

Observations in IDSPark Hortobágy National Park

The observations were made during the night 03/04 July 2019. The weather conditions were not very good as high clouds came up already in the evening. These will reflect the light even of distant and therefore will not result in optimal sky conditions.

End of nautical twilight was at 22:10, of astronomical twilight at 23:34, true midnight at 0:39 CEST.

Observations were made in the Vadaspark (animal park) which is closed at night and not open to the public. During day it is accessible only with National Park buses from the visitor's center in the village Hortobágy. Vadaspark lies within the boundaries of the National Park, but outside of the actual boundaries of the Dark Sky Park.

The first impression was, that on some buildings in the zoo unshielded fixtures were installed disturbed the night vision considerably:



Left: A barn with unshielded light



Right: light from the windows of the central building



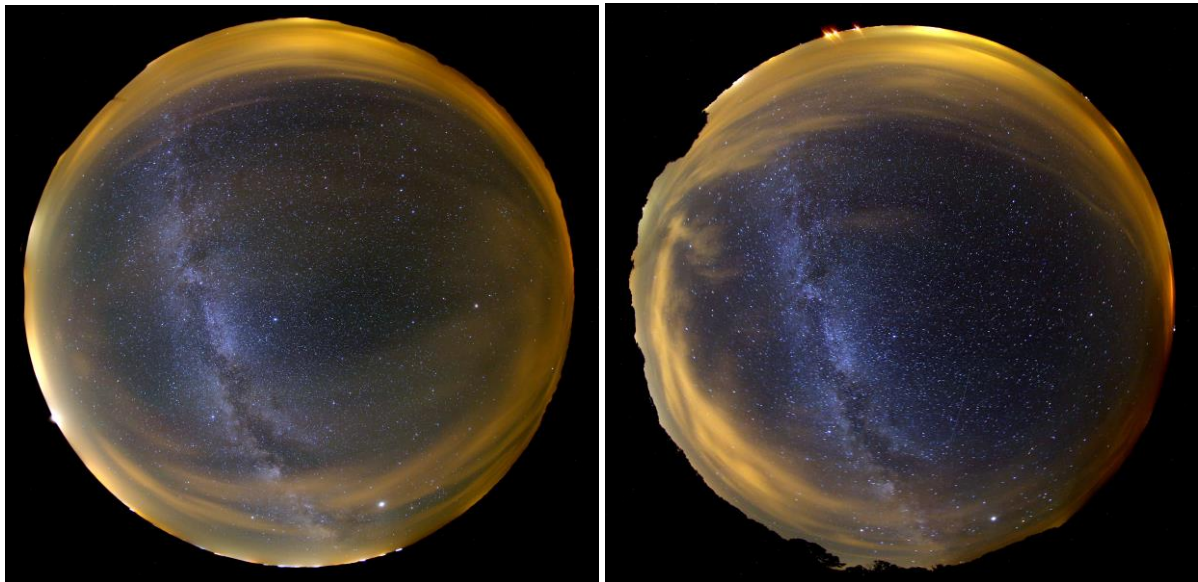
Outside lighting on the central building: left before and right after the manual switch-off

The outdoor lighting at the Fecskeház Erdei Iskola (environmental center) is full cut-off, but appears very bright at night. The question is, if this lighting is necessary at all and if it could be reduced in brightness considerably.



The observations in Vadaspark were made at two places from where vision towards the east and west was unobstructed; using the advantage of the “Pusztá” plain that it offers free views toward the horizon.

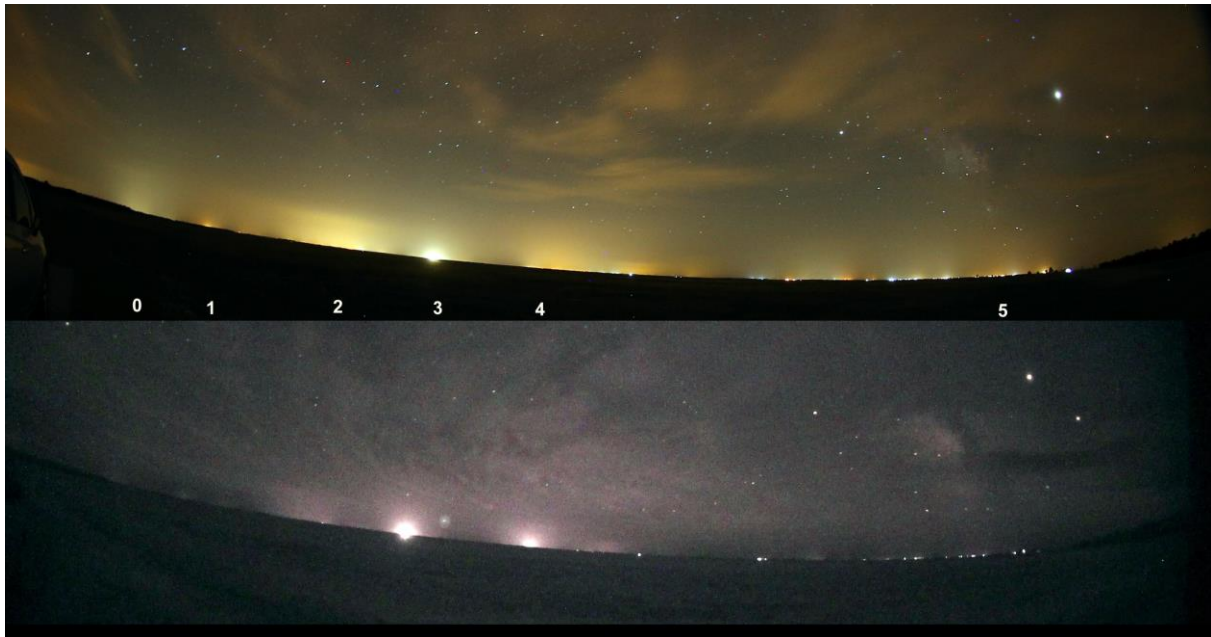
The photos were taken with a Canon 6D with Sigma 8 mm/3.5 fisheye and with a modified Canon 700D with Sigma 4.5 mm/2.8 fisheye for the near infrared (nir, 700 – 900 nm) spectral range.



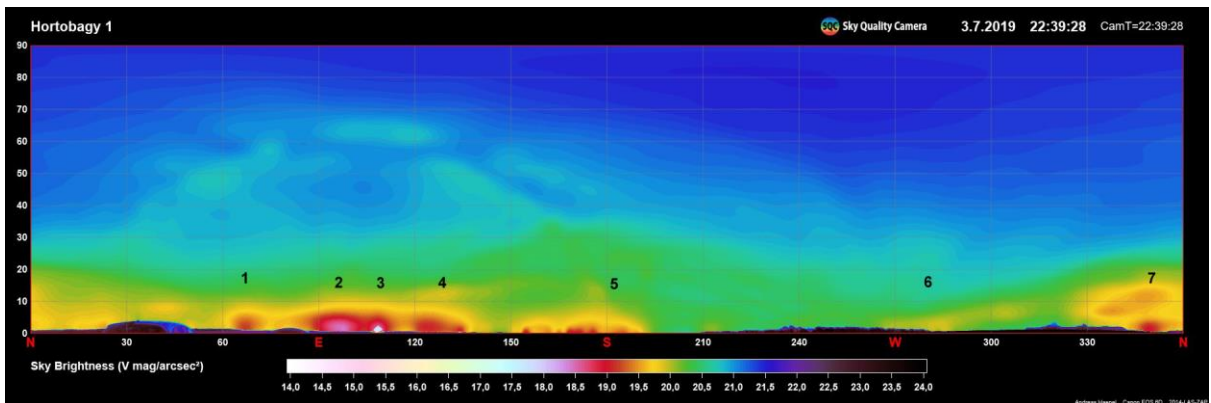
At the first position the horizon towards the West was obscured by forest and at the second position the forest was towards the South and East. In both pictures N is to the top, S to the bottom, W to the right and E to the left.

The fisheye images were evaluated with the software Sky Quality Camera which gives the luminance values of the sky brightness and a correlated color temperature.

In the following picture the camera with the fisheye lens was turned towards the East, top visual, below the nir image.



Horizon picture with calibrated sky brightness and identification of some bright light sources



The marked places with characteristic values:

#	places	color	cct	nir	distance	inhabitants
0	Nyíregyháza	white	med.	no	61	120000
1	Balmazújváros, Hajdúböszörmény	orange	blue	faint	15/30	17400/32000
2	Debrecen	orange	red	faint	36	208000
3	gas storage facility	white	blue	bright	18	
4	Hajdúszoboszló	orange	red	bright	23	24000
5	Püspökladány	red		faint	27	15000
6	Budapest				155	1 600 000
7	Hortobágy, Tiszaújváros, Miskolc				1.5/40/66	

The dominant light source towards the East is #3, a gas storage station at a distance of 18 km.

The second more diffuse light dome is #2 from Debrecen (208 000 inh., 36 km) with relative low nir emission indicating that the city uses already many LED lamps with low nir emission.

The light dome #4 of Hajdúszoboszló (24 000 inhab., 23 km) shows a very bright nir emission, which seems to be due to many sodium high pressure lamps.

Several individual bright white sources towards the South cannot be identified with villages. Perhaps they could be attributed to lights (bright LED floodlights?) of large animal farms North of Nádudvar. This must be checked on place.

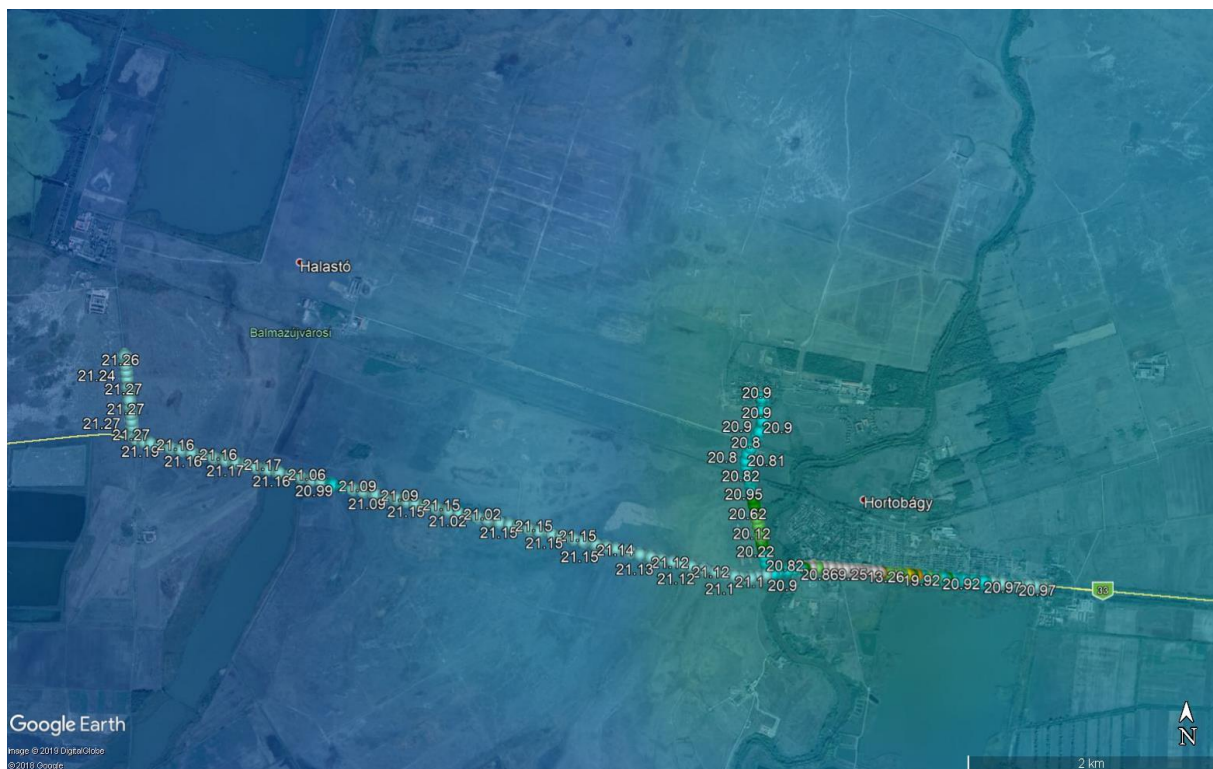
The light dome #6 of Budapest was better visible from the second observing place towards the West (Budapest, 1 600 000 inh., 155 km).

To the North are the combined light domes #7 of Hortobágy (1500 inh., 1.5 km), the industrial complex of Tiszaújváros/Tiszaújváros (16 500 inh., 40 km), which seems to be the main light source, and Miskolc (160 000 inh., 66 km).

Due to the increase of cloudiness sky brightness measurements have only limited value. At the two observing places the sky brightness in the night was 21.3 mag/arcsec² (SQM-L #2536), mainly influenced by the Milky Way and the clouds.

Continuous measurements (simultaneously with an SQM-LU 2436 and GPS positions from a smartphone with the Android application SQMDroid) were taken along the road 33 as there are few trees and nearly unobstructed views towards the sky were possible. However due to the clouds the sky brightness is relatively high.

The measurements are overlaid to the sky brightness atlas of Falchi et al. (2016). While on the road the brightness is constant at about 21.2-21.3 mag/arcsec², it becomes much brighter towards and inside the village Hortobágy.



Conclusion:

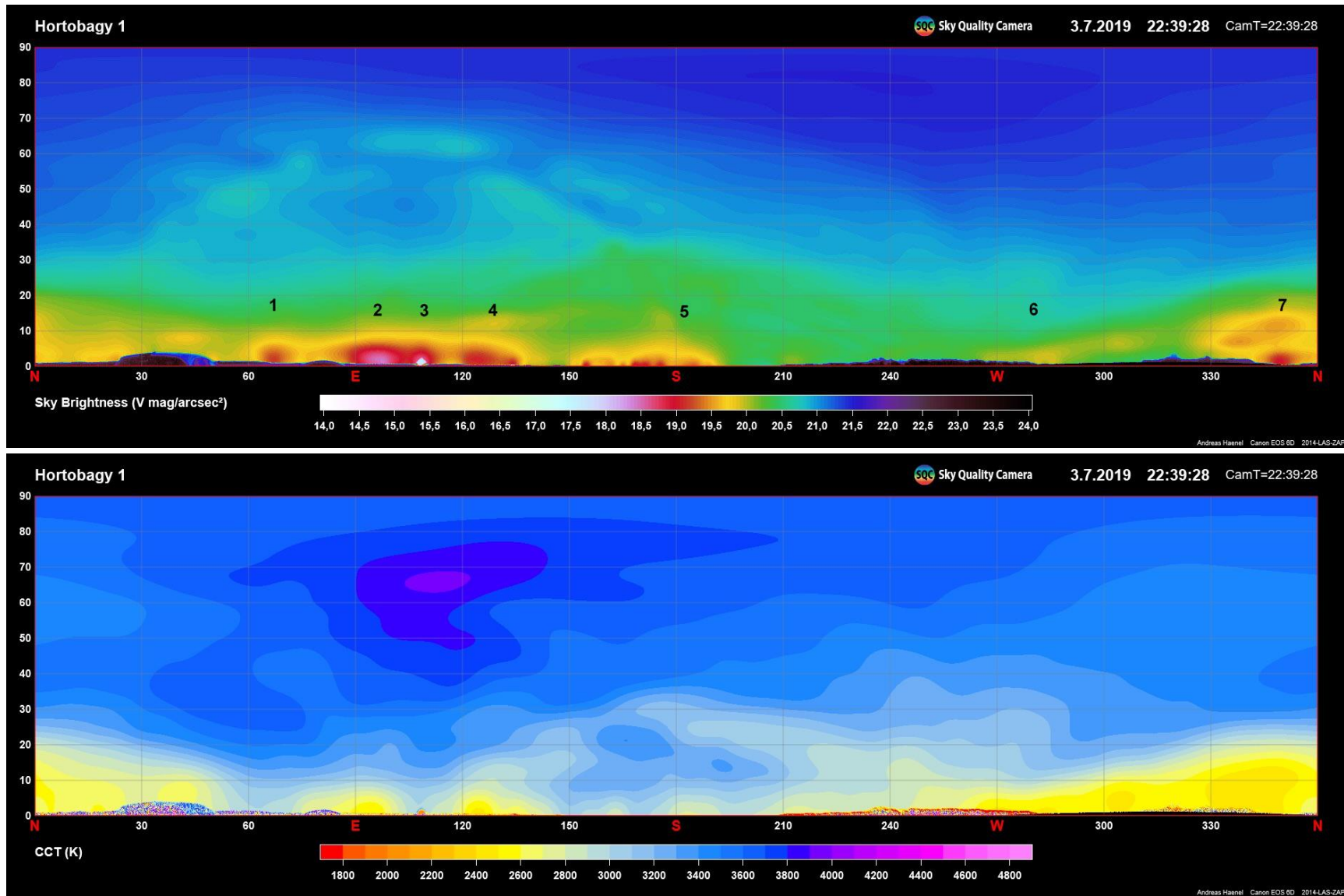
- The IDSPark should be extended to the whole Hortobágy National Park
- As can be seen from the sky brightness atlas of Falchi et al. (2016), the sky brightness does not change too much over the park outside the villages. This seems to be confirmed by the SQMDroid measurements. More measurements over a larger area during clear nights would be desirable.
- Light sources on buildings especially at National Park owned buildings (like in the animal park) should be full cut-off and reduced or switched-off during night.
- At the periphery of the National Park there seem to be agricultural farms with bright (LED?) floodlights shining into the Park. They appear mostly white and do not contribute much to the light domes. As these seem to be mainly badly oriented, they should be adjusted. But this needs to be checked.
- The brightest source is the gas storing station North of Hajdúszoboszló. The lights should be shielded and the intensity reduced. This should not contradict to security guidelines for the working places.
- The light domes of the villages and cities are mainly yellow, due to the use mainly of sodium high pressure lamps. It should be tried to find arrangements with the closer villages to reduce their light emission.

Thanks

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Sky brightness and correlated color temperature at the first observing place



Sky brightness and correlated color temperature at the second observing place

