo.

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Jedinečný interaktívny talk rozšíri tvoje chápanie vesmíru.

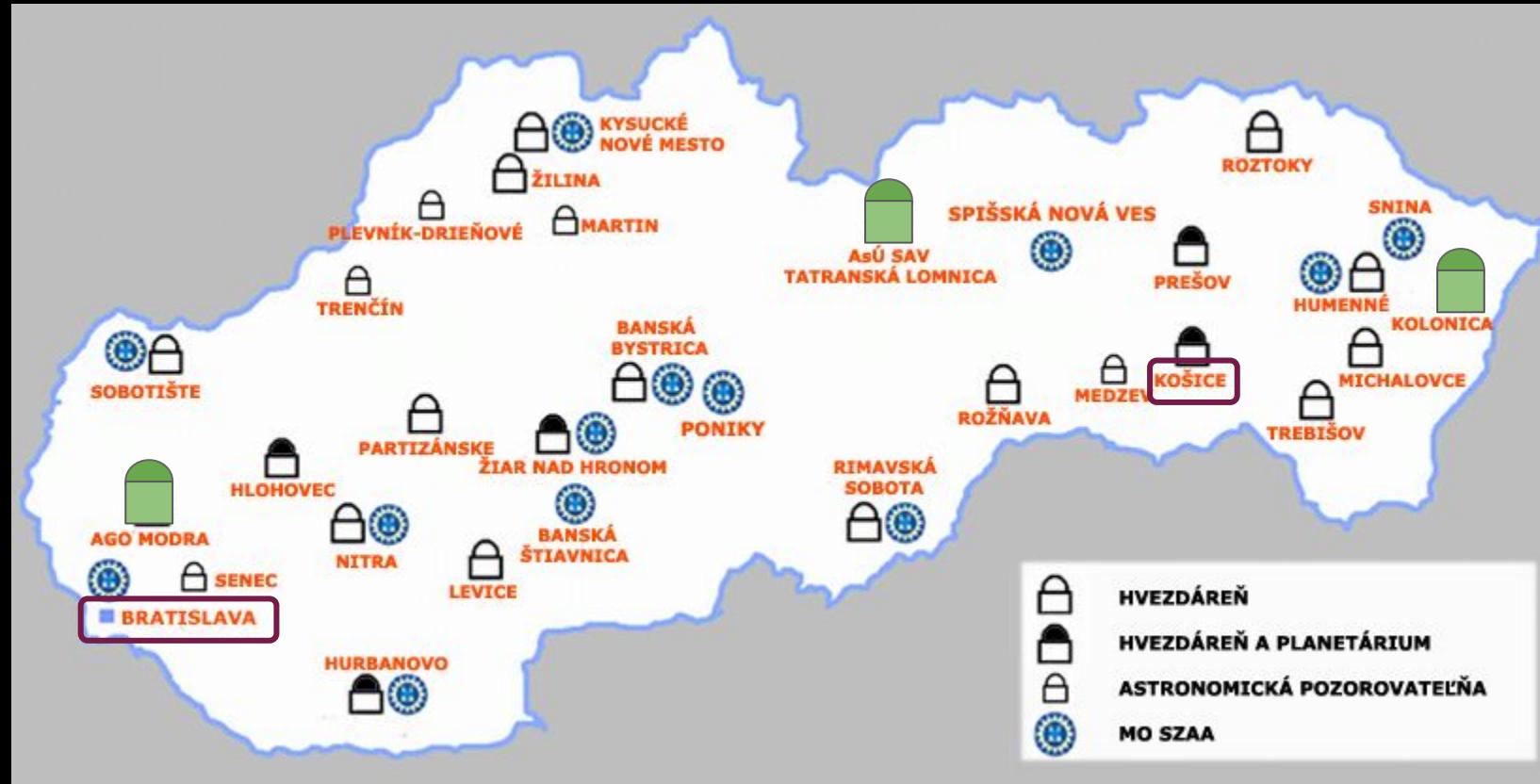
Zdieľame aktuálne novinky a máme priestor aj na networking. Prednášajú najlepší slovenskí odborníci v danej oblasti.

SPACE::TALK meetupy sú plánované stále na 1. štvrtok v mesiaci v čase 18:00-20:30. Celkovo je zatiaľ plánovaných 20 meetupov v priestoroch SPACE::LABU na Bulharskej 4 v Košiciach.

<http://www.space-lab.sk/space-talk>



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Credit: SZA



[Fakulta matematiky, fyziky a informatiky UK](#) > Oddelenie astronómie a astrofyziky

◀ O ÚROVŇ VÝŠIE

ODDELENIE ASTRONÓMIE A  
ASTROFYZIKY

Udalosti a oznamy

Meteoroids 2019

História

Lúdia

AGO Modra-Piesok

Štúdium

Veda a výskum

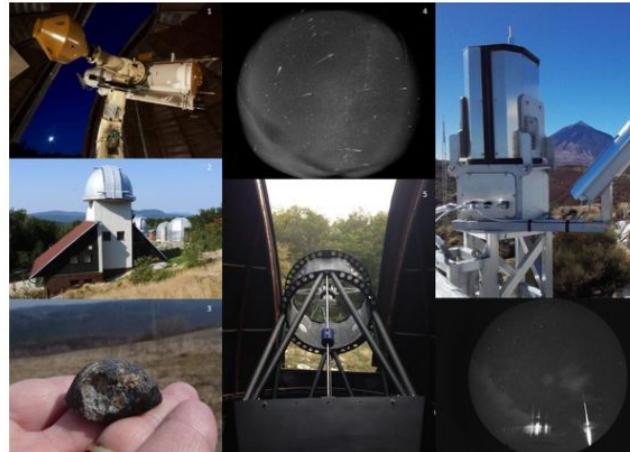
Obrázky

Médiá a popularizácia

Kontakty

## ODDELENIE ASTRONÓMIE A ASTROFYZIKY

Vedecko-výskumná činnosť Oddelenia astronómie a astrofyziky, ktoré je súčasťou Katedry astronómie, fyziky Zeme a meteorológie, je zameraná na výskum medziplanetárnej hmoty, na štúdium fyziky a dynamiky malých telies Slnčnej sústavy, ich vzájomných väzieb a vývoja, na modelovanie dráhového vývoja prachových častic. Druhou oblasťou je slnčná fyzika sa zameraním na diagnostiku neterminálnych distribúcií v slnčnej koróne a na štúdium prejavov slnčnej fyziky v atmosfére Slnka s využitím družicových a vlastných pozorovaní erupcií. Pozorovacie programy prebiehajú na AGO FMFI klasickými a modernými (CCD kamery) metodami. Oddelenie spolupracuje s AU SAV, AÚ AV ČR, IASO CNR Bologna, Observatoire de Paris, section de Meudon a Institute for Astronomy. Doktoranti a poslúži oddelenia absolvovali dlhodobé študijné pobytu alebo v súčasnosti pracujú na University of Hawaii, NASA, Vatican Observatory a v NASA Marshall Space Flight Center.



### Prečo študovať astronómie a astrofyziku na UK?



RNDr. Juraj Tóth, PhD.  
Katedra astronómie, fyziky Zeme  
a meteorológie, FMFI UK

Študovať fyziku a zvážiť astrofyziku sa  
čiaria. Ziskate schopnosti analytické  
myšlienia, zorientovať sa v problémoch,  
a tým sa uplatniť v akomkoľvek zamestnaní.  
75 % našich absolventov sa uplatní  
v vede. Mnohých absolventov nám  
však nepoteší, že sa vedeckým cestám  
nepodarí dosiahnuť.

NASA, Université v Berne, Akademie vied CR a domáciach (Universita Komenského v Bratislave, Slovenská akadémia vied) astronomických pracoviskach. Na Fakulte matematiky, fyziky a informatiky UK sa  
snažíme využívať moderné, teoretické a observačne orientované  
pracovisko vrátane Astronomického a geofyzického observatória  
v Modre, kde pripravujeme nové projekty. Sme najdynamickejšie sa  
rozvíjajúcim astronomickym pracoviskom v strednej Európe s viac ako  
60-ročnou tradíciami výchovy takmer všetkých slovenských astronómov a astrofyzikov.

### 3X3 O VESMÍRE (YOUTUBE KANÁL FMFI)



<https://fmph.uniba.sk/daa/>



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Astrophysical group of Department of Theoretical Physics and Astrophysics (DTFA) was formed in 1999-2000, when with collaboration with Astronomical Institute of SAS, the department started to participate in the teaching of various disciplines of astronomy and astrophysics, which has allowed master students of physics to specialize in this field.

Students can study **astronomy and astrophysics** in the second, Master's degree of university education. It is actually the 4<sup>th</sup> and 5<sup>th</sup> year of university studies. Formally it is provided by the DTFA. However, some introductory lectures begin in the last year of bachelor study (3<sup>rd</sup> year) on the foundations of astronomy and astrophysics.



Lectures cover all basic fields of astronomy and astrophysics, like the solar system, Sun, stars, their structure and evolution, galaxies and extrasolar planets, as well as observational techniques and necessary software and programming skills. Teaching is provided by our internal staff teachers and also by external teachers from the Astronomical Institute of SAS. We also place emphasis on practical astronomical observations and data reduction techniques. Students take part in several short and long-term practices at different observatories and institutes.

Students are engaged into scientific research by their master's thesis. Subjects can be selected, within possibilities, by their individual interests. However, bachelor students may also choose subjects from the field of astronomy and astrophysics for their thesis in the 3<sup>rd</sup> year of study. We prefer individual access and work with each student.

In cooperation with Vihorlat Observatory and Astronomical Observatory on Kolonica Saddle, we operate several university telescopes at our technological station called Kolonica Observatory. For our observations, we can use also telescopes of Vihorlat Observatory, as well as, after an agreement, telescopes from other cooperating institutes.



## ANNOUNCEMENTS

Call for Application: Postdoctoral research fellowship

## CONFERENCES/SCHOOLS

GROWTH Astronomy School 2020 – online edition by Caltech, 17-21.8.2020

GAIA&TESS: Tools for understanding the Local Universe ERASMUS+ Summer school, 7 – 16.8.2020, Brno, Czech Republic



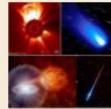
# Astronomický ústav

## Slovenskej akadémie vied



### Aktuality

»staršie aktuality«



Astronomické novinky



European Solar Telescope



Fotogenický bolid nad Starou Lesnou



100 rokov IAU (1919-2019)

MEDZINÁRODNÁ  
ASTRONOMICKÁ  
ÚNIA  
1919 - 2019

| O Astronomickom ústave                          | Výskum                                    | Podujatia                               |
|---|---|---|
| <b>Kontakty</b>                                 | <a href="#">Oddelenia</a>                 |   |
| <a href="#">Všeobecné informácie</a>            | <a href="#">Pracovníci</a>                |   |
| <a href="#">Organizačná schéma</a>              | <a href="#">Observatóriá</a>              | <a href="#">Nadchádzajúce podujatia</a> |
| <a href="#">Výročné správy</a>                  | <a href="#">Granty / Projekty</a>         |   |
| <a href="#">Vedecká rada</a>                    | <a href="#">Vedecké výsledky</a>          |   |
| <a href="#">História</a>                        | <a href="#">Zoznam publikácií</a>         | <a href="#">Nedávne podujatia</a>       |
| <a href="#">Dr. Bečvář - zakladateľ AsÚ SAV</a> | <a href="#">Meteorické dátové centrum</a> |   |

[https://www.astro.sk/homepage\\_sk.php](https://www.astro.sk/homepage_sk.php)



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# Vihorlatská hvezdáreň v Humennom

Organizácia v zriaďovateľskej pôsobnosti Prešovského samosprávneho kraja

[O nás](#)[Hvezdáreň v Humennom](#)[Observatórium na Kolonickom sedle](#)[Ponuka podujatí](#) ▾[Objednávka](#)

## Astronomické observatórium na Kolonickom sedle

Astronomické observatórium na Kolonickom sedle je vysunutým odborným pracoviskom Vihorlatskej hvezdárne v Humennom. Je situované v oblasti s veľmi nízkou úrovňou svetelného znečistenia. Vďaka tomu je mimoriadne vhodným miestom na astronomické pozorovania nielen pre verejnosť ale i pre odbornú prácu.



### REZERVÁCIE na kolonické observatórium na JÚL a AUGUST

### ĎAKUJEME

*Astro bikers a Savez za pomoc pri vykonávaní priebežnej dezinfekcie našich priestorov počas opatrení proti šíreniu koronavírusu! 😊*

### Aktuálne úkazy na oblohe

### KAMERA NA ASTRONOMICKOM OBSERVÁTORIU NA KOLONICKOM SEDLE



<http://www.astrokolonica.sk/>

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## O nás



SPACE::LAB je iniciatíva Oddelenia kozmickej fyziky Ústavu experimentálnej fyziky Slovenskej akadémie vied v rámci programu ESA/PECS.

Kozmický program v Košiciach má už viac ako 50 rokov. Začalo to výskumom kozmického žiarenia na Lomnickom štítu a zapojením do programu Interkozmos.

[DOZVEDIET SA VIAC](#)

Foto: ESA/ATG medialab;  
Comet image: ESA/Rosetta/Navcam

<http://www.space-lab.sk/o-nas>

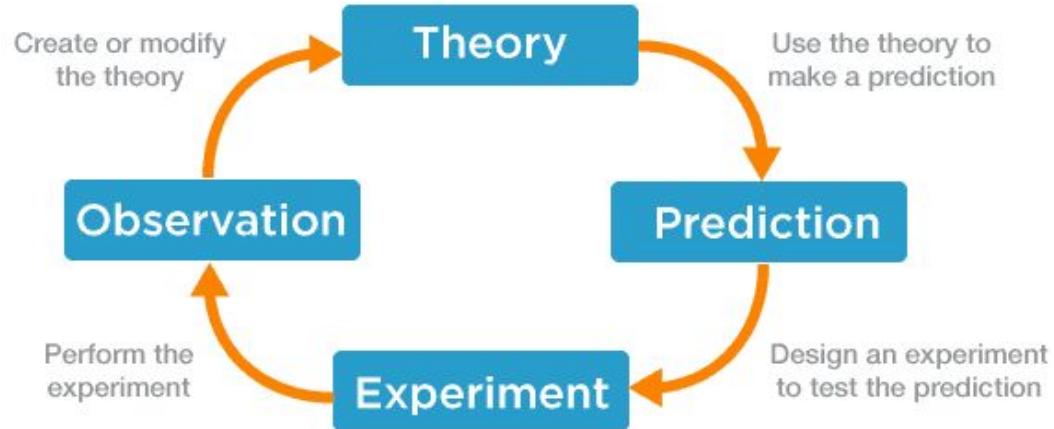


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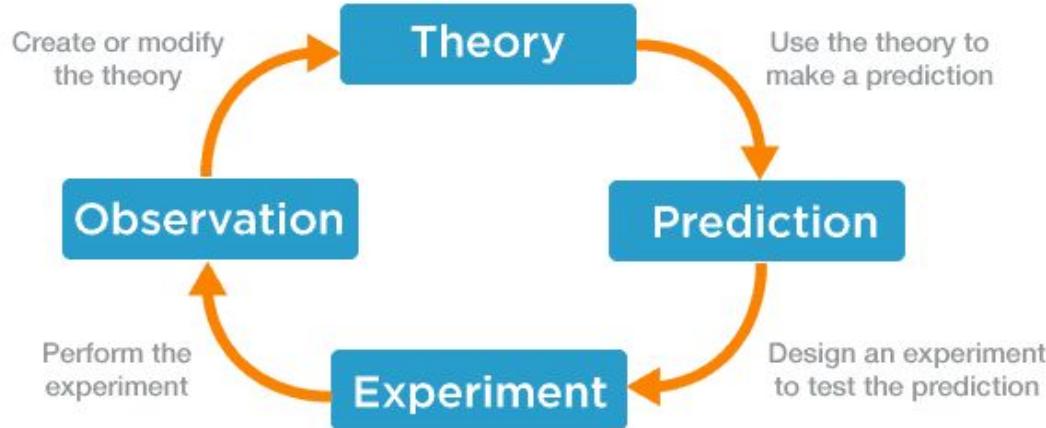
# AIRGLOW



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# Could I observe the airglow?

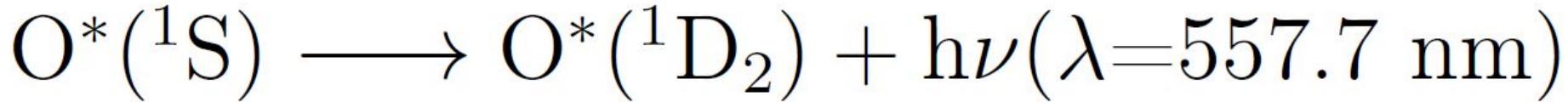
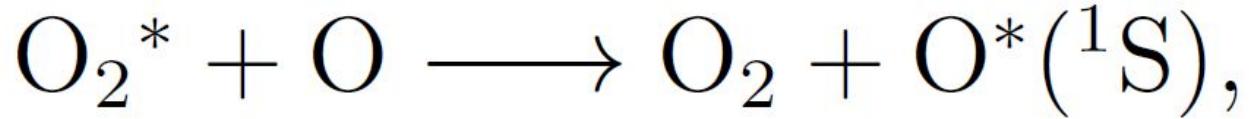
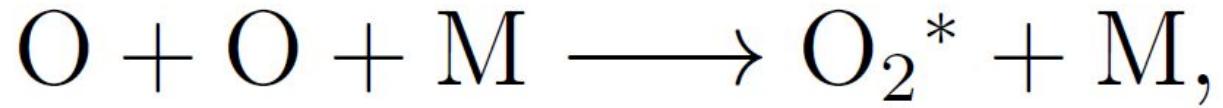




*Image by: ISS/NASA*

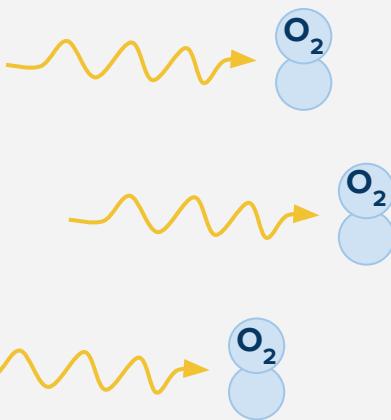


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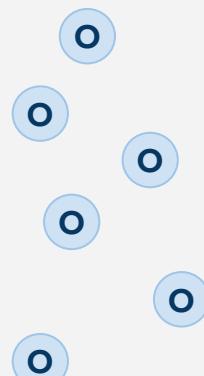


I.

EUV solar radiation  
( $< 242$  nm)



II.

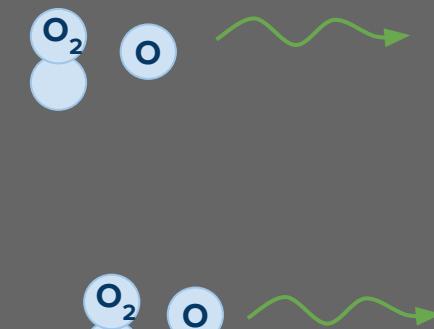


III.



IV.

Airglow  
557.7 nm



Photodissociation

Recombination

Emission



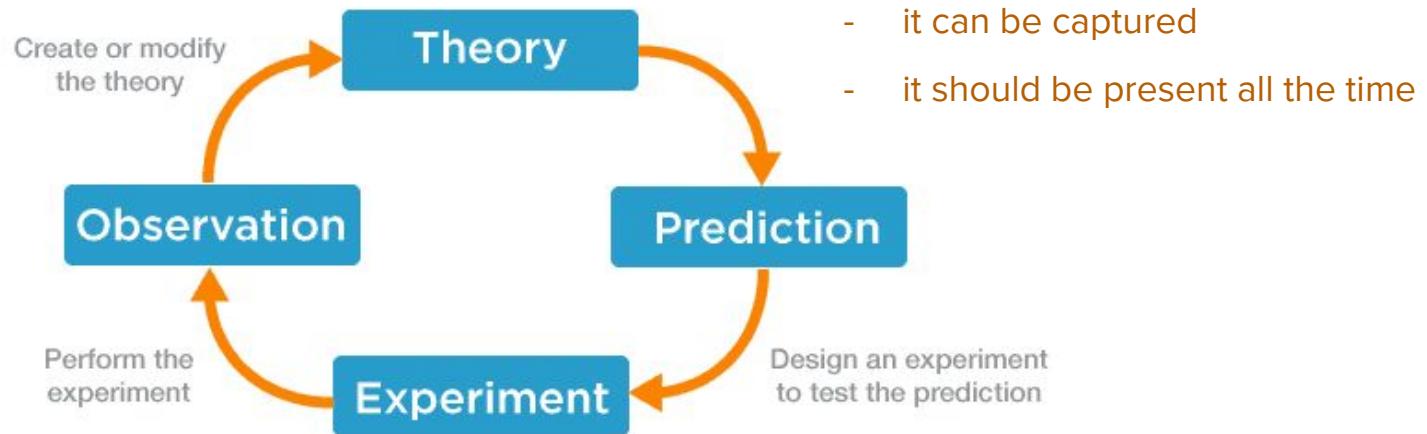


Image by: Petr Horálek

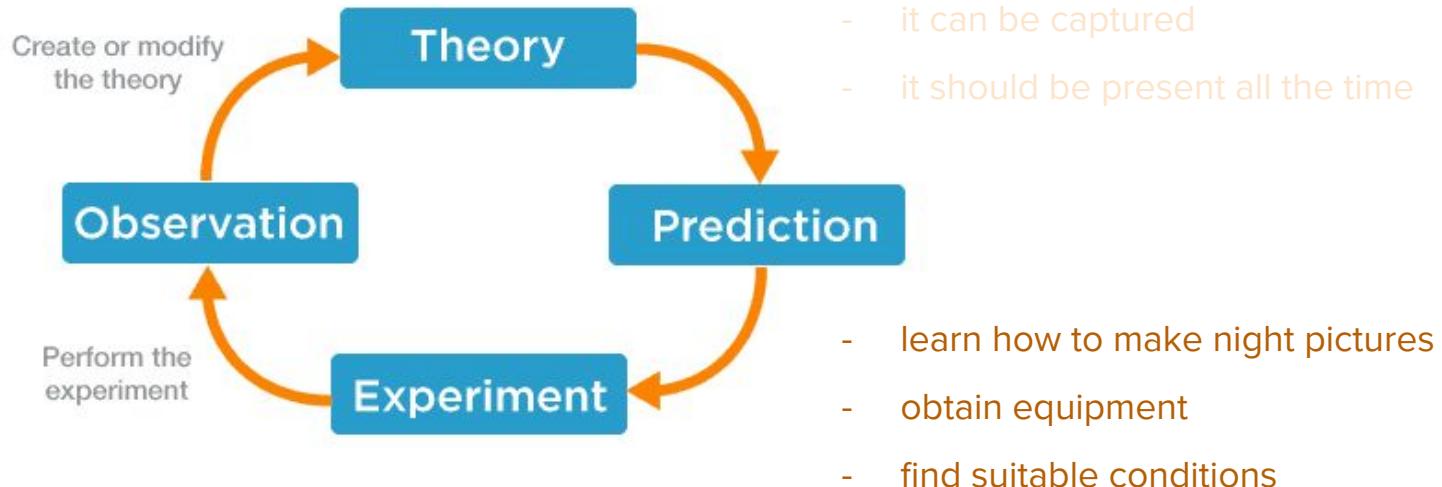


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# Could I observe the airglow?



# Could I observe the airglow?



# Could I observe the airglow?

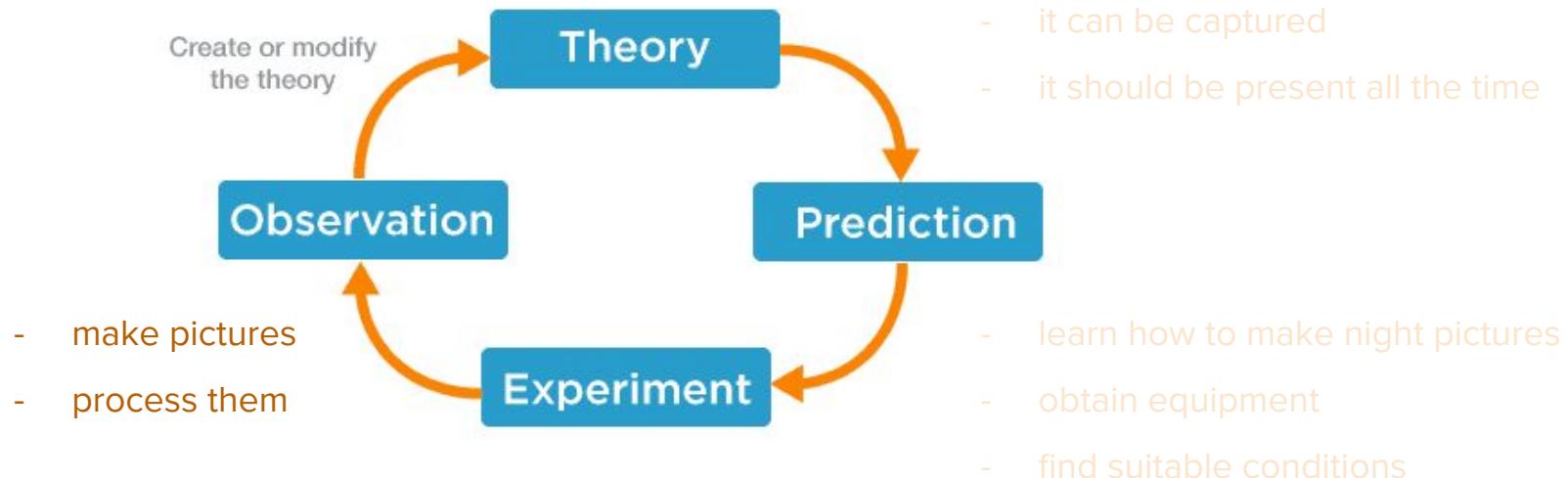


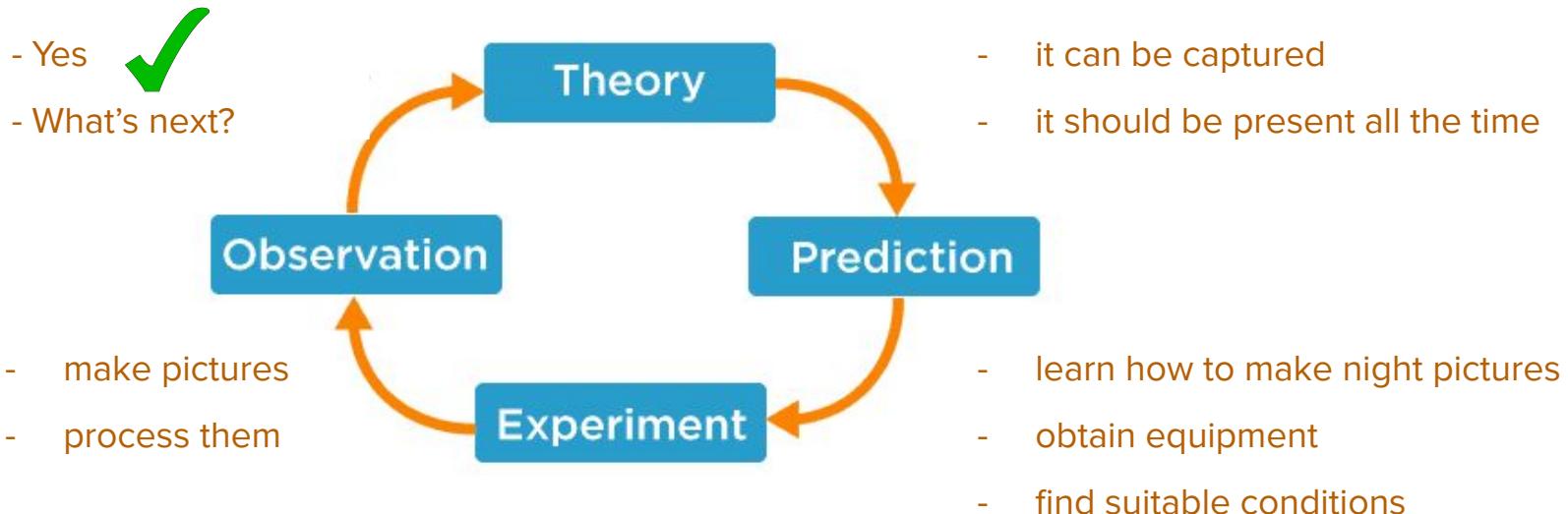


Image by: S. Mackovjak, Slovakia, 2018/05/13

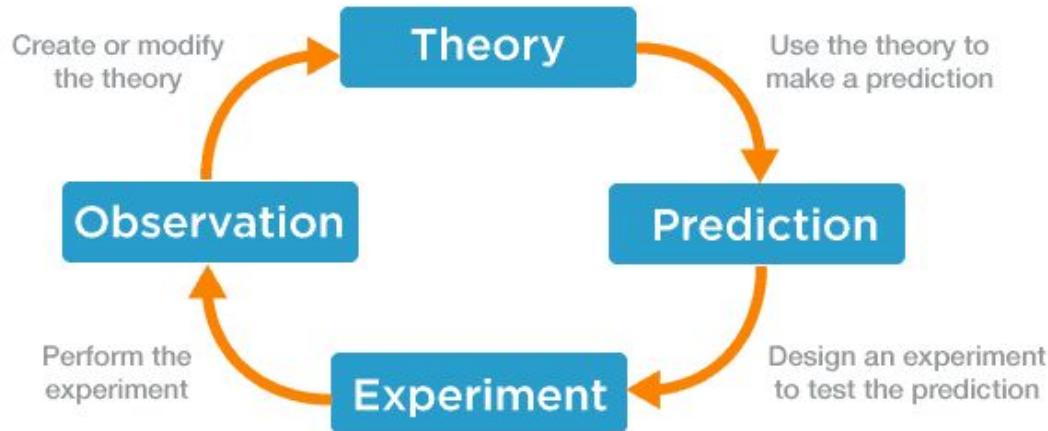


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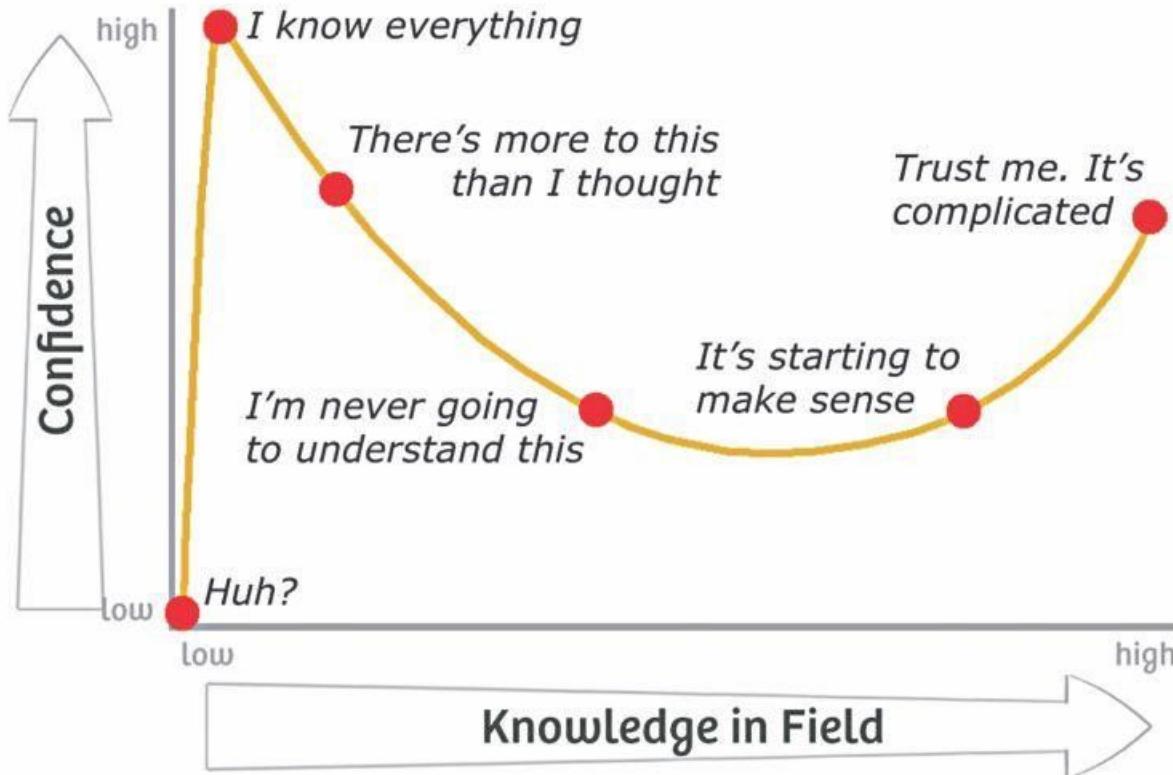
# Could I observe the airglow?



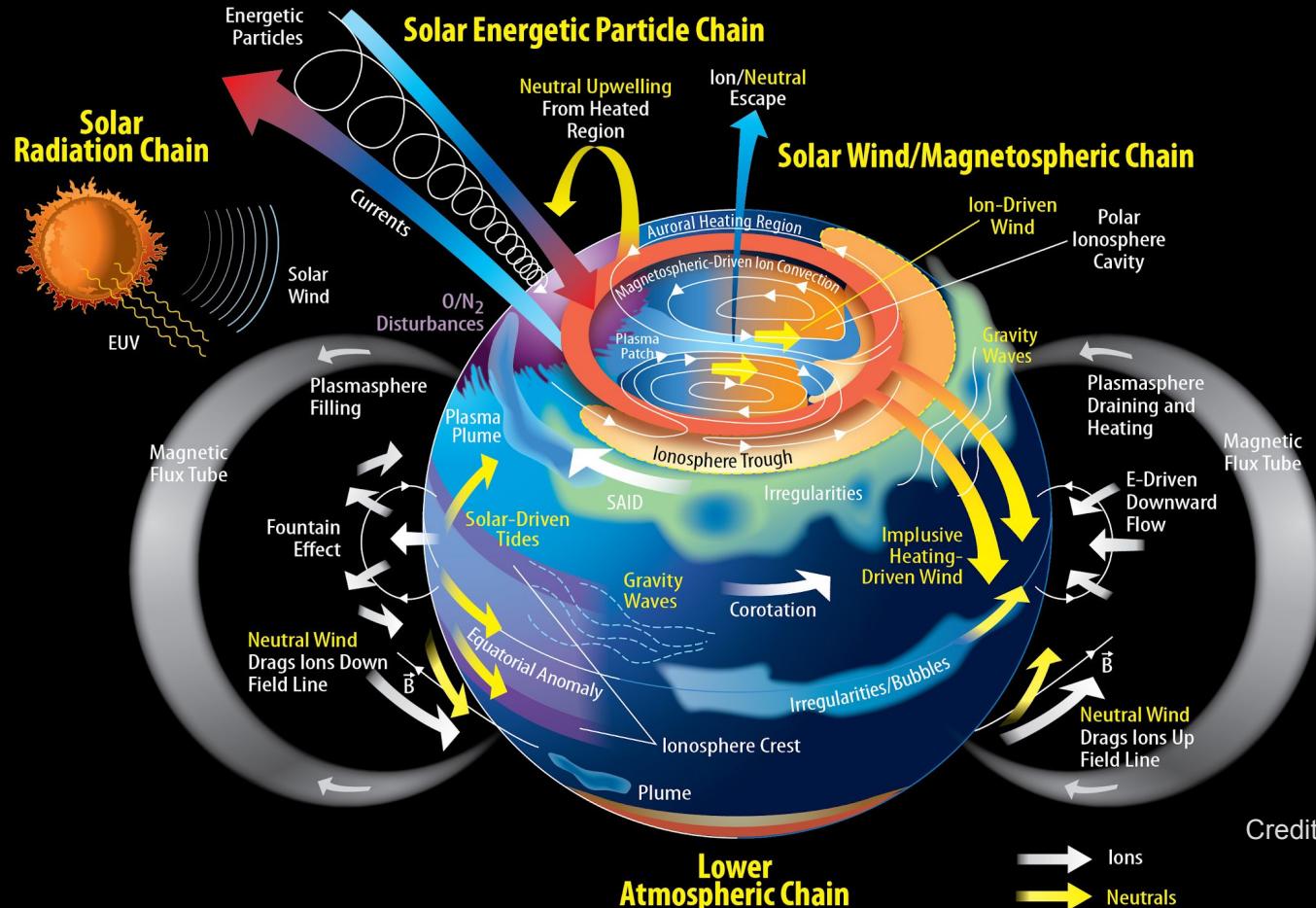
???



# Dunning Kruger effect



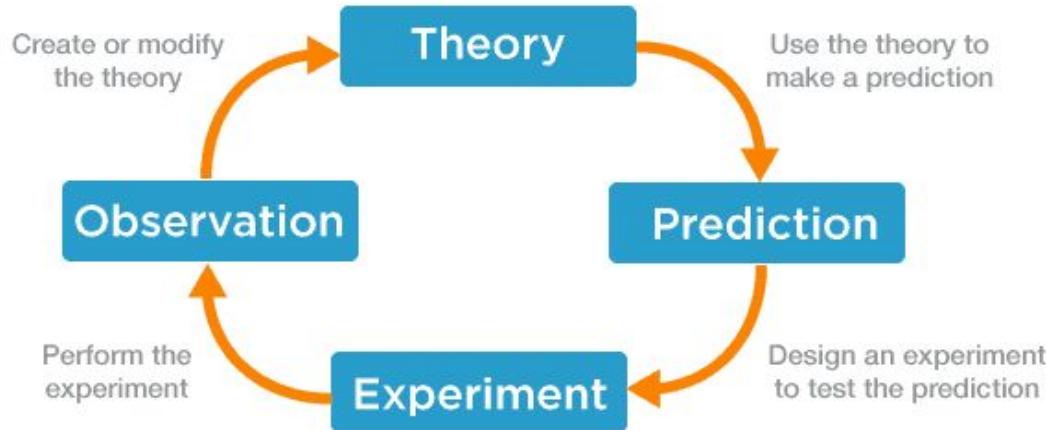
# Terrestrial Atmospheric ITM Processes



Credit: NASA / J. Grobowsky

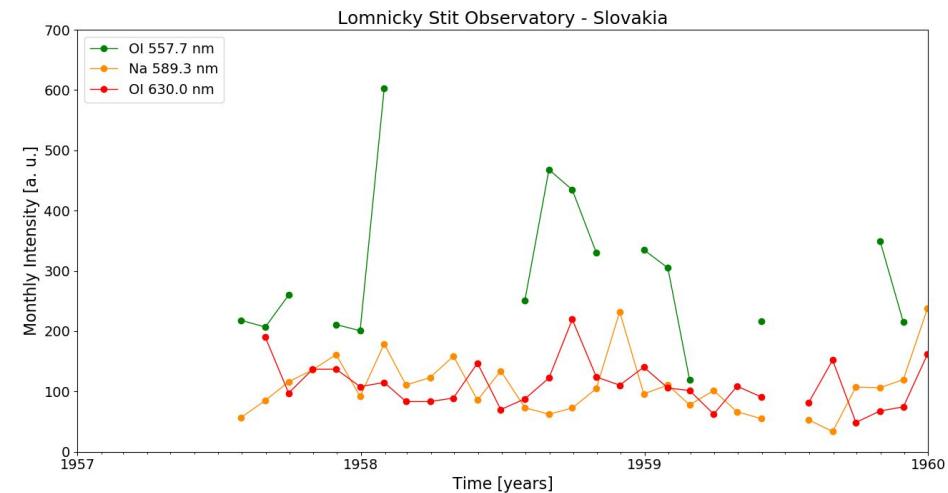


# Could I observe the airglow dynamics?



# Airglow in Slovakia?

- first measurements of airglow (557.7, 589.3, 630.0 nm) in Slovakia were in August 1957



[ftp://ftp.ngdc.noaa.gov/STP/SOLAR\\_DATA/SOLAR\\_PHENOMENON/AIRGLOW\\_IGY/](ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SOLAR_PHENOMENON/AIRGLOW_IGY/)



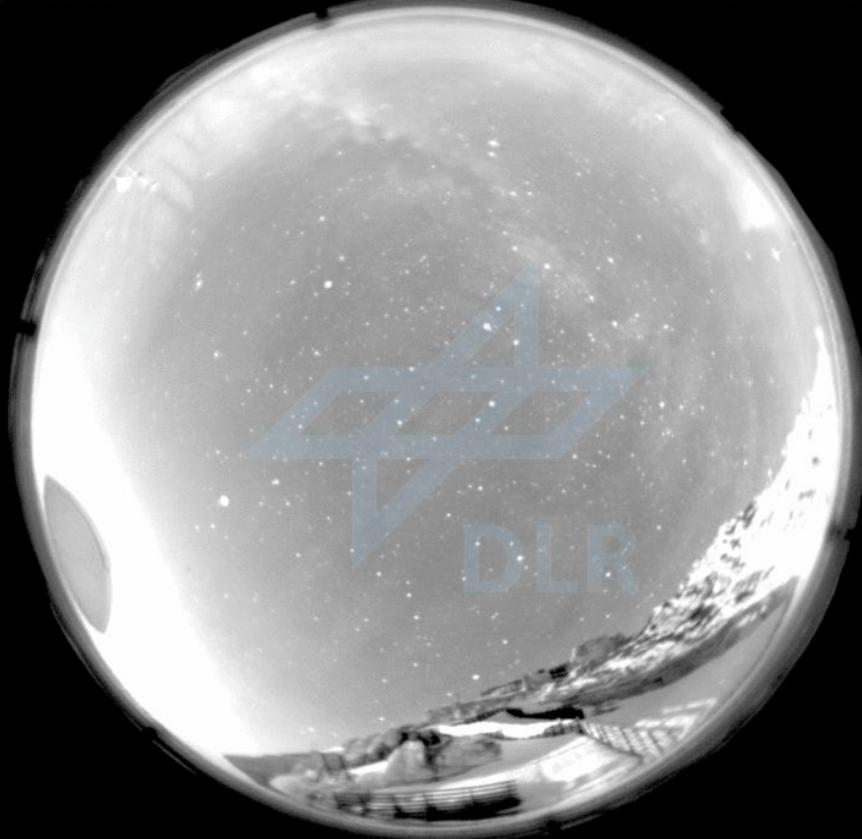
Lomnický Štít Observatory (LSO) - Slovakia  
2634 m a.s.l. (1957 - present)



2013-06-17

OH (715 - 930nm)

22:31:28 UT



UFS / Zugspitze  
(47.42°N, 10.98°E)



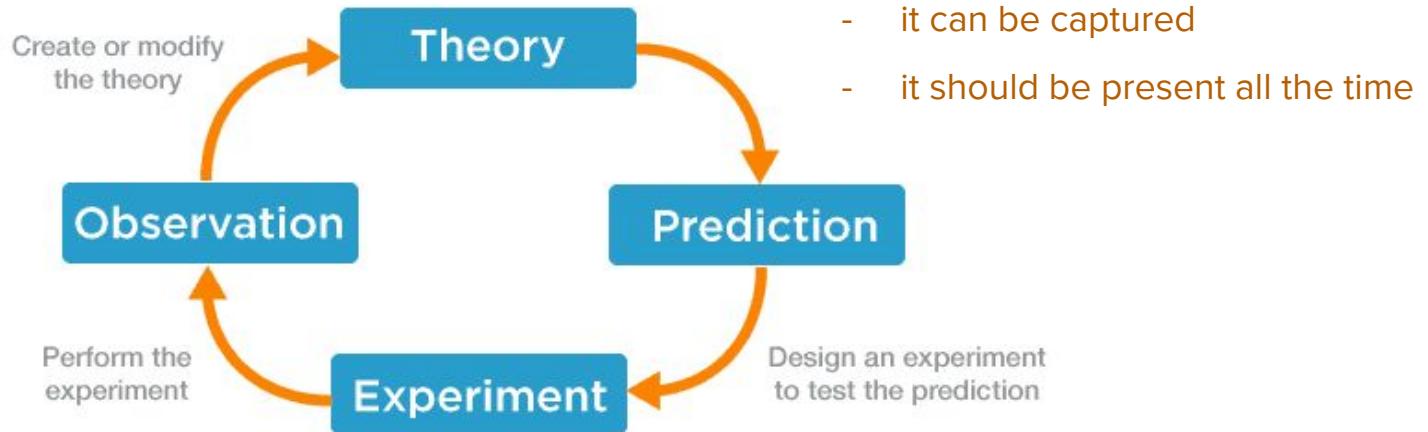
for the network  
detection  
of mesopause  
change

ndmc

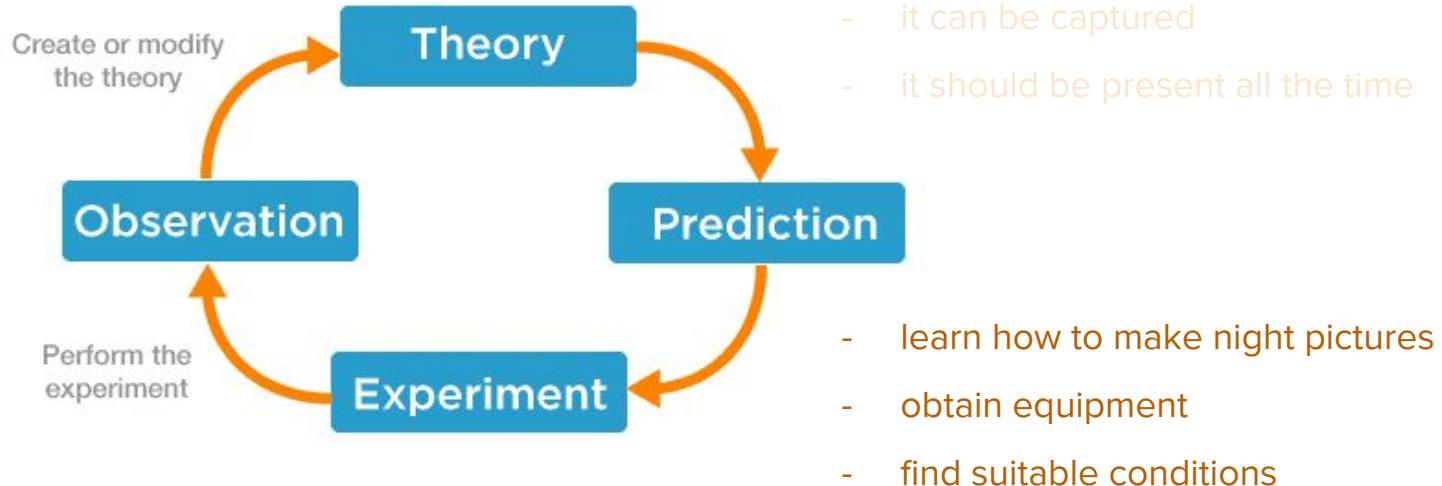


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# Could I observe the airglow dynamics?

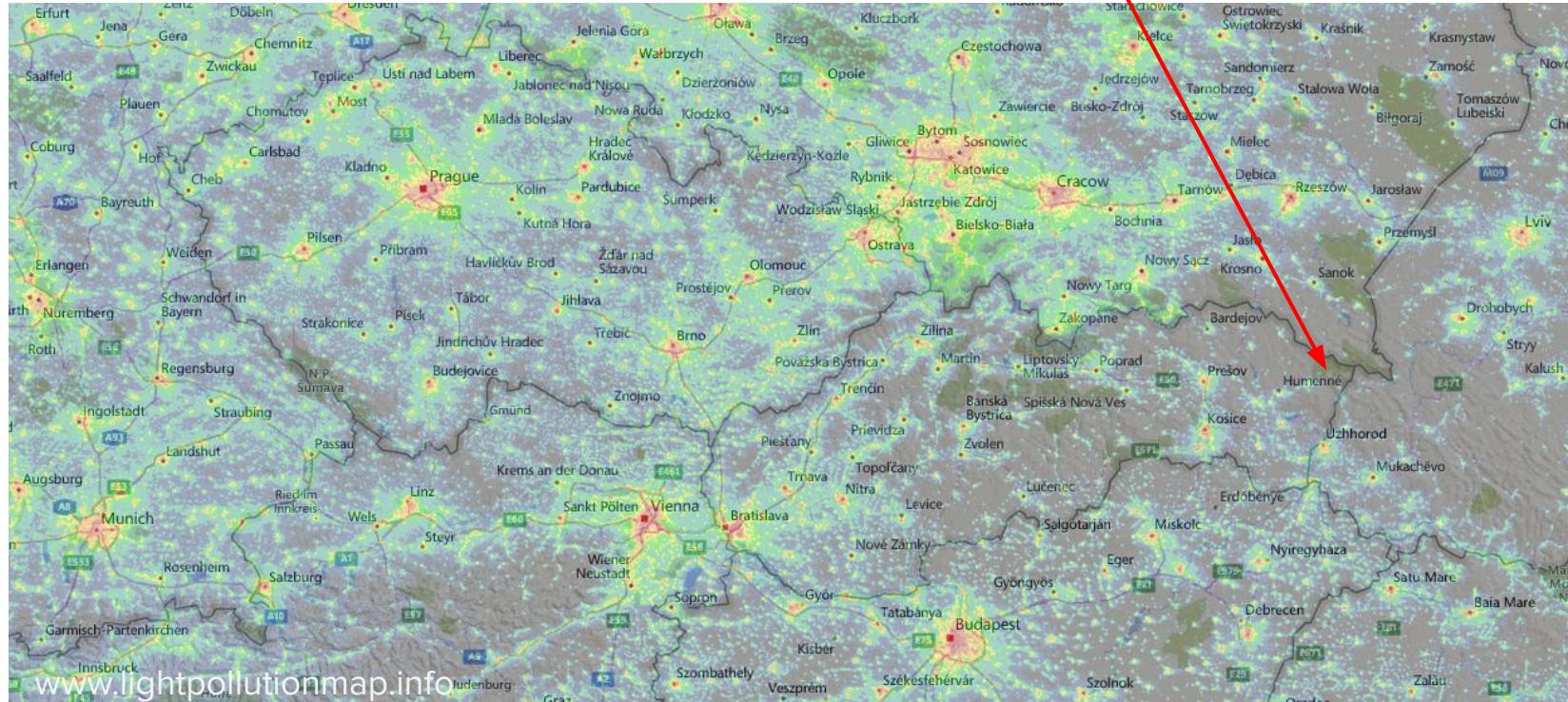


# Could I observe the airglow dynamics?



# Airglow MONitor - Extended Station

- Astronomical Observatory at Kolonica Saddle (Slovakia)
- lat =  $48.9349^{\circ}$  N, long =  $22.2737^{\circ}$  E, alt = 450 m asl





*Image by: S. Mackovjak, AOK, Sep 2019*

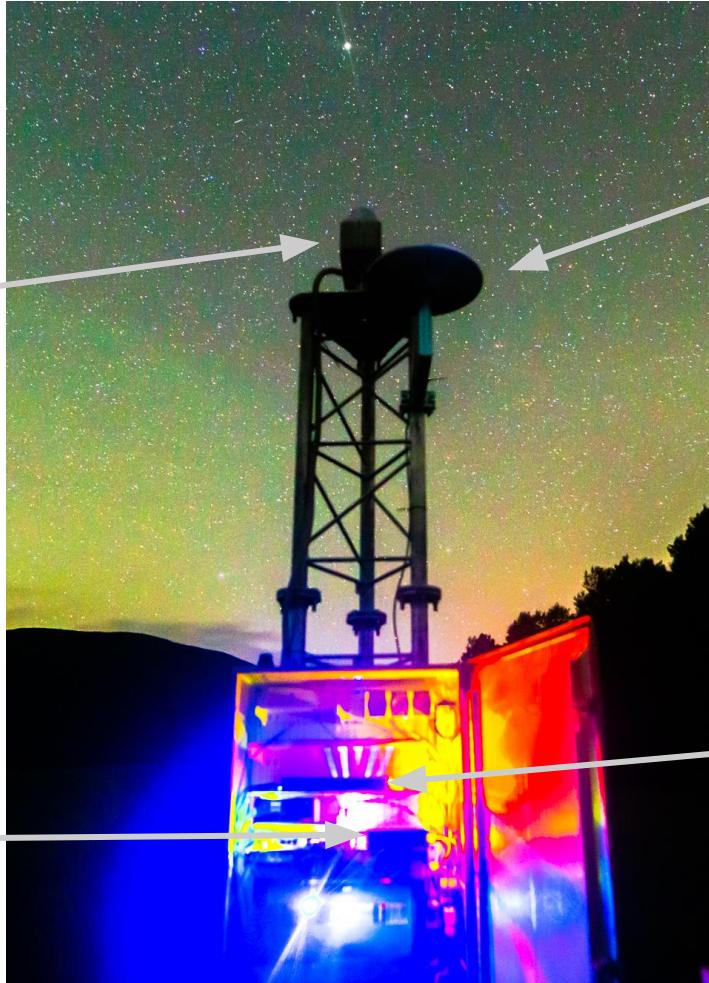


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# AMON-ES



Moravian Instruments G2-4000  
CCD camera (2056 x 2062 px)  
Sigma, fisheye lens, 4.5 mm, f/2.8



Trimble Zephyr 2 Geodetic  
GNSS antenna



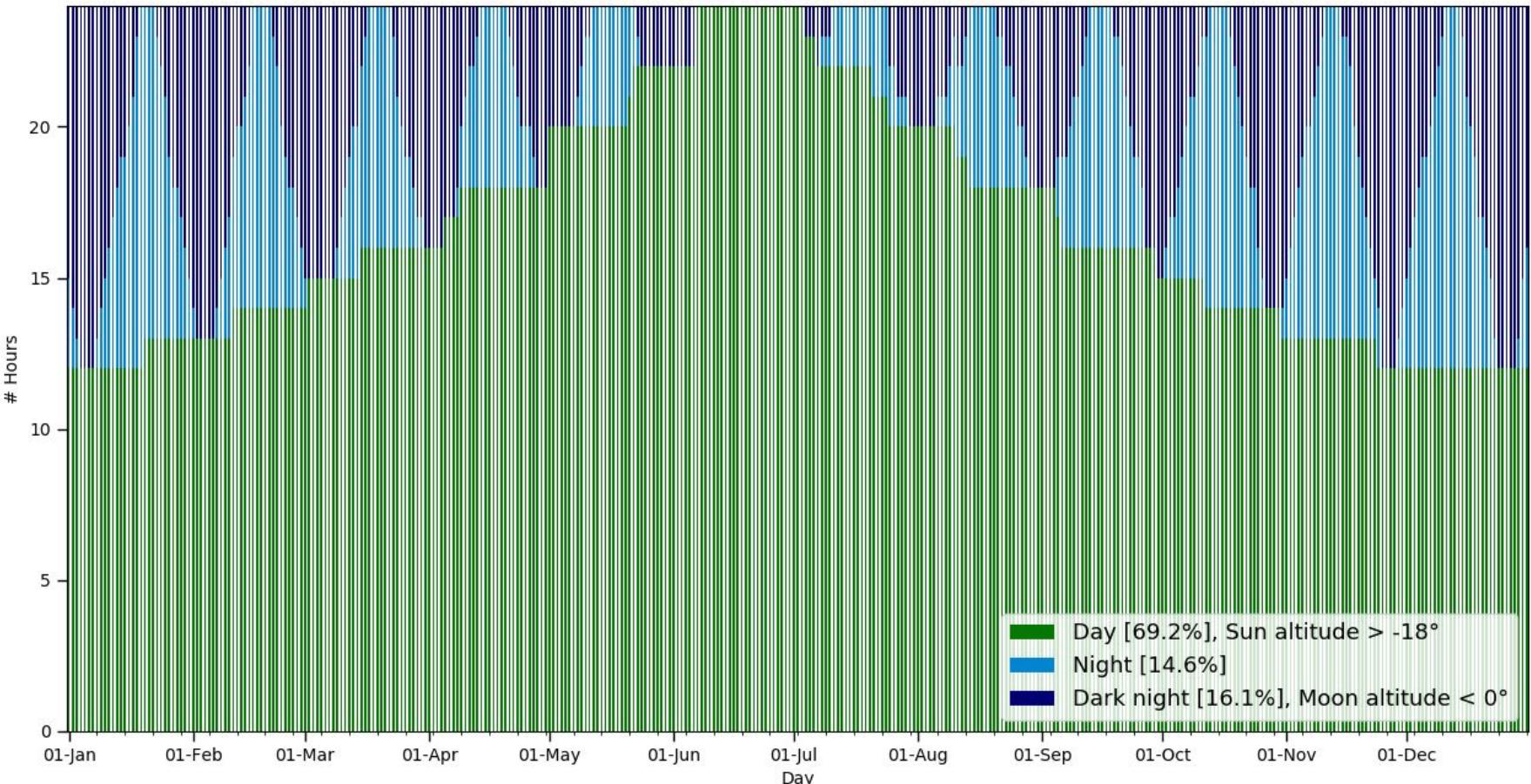
Supermicro SYS-E100-9S-L - computer  
+ power and network connection



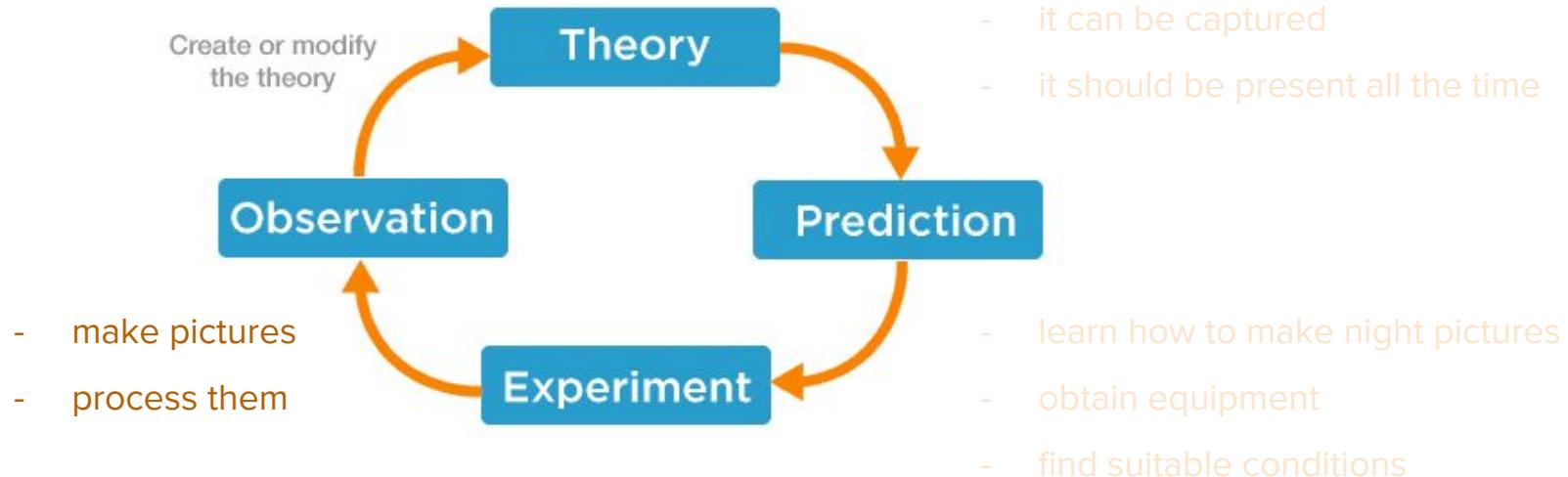
Septentrio PolaRxS GNSS receiver



Sky luminosity from 2019-01-01 to 2019-12-31  
Kolonicke sedlo, lat: 48.93489, lon: 22.27381



# Could I observe the airglow dynamics?



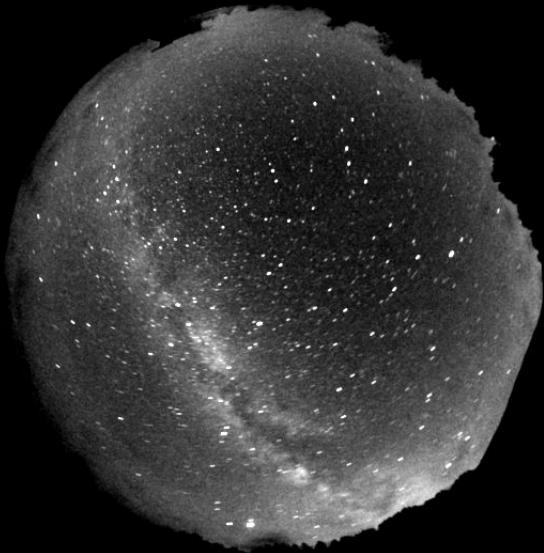


Composition of DSLR images  
<http://slovinsky.art>



SPACE::LAB

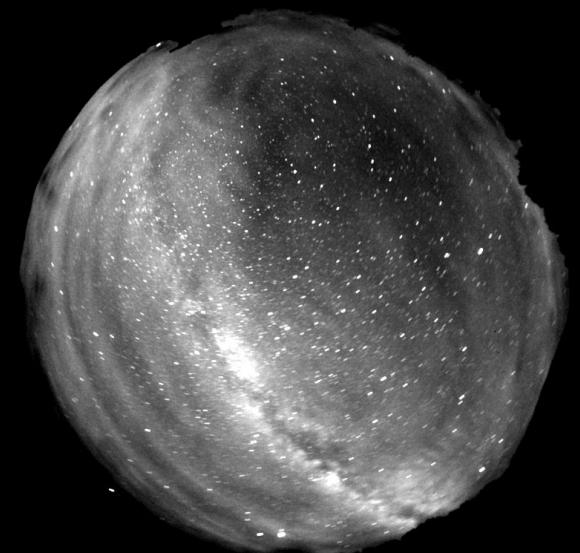
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AMON-ES  
N filter: NO airglow emission



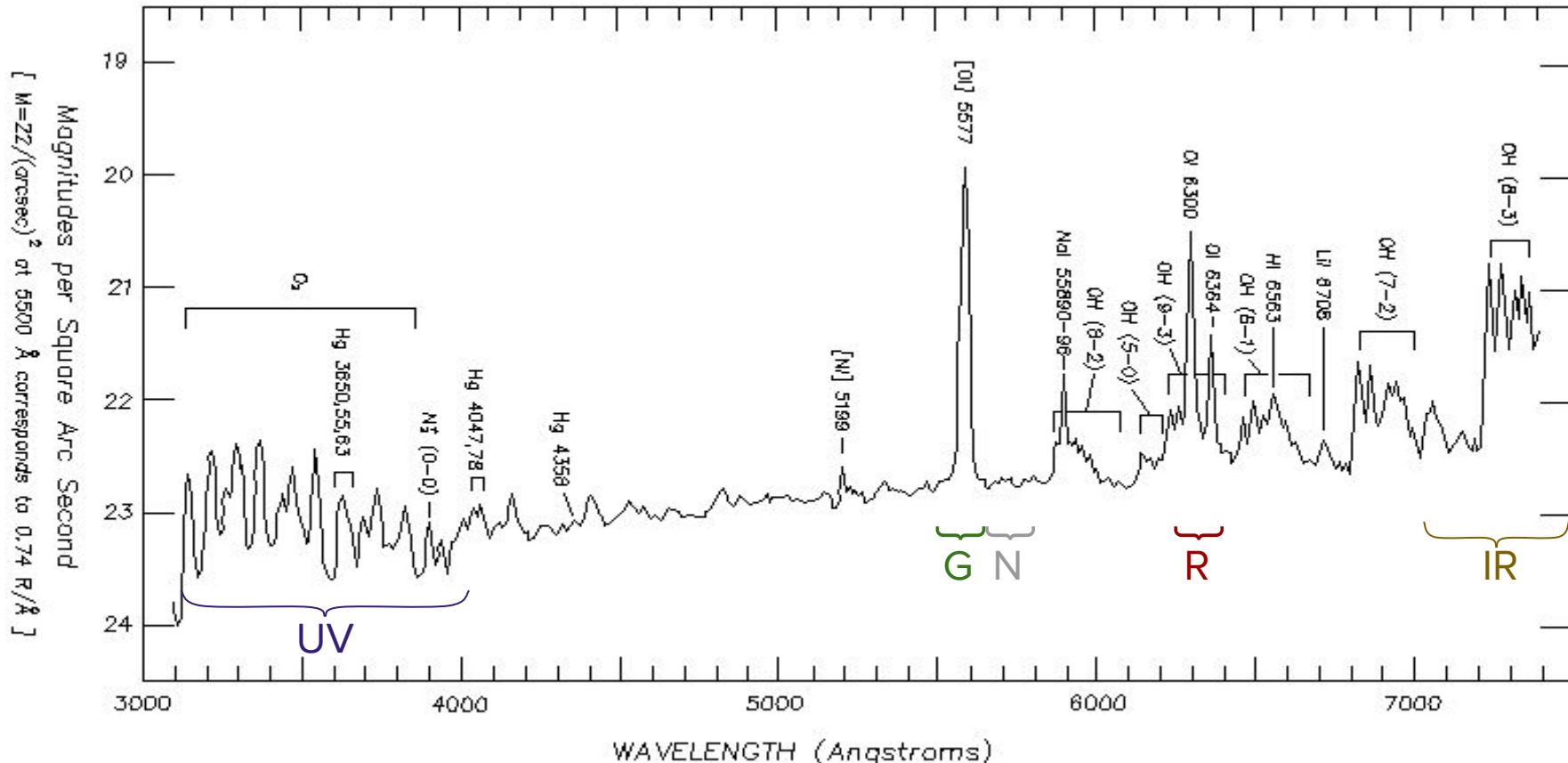
Composition of DSLR images  
<http://slovinsky.art>



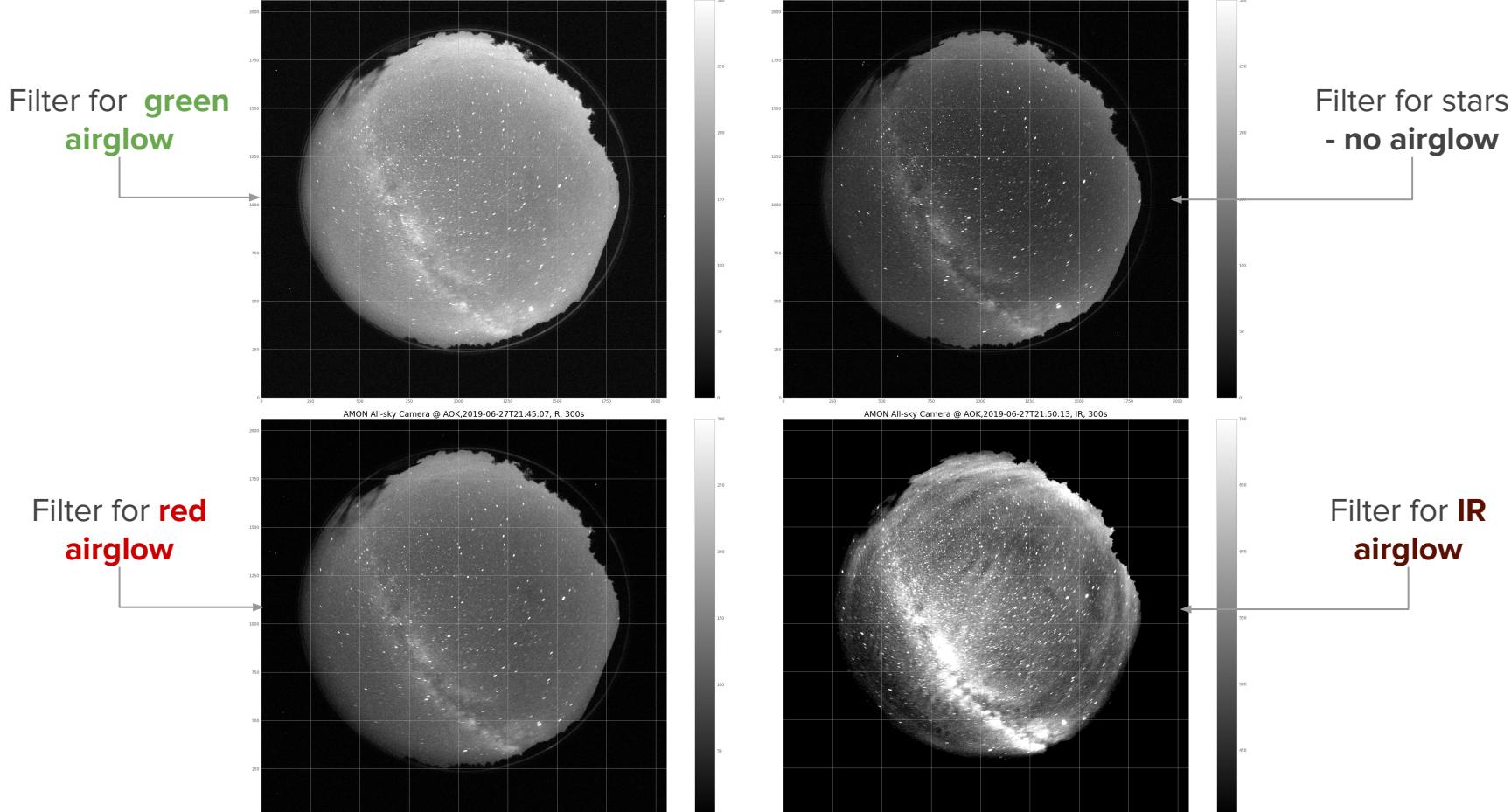
AMON-ES  
I filter: IR airglow emission (700 - 900 nm)

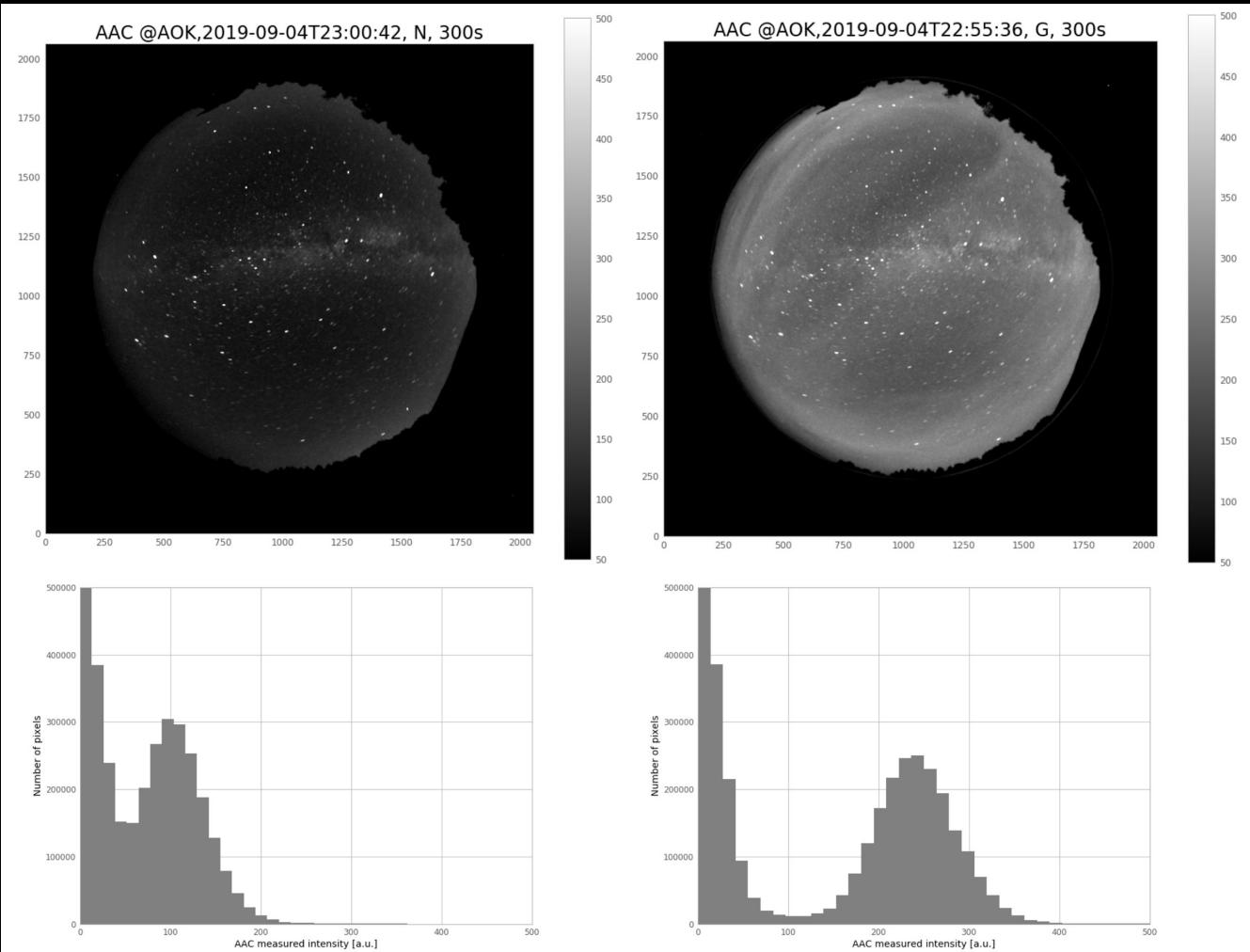
# Spectral ranges of AMON All-sky Camera (AAC)

Typical spectrum of visible night sky emission at Mauna Kea (Paul Hickson and Alan Stockton)

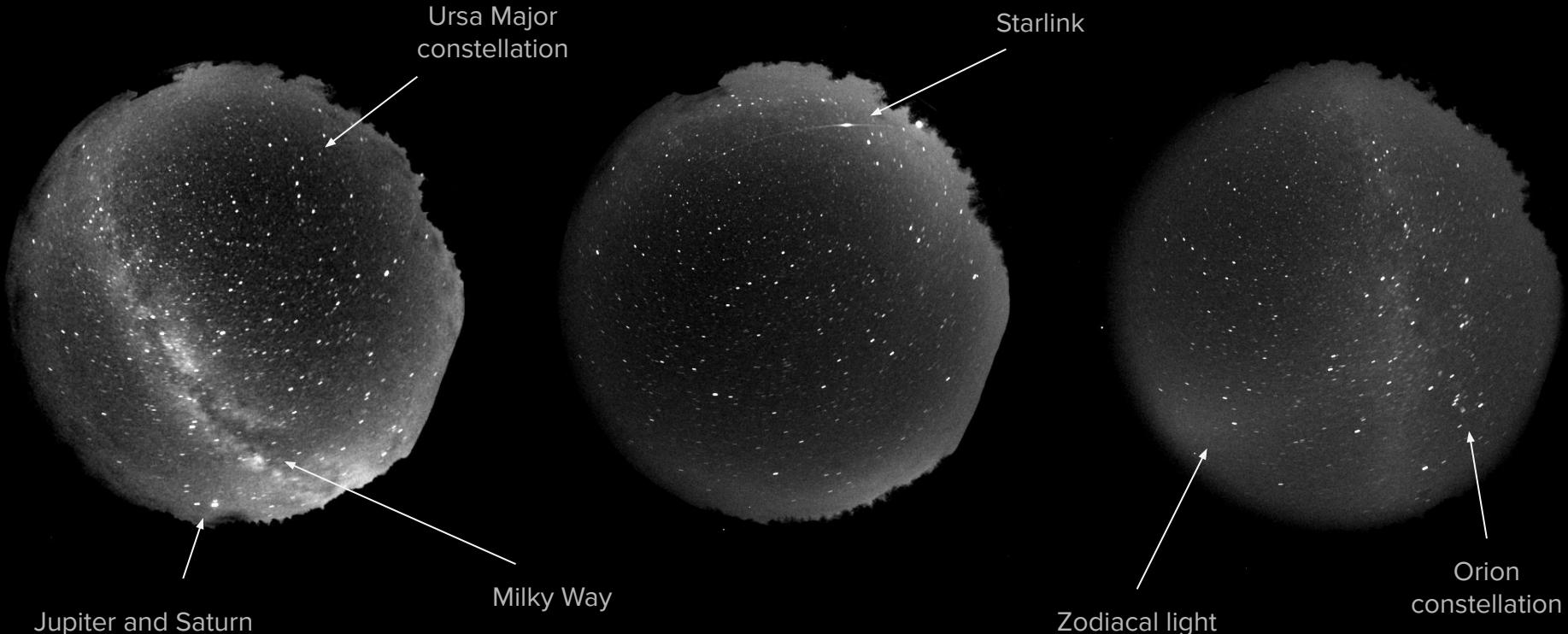


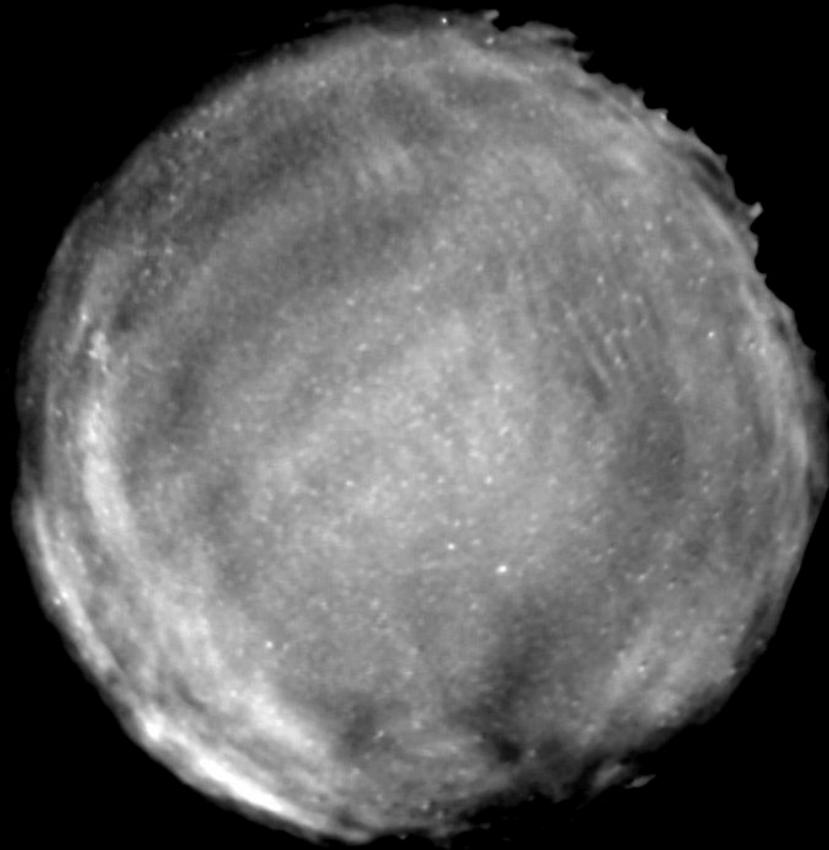
# AMON-ES - Airglow All-sky Camera (AAC)





# Astronomical objects without airglow (N filter)



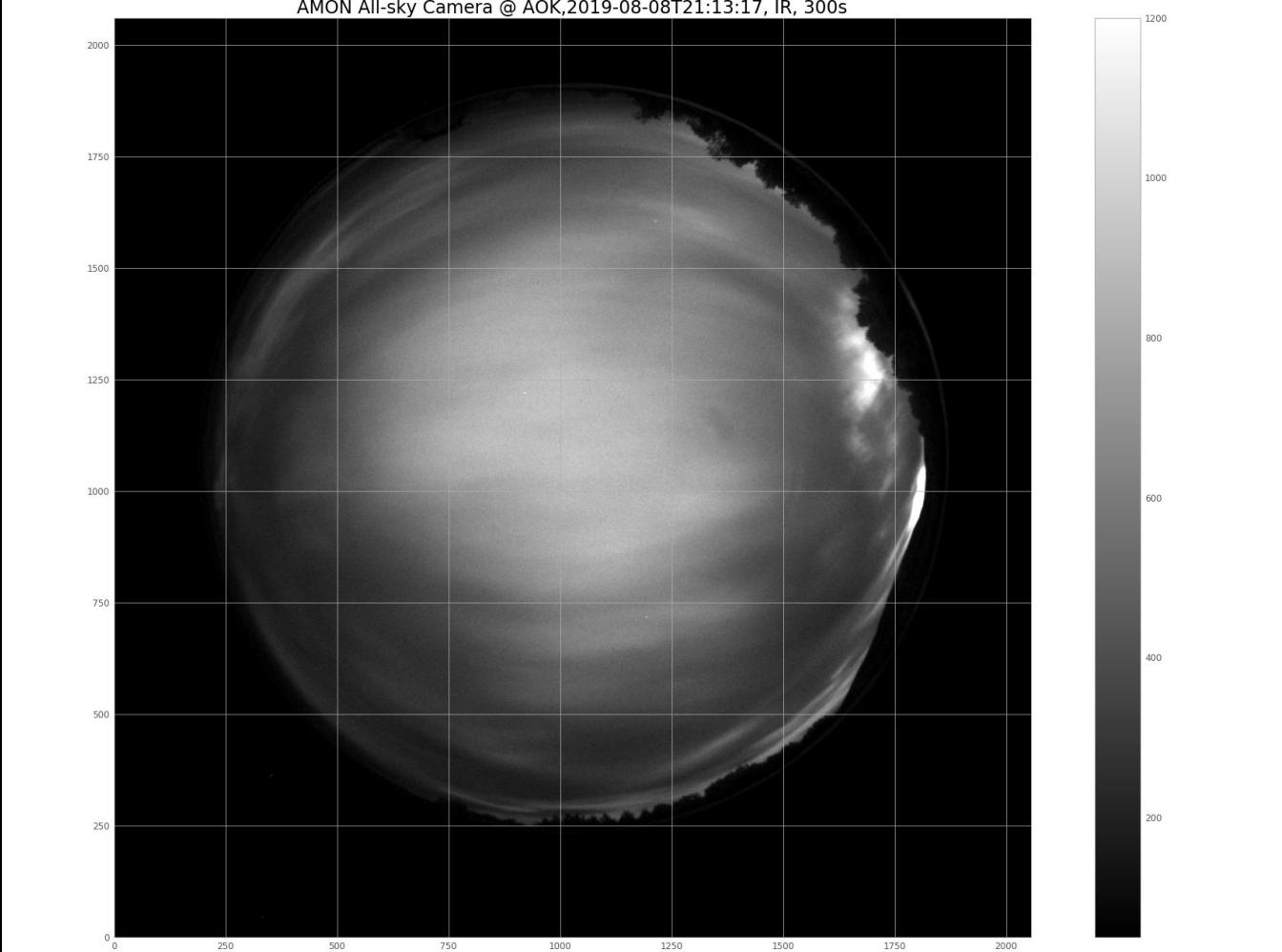


IR airglow variation within 4 hours on 21 - 22 may 2020

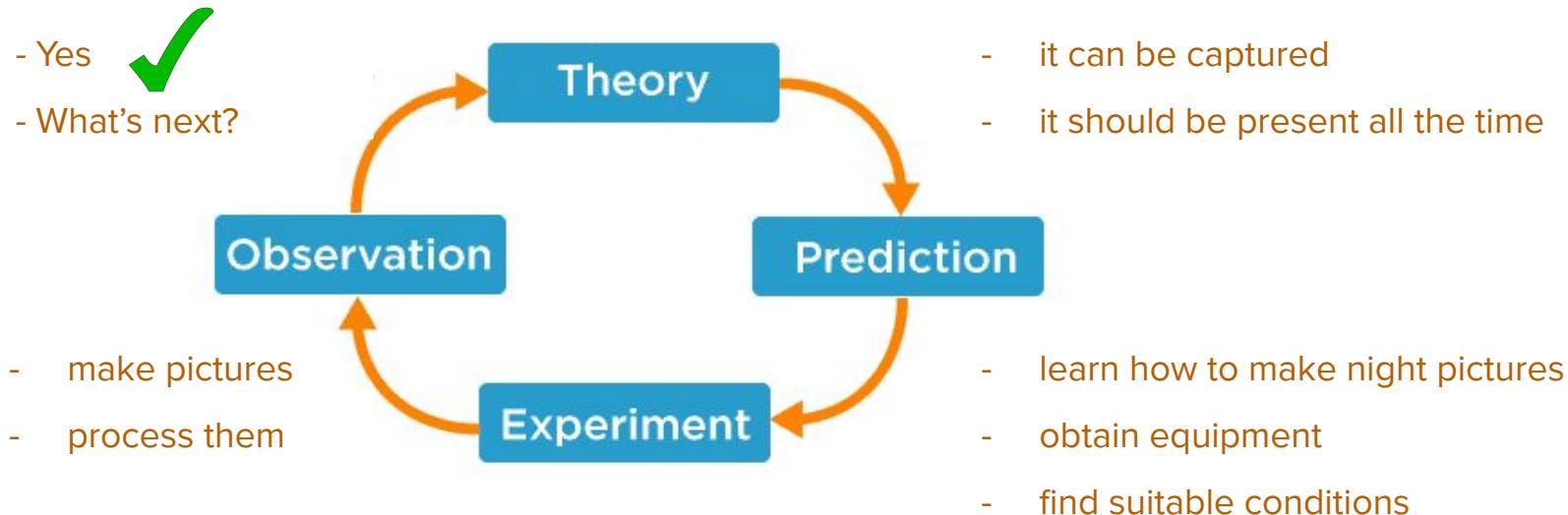


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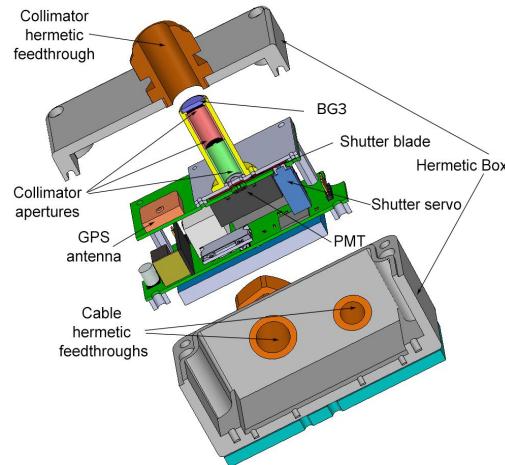
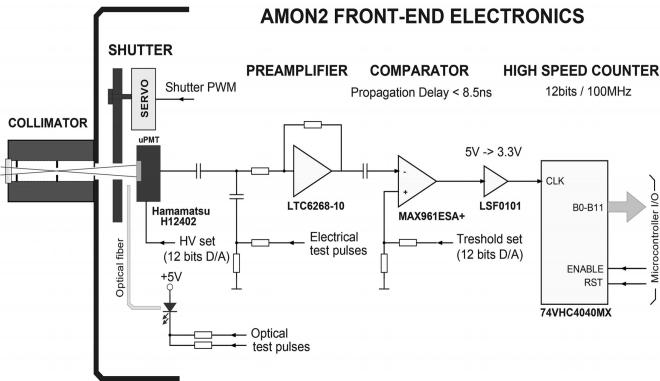
AMON All-sky Camera @ AOK, 2019-08-08T21:13:17, IR, 300s



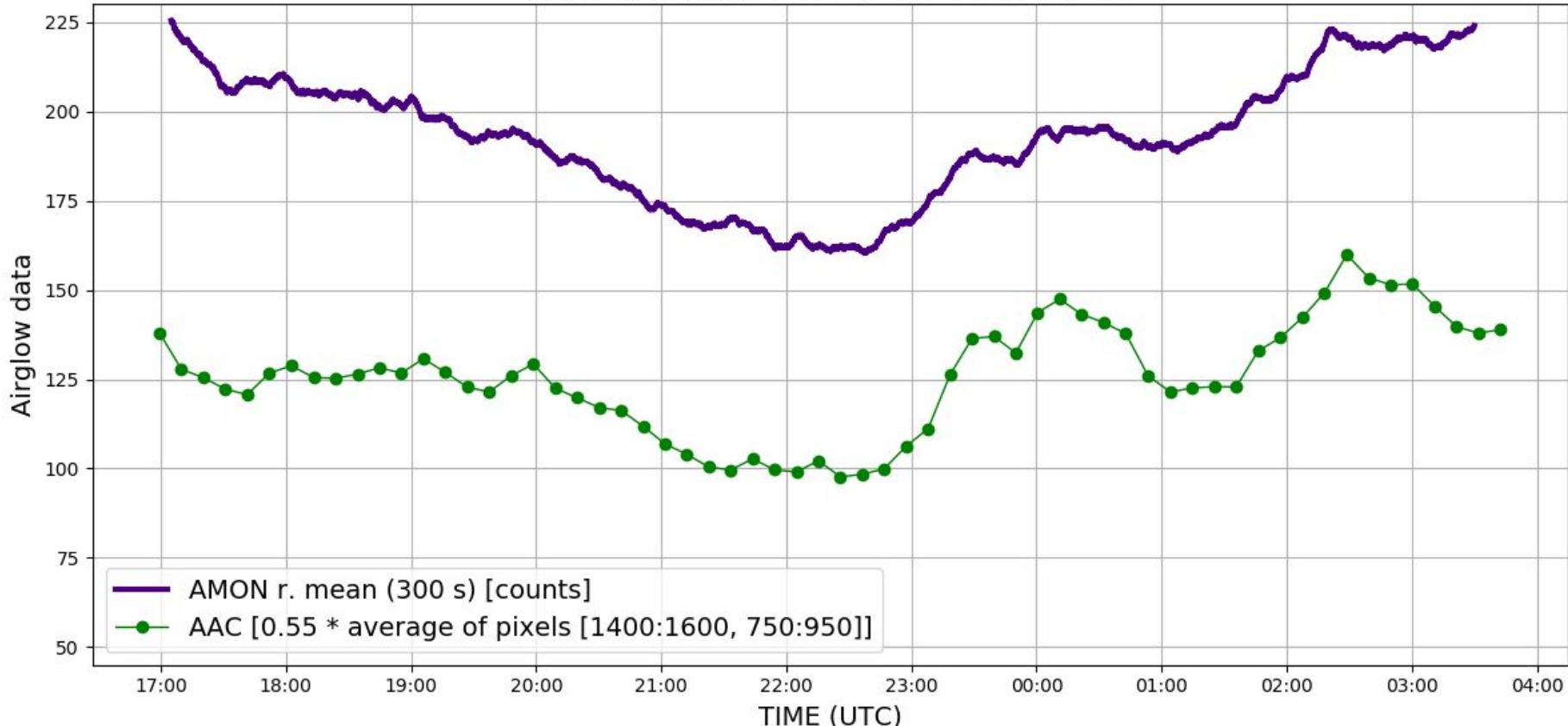
# Could I observe the airglow dynamics?



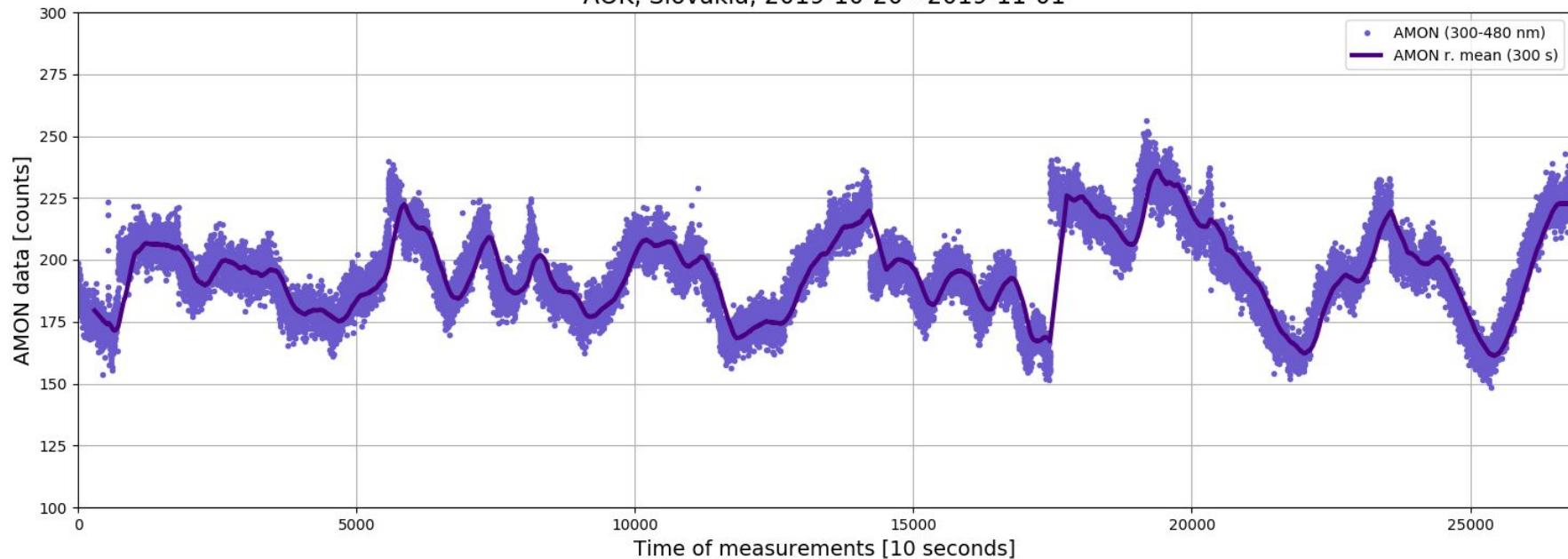
# AMON - Airglow MONitor



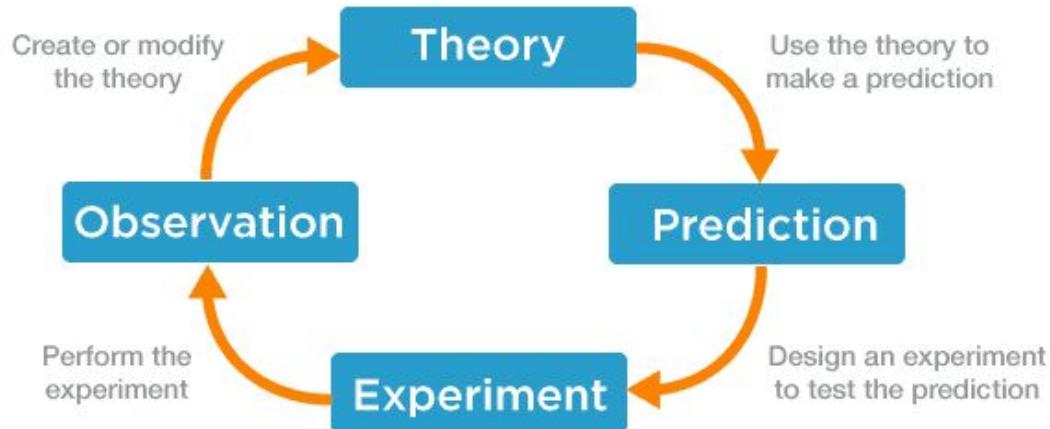
# AOK, Slovakia, 2019-10-30 - 2019-10-31



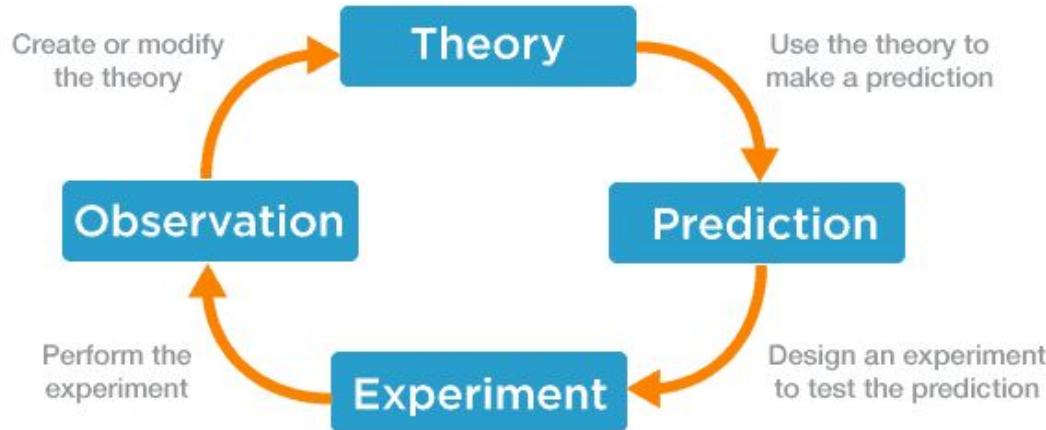
AOK, Slovakia, 2019-10-20 - 2019-11-01



???



# What is source of the airglow dynamics?



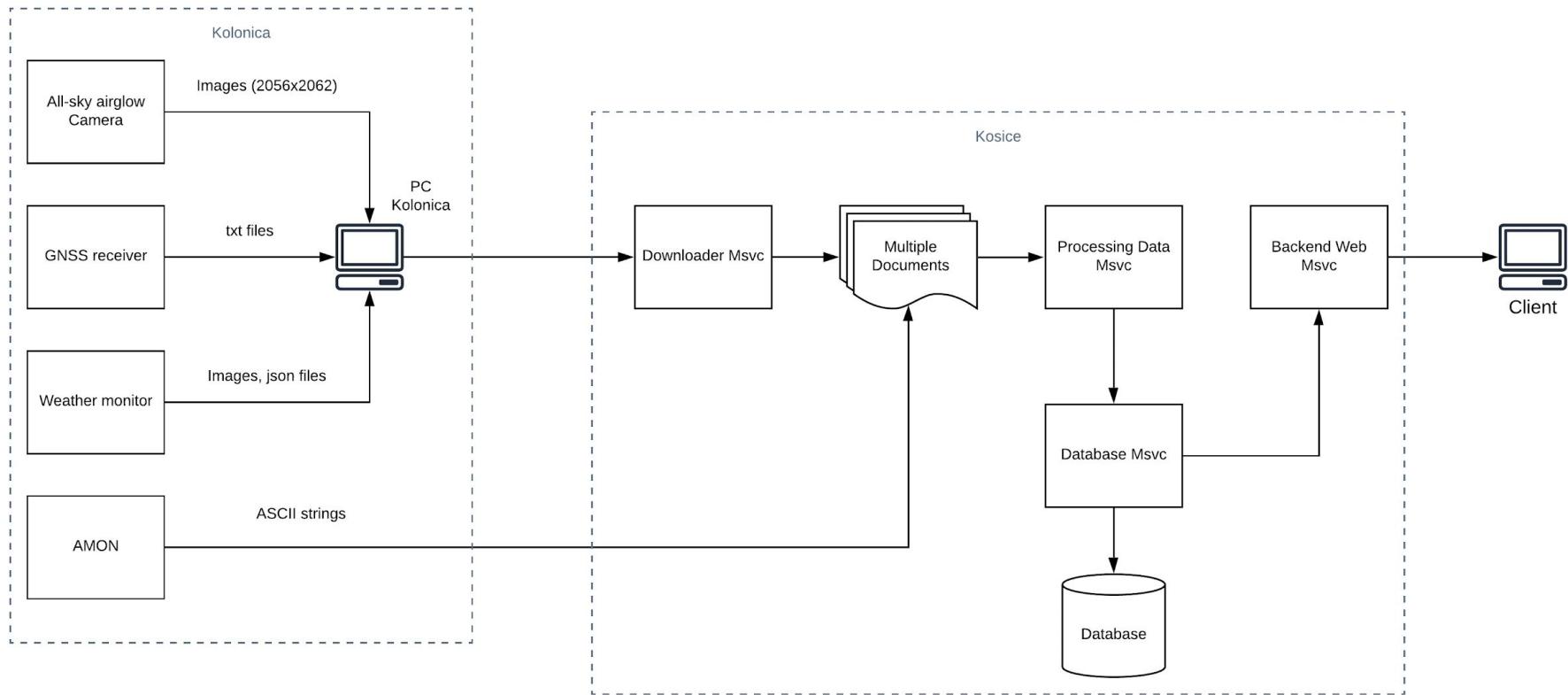


# Why we need virtual observatory?

- More effective usage of:
  - location
  - expenses
  - staff
- Automatic data acquisition needs to be followed by automatic data processing and presentation



# AMON-ES VO proposed architecture



# Conclusions

- Domain selection is key
- Airglow science interconnects Slovak and ESA interests
- We can not continue without VO



# Disclaimer

*The AMON-net project is supported by the government of Slovakia through an ESA contract under the PECS (Plan for European Cooperating States).*



*ESA disclaimer: The view expressed herein can in no way be taken to reflect the official opinion of the European Space Agency.*