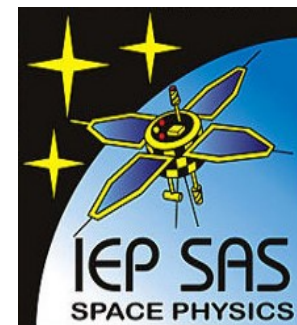


Progress of UV background analysis from EUSO-Balloon data

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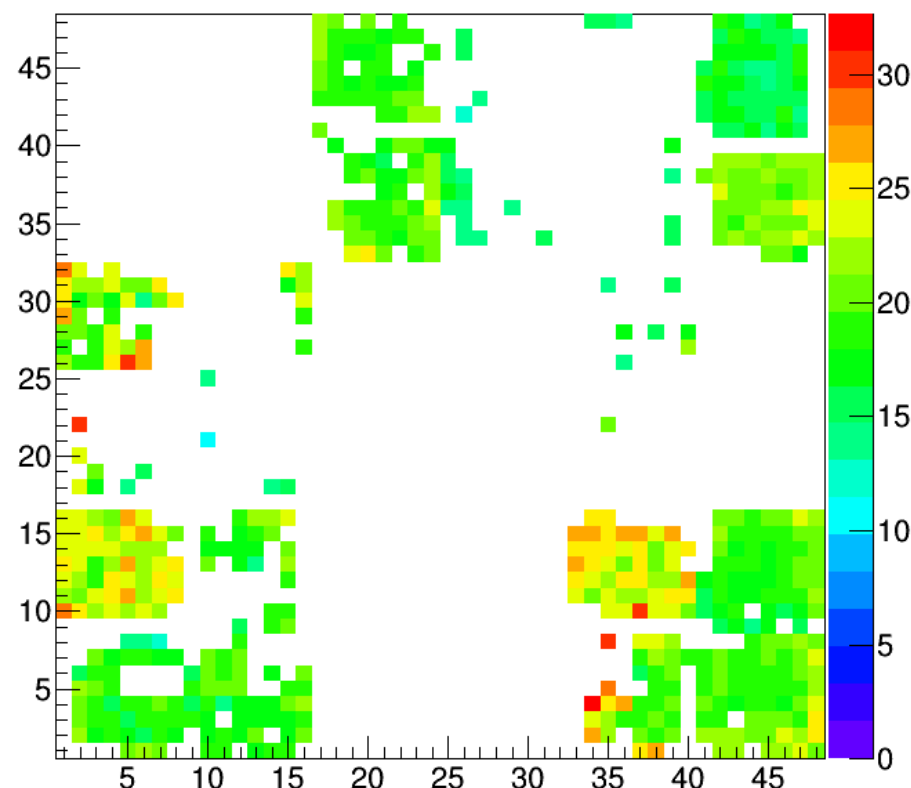
Intensity of PDM data

- CPU-TRIGGER data: "normal" acquisition mode
- Values of PDM pixels averaged per 128 GTUs

Conversion of intensity units:

- Good pixels with their efficiency suggested by Camille Morreto
- $QE = 0.2$ (for this calculation)
- Efficiency of the optics: $OE = 0.24$
- Number of PDM pixels: $N_p = 2304$
- Acceptance: $A = 144/3282.81 \text{ m}^2 \text{ sr}$
- Exposure time: $t = 1 \text{ GTU} = 2500 \text{ ns}$

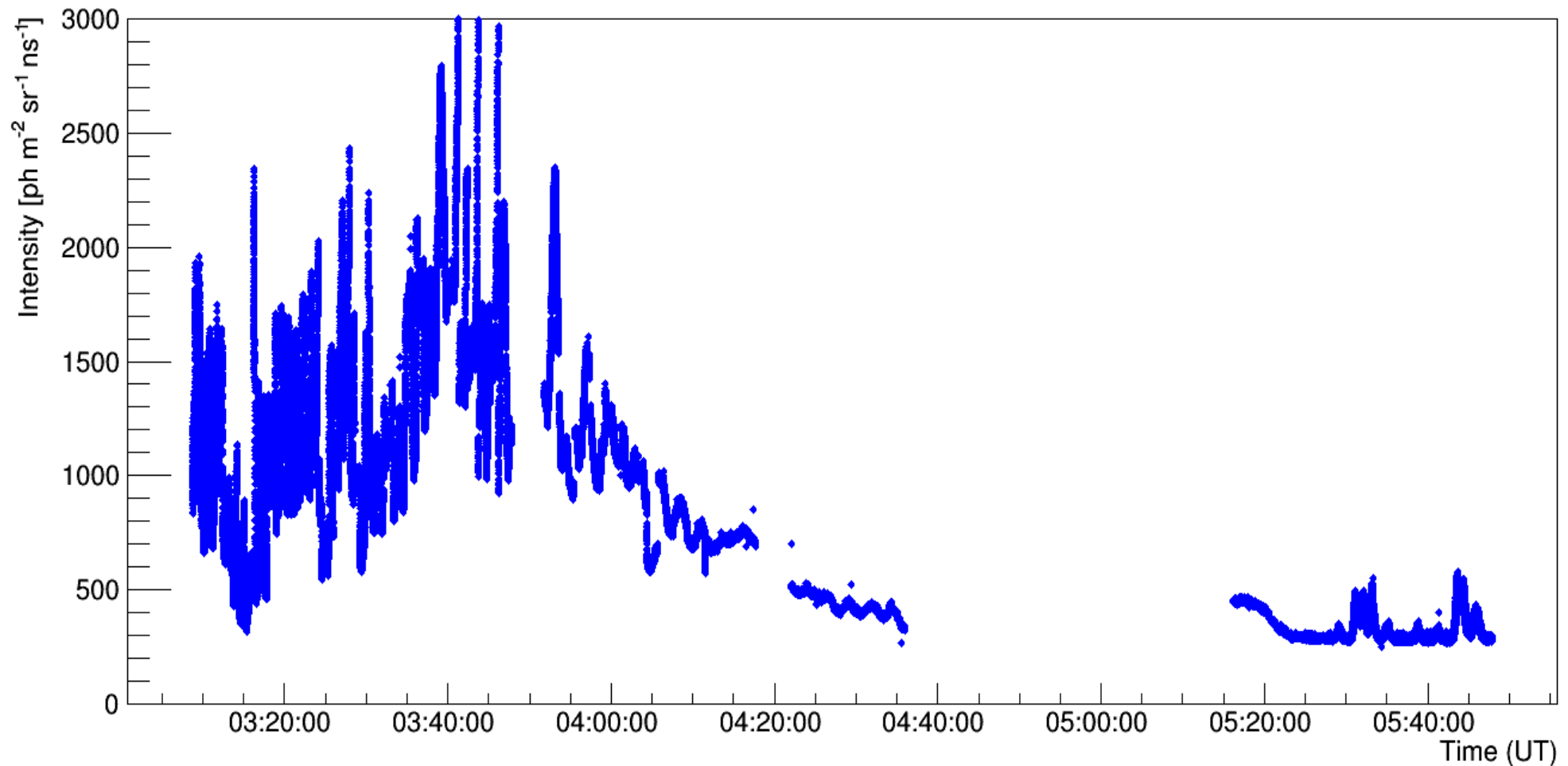
Good pixels with efficiency (DAC 250, gain 64)



$$1 [pe \text{ px}^{-1} \text{ GTU}^{-1}] * \left(\frac{N_p}{QE OE A t} \right) = 437.64 [ph \text{ m}^{-2} \text{ sr}^{-1} \text{ ns}^{-1}]$$

Averaged UV intensity

EUSO-Balloon measurements

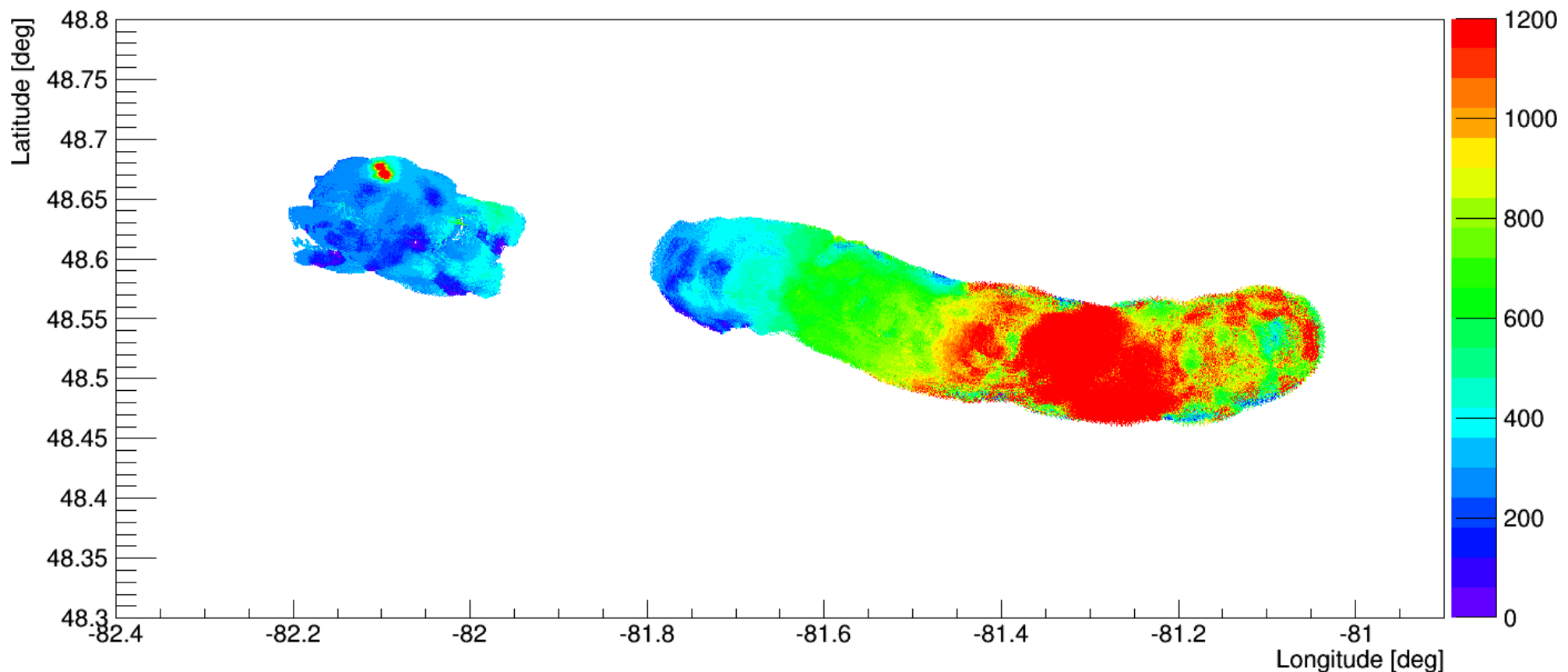


- Understanding of each observation for current time, position and weather situation is desired for UV background analysis

PDM UV map

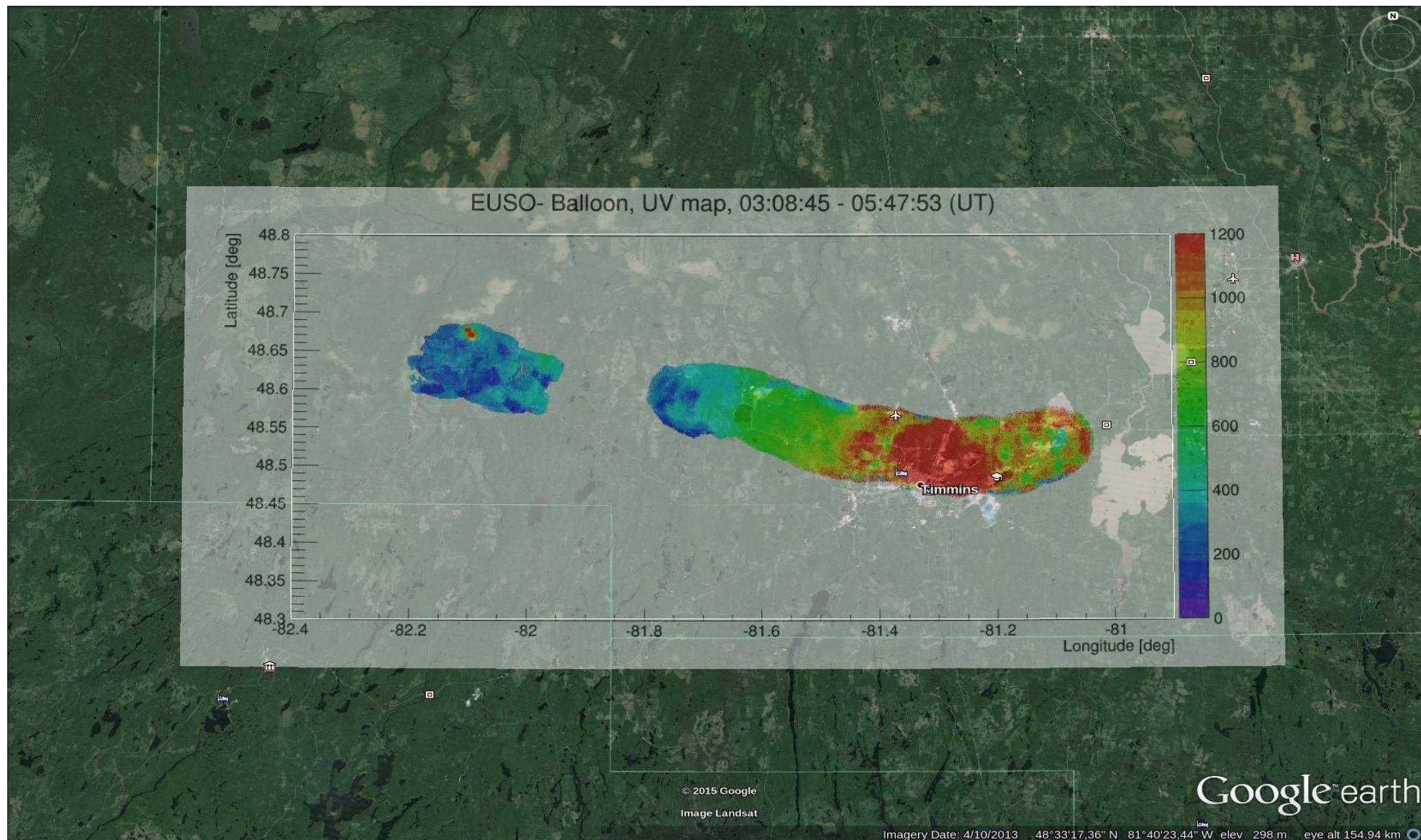
- Calculation of ground position of each PDM pixel for each time were performed (height, position, azimuth as function of time were needed)
- Measured intensity of each pixel was associated with its position

EUSO- Balloon, UV map, 03:08:45 - 05:47:53 (UT)



PDM UV map

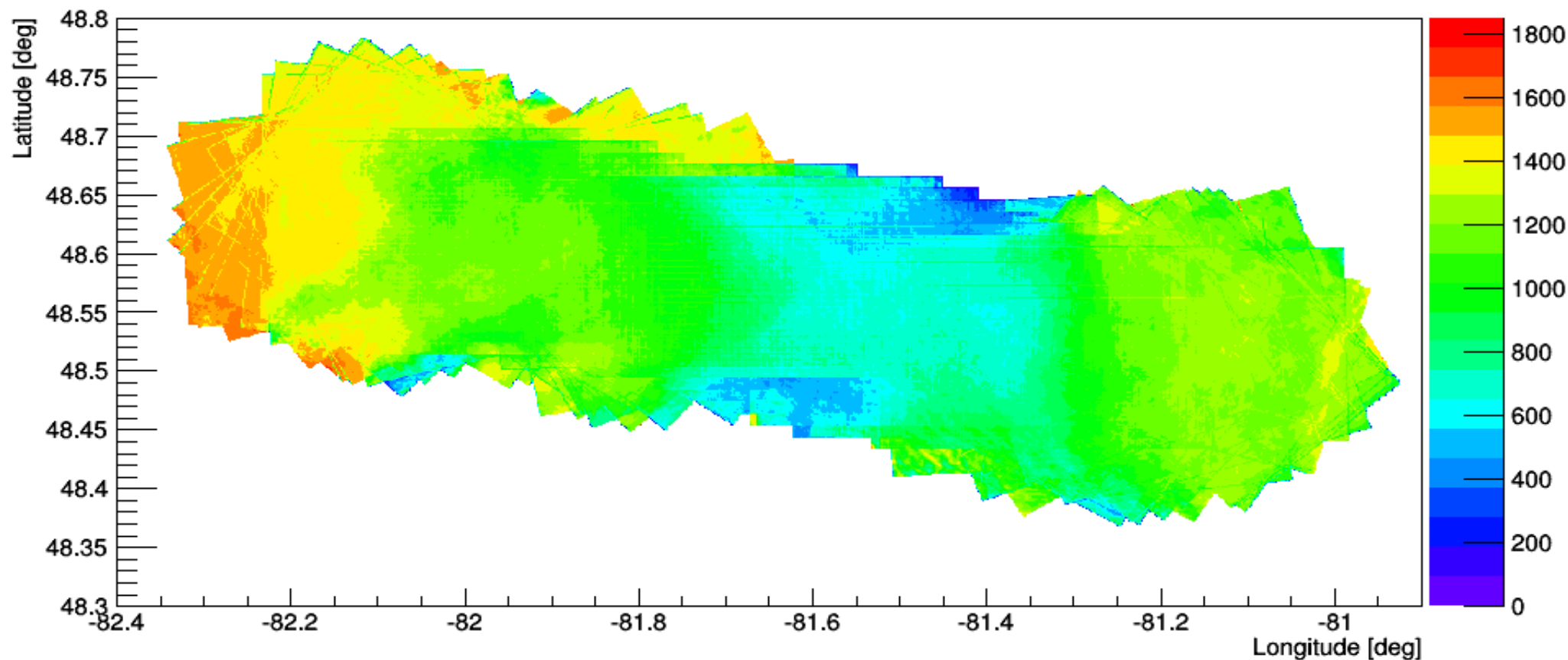
- UV map match geographical map just for time 05:16 – 05:48 (UT)
- Update of azimuth is required to match also data over Timmins



IR map

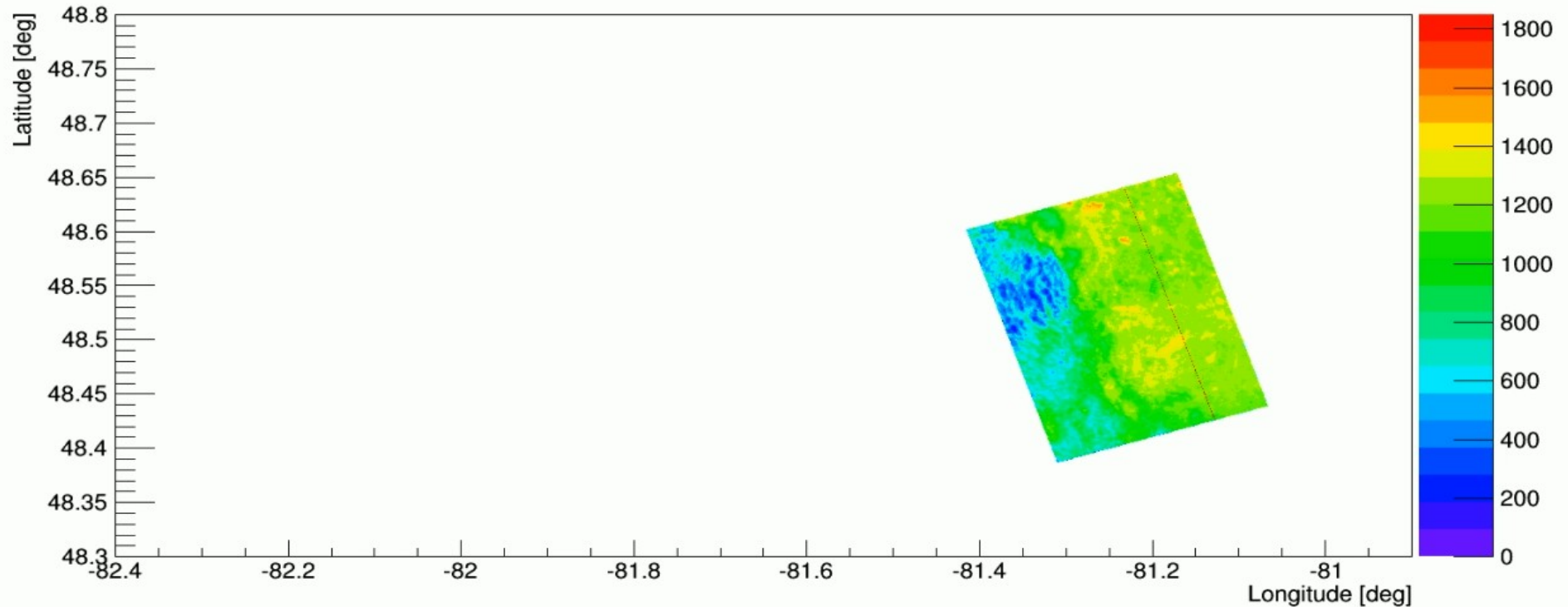
- Calculation of ground position of each IR camera pixel for each time were also performed
- Scale is in number of counts
- Not so clear overlapping - clouds were moving

EUSO- Balloon, IR map, 03:12:58 - 05:46:51 (UT)



Video: Observations of IR camera

EUSO- Balloon, IR map, 03:33:03 (UT)

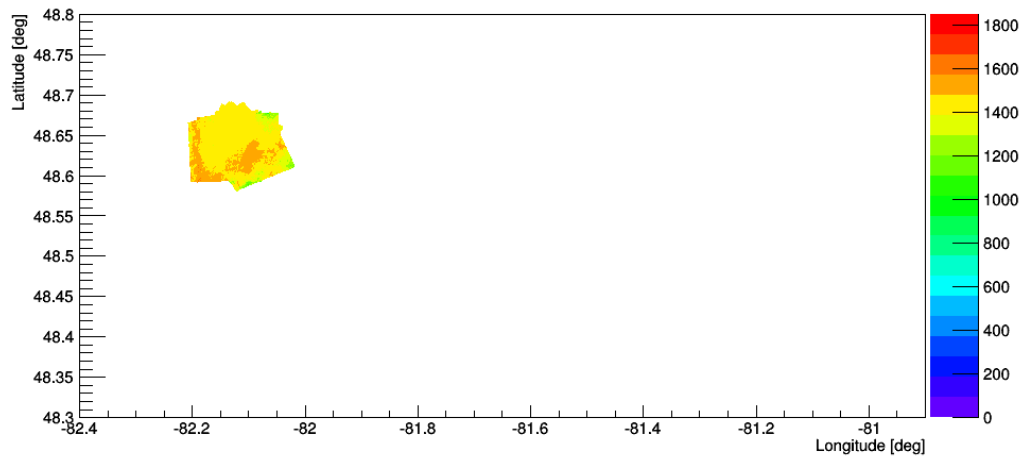


- Clouds (green and blue) are moving!
- Only frames with good azimuth are displayed

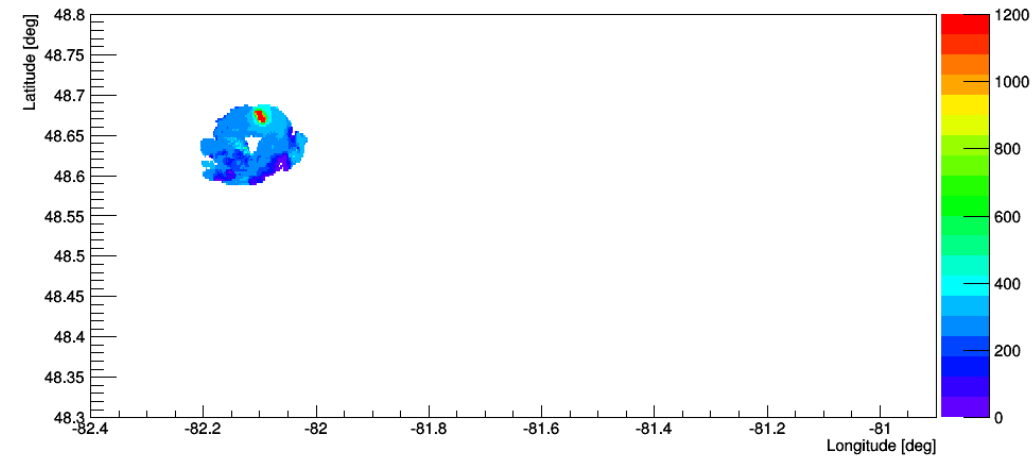
Region without clouds

- Region and time without clouds were selected and investigated

EUSO- Balloon, IR map, 05:30:47 - 05:46:51 (UT), FoV of PDM

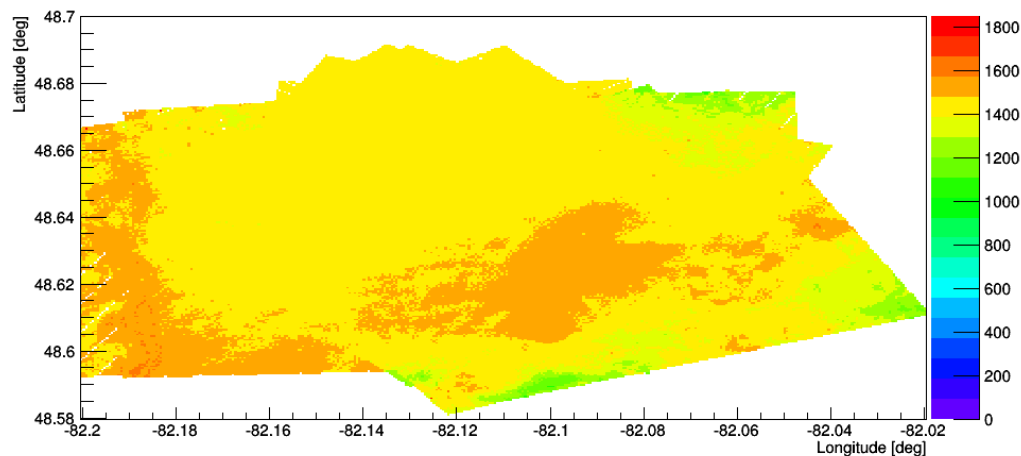


EUSO- Balloon, UV BG map, 05:29:49 - 05:47:53 (UT)

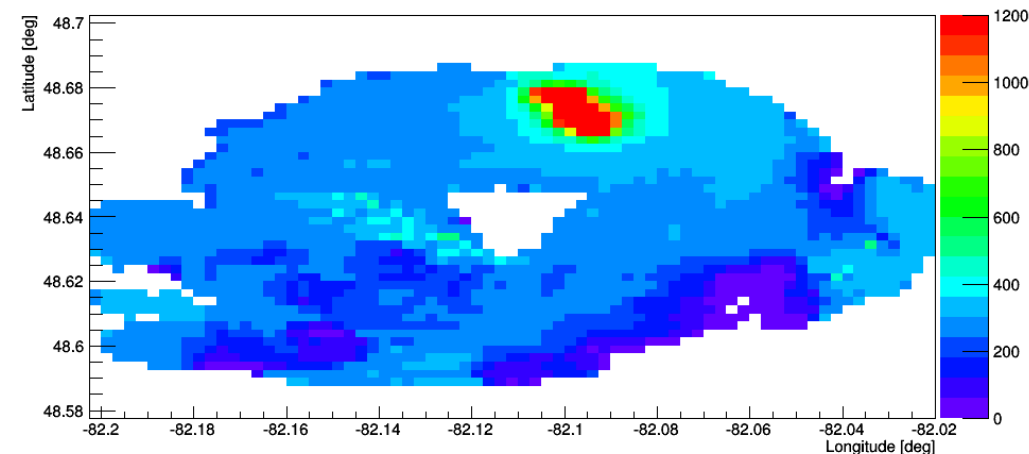


ZOOM IN

EUSO- Balloon, IR map, 05:30:47 - 05:46:51 (UT), FoV of PDM



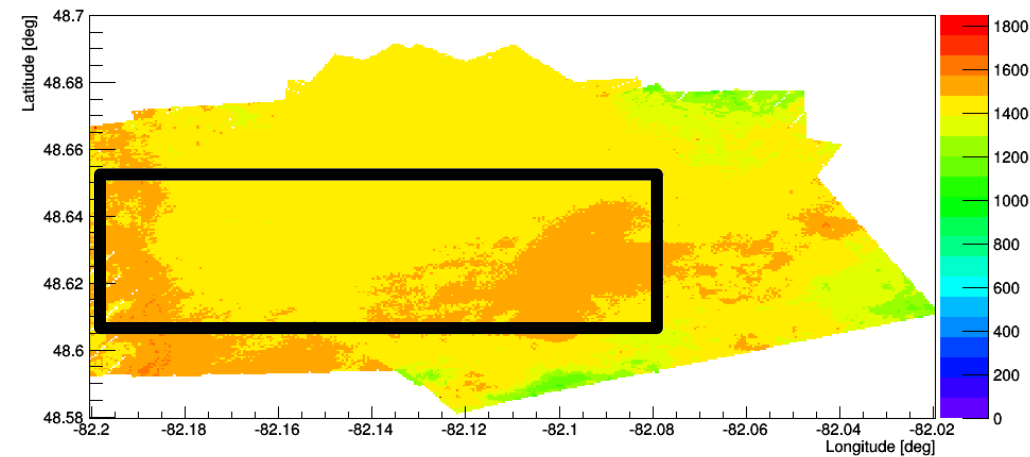
EUSO- Balloon, UV BG map, 05:29:49 - 05:47:53 (UT)



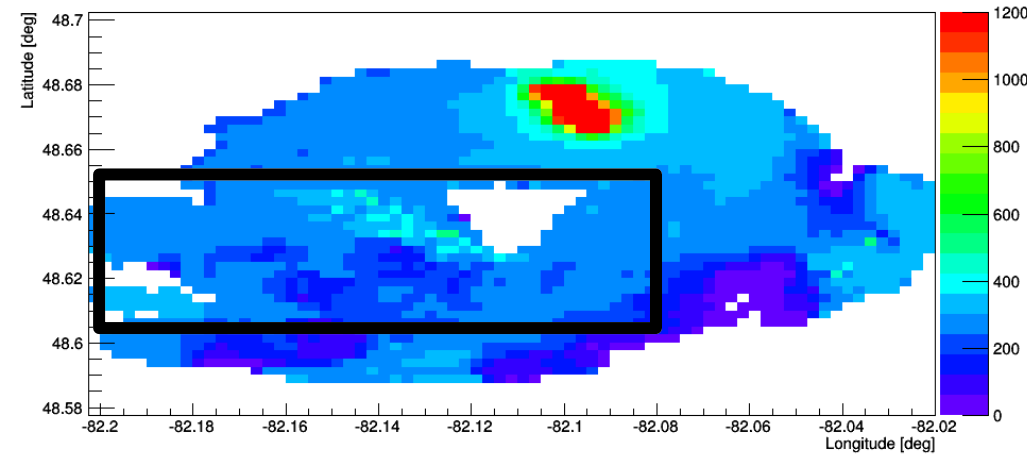
UV BG without clouds: $276 \text{ ph m}^{-2} \text{ sr}^{-1} \text{ ns}^{-1}$

- Region and time without clouds and without mine were selected
- Histograms for IR and UV were filled with values from this region only

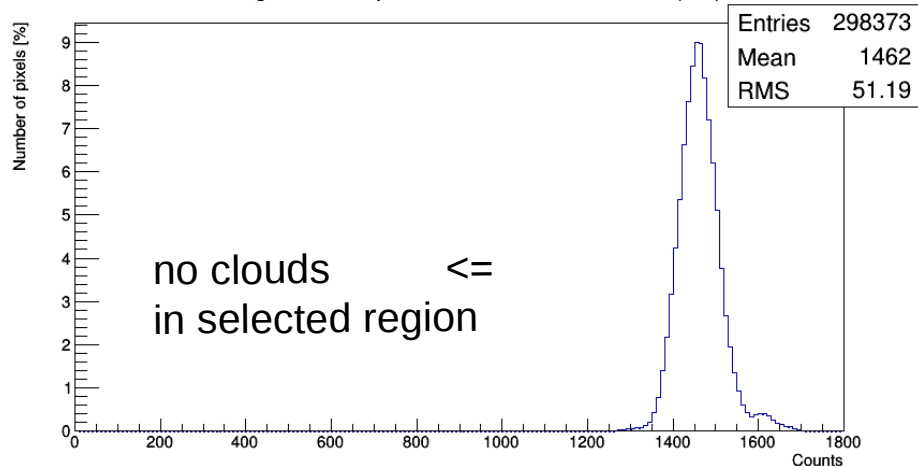
EUSO- Balloon, IR map, 05:30:47 - 05:46:51 (UT), FoV of PDM



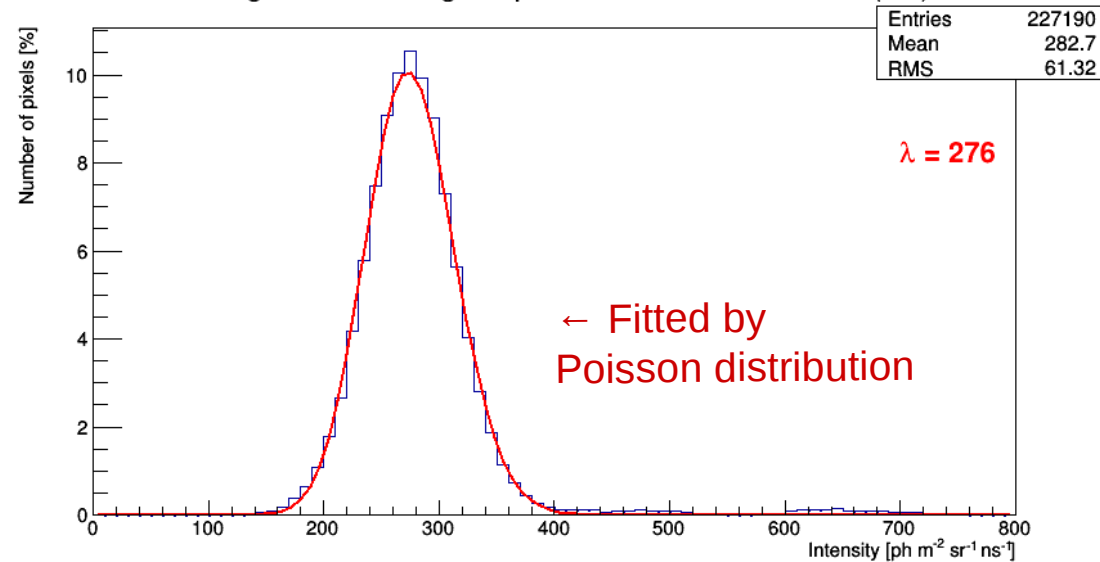
EUSO- Balloon, UV BG map, 05:29:49 - 05:47:53 (UT)



Histogram of IR pixels: 05:30:47 - 05:46:51 (UT)



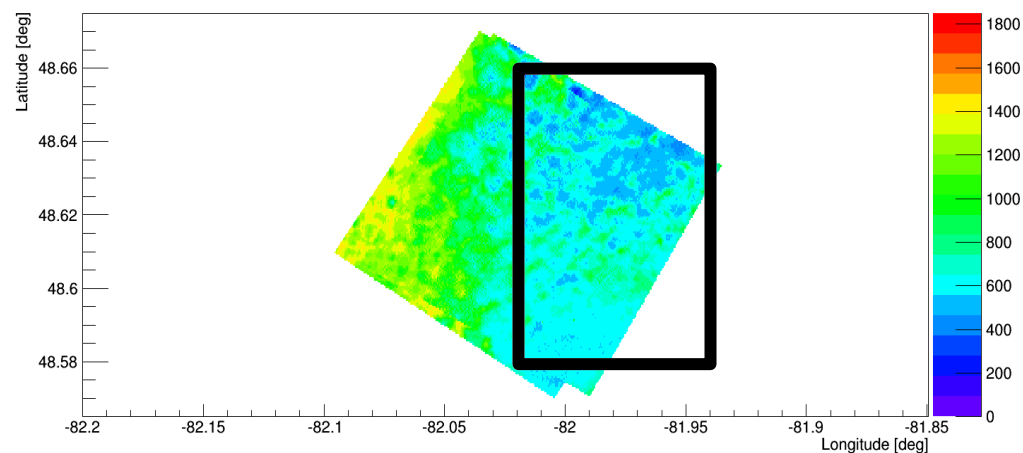
Histogram of active good pixels: 05:29:49 - 05:47:53 (UT)



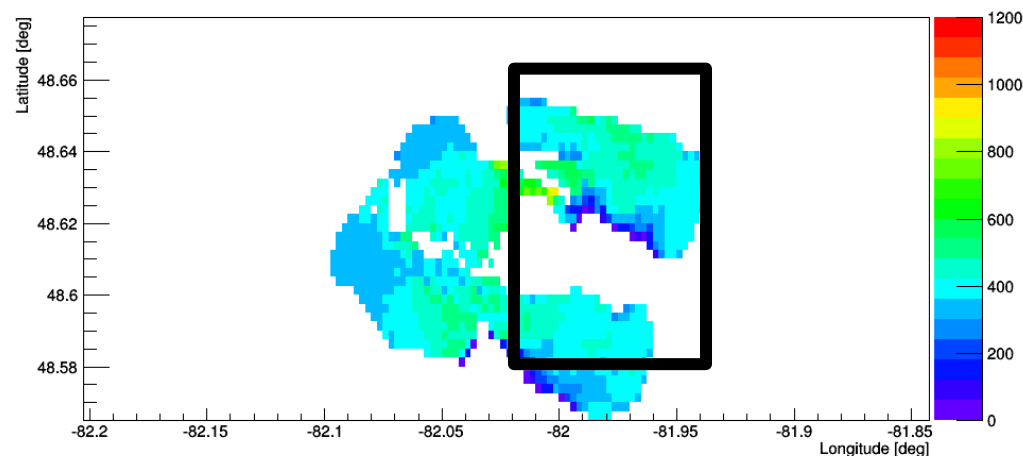
UV BG with “some” clouds: $438 \text{ ph m}^{-2} \text{ sr}^{-1} \text{ ns}^{-1}$

- Region and time with “some” clouds

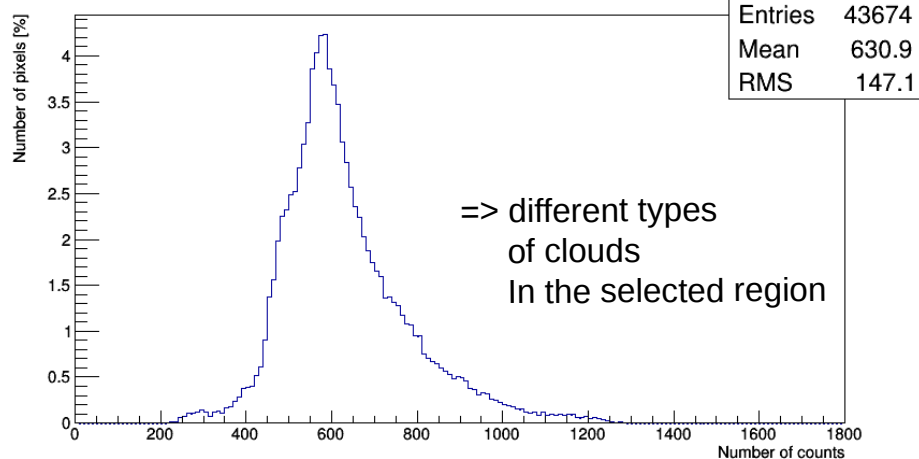
EUSO- Balloon, IR map, 05:17:25 - 05:18:45 (UT), FoV of PDM



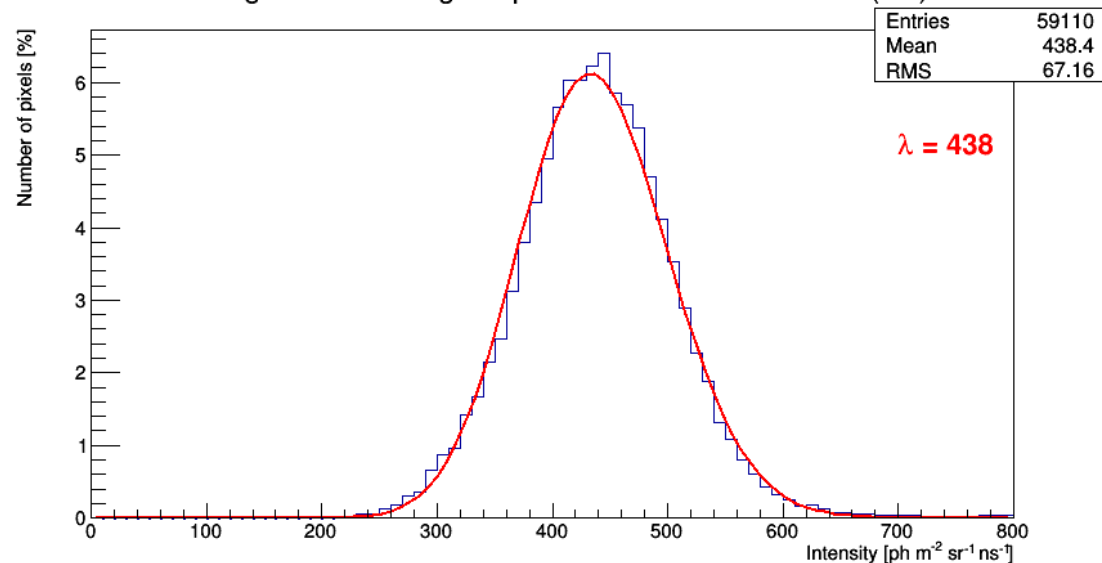
EUSO- Balloon, UV BG map, 05:16:14 - 05:19:59 (UT)



Histogram of IR pixels: 05:17:25 - 05:18:45 (UT)



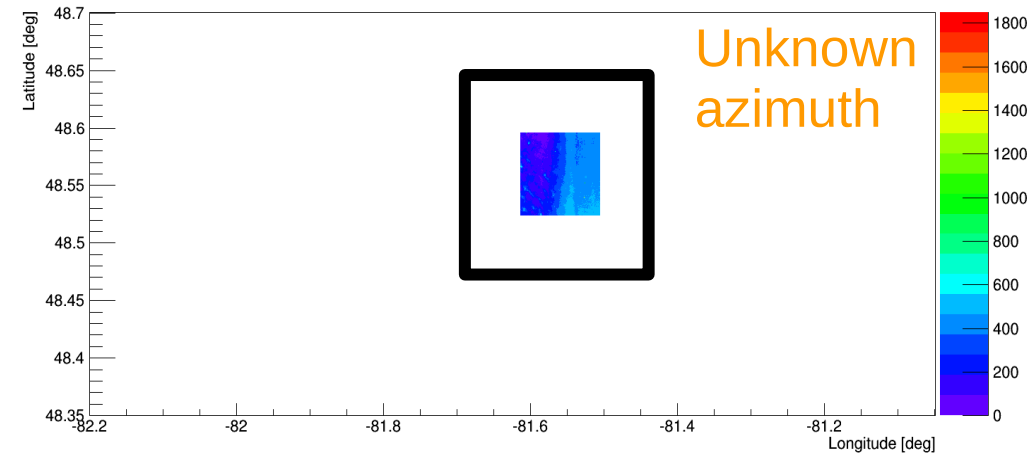
Histogram of active good pixels: 05:16:14 - 05:19:59 (UT)



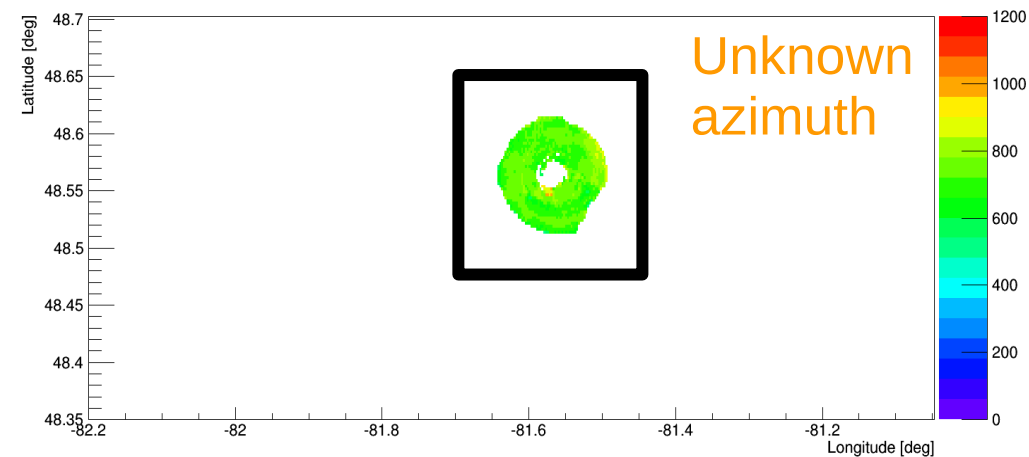
UV BG with clouds: $733 \text{ ph m}^{-2} \text{ sr}^{-1} \text{ ns}^{-1}$

- Region and time with full cloud coverage

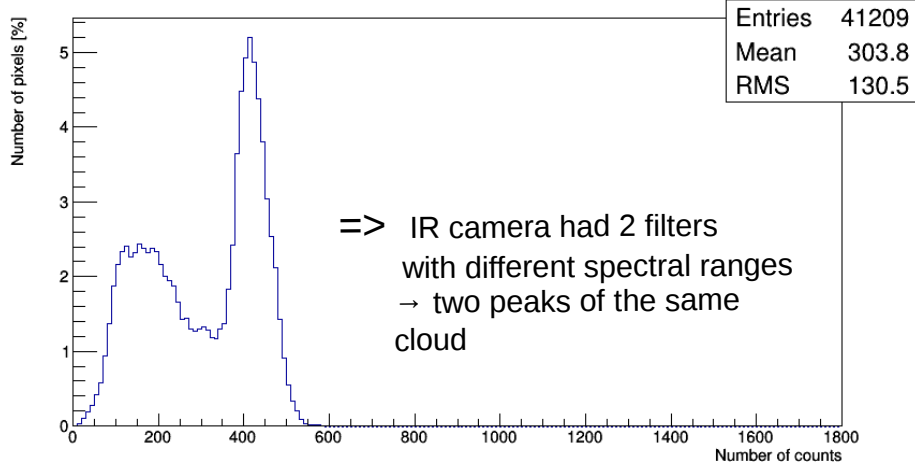
EUSO- Balloon, IR map, 04:14:32 (UT), FoV of PDM



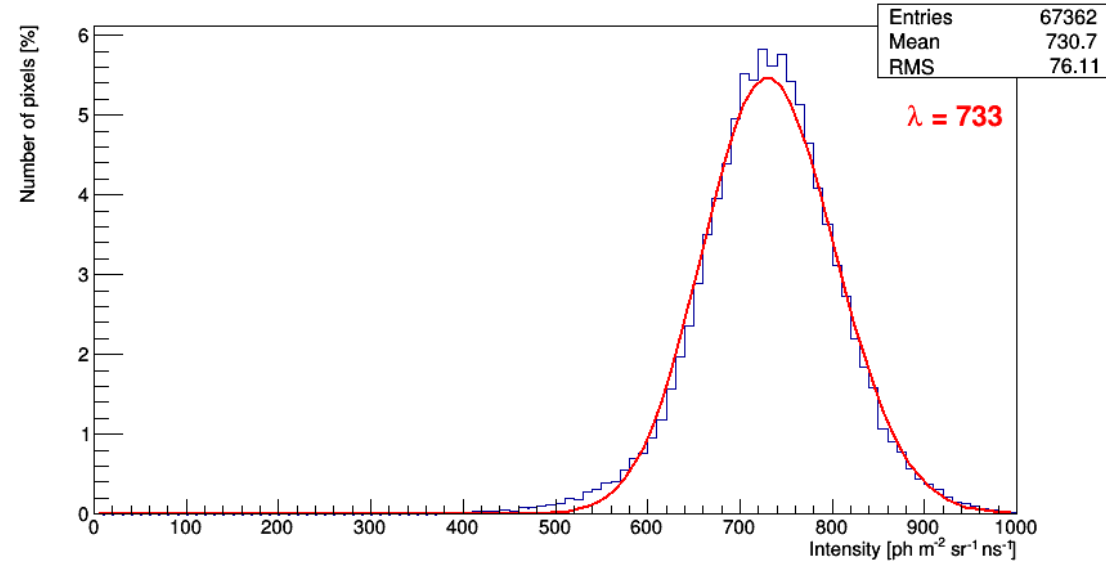
EUSO- Balloon, UV BG map, 04:13:44 - 04:15:38 (UT)



Histogram of IR pixels: 04:14:32 (UT)

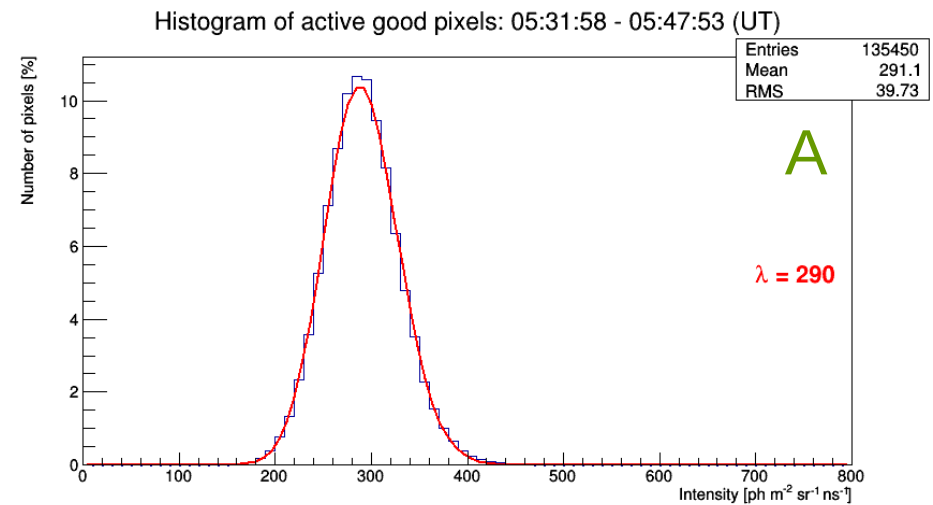
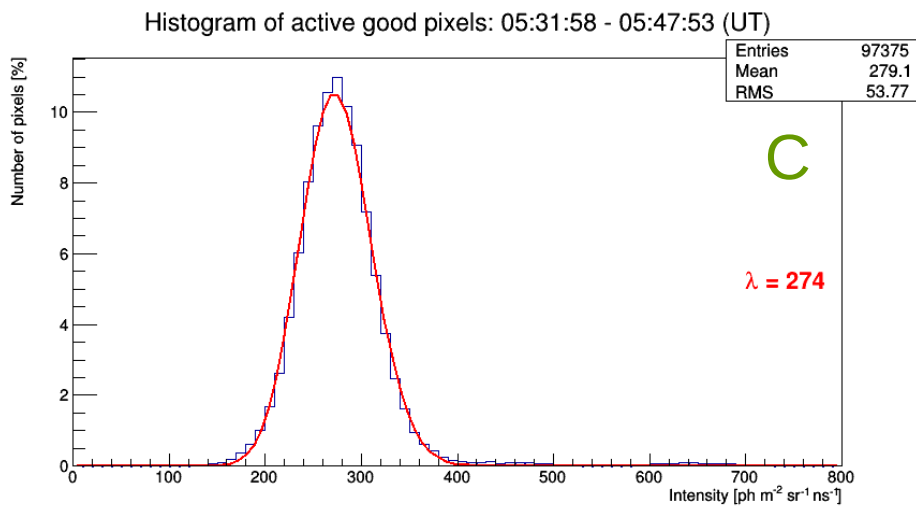
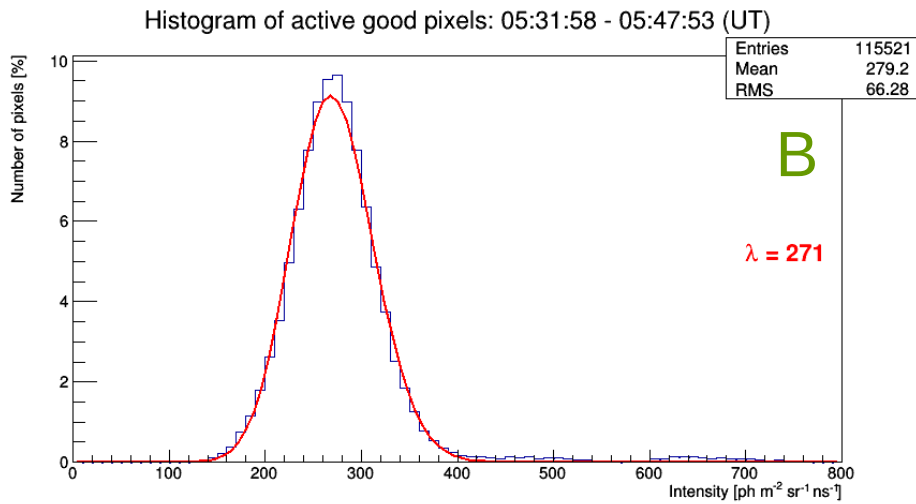
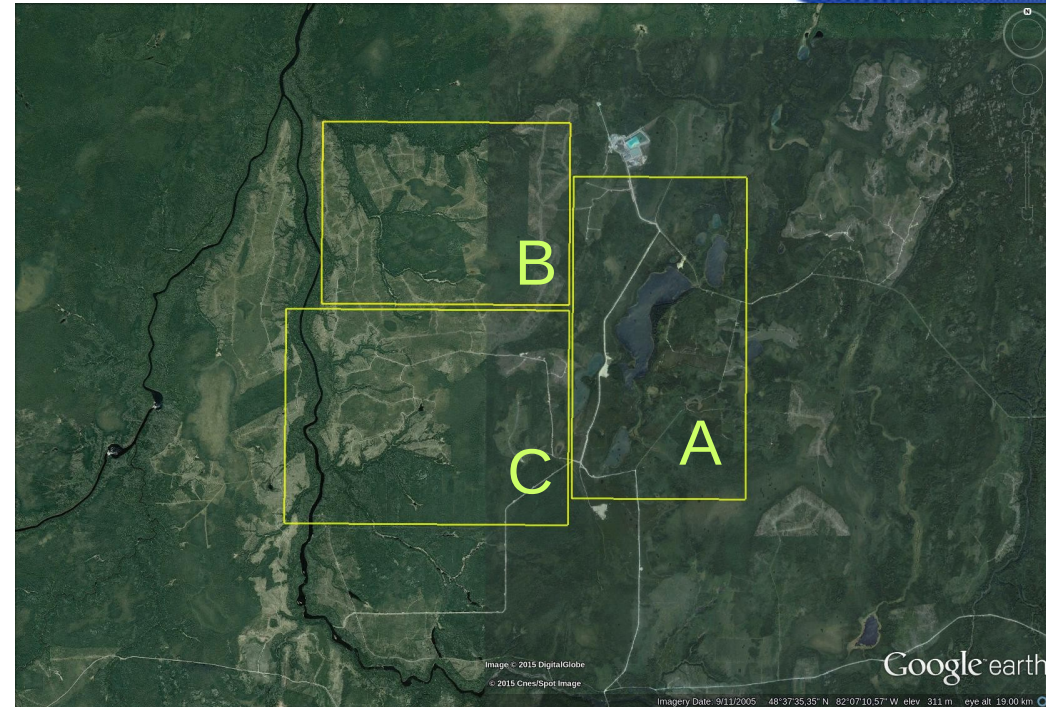


Histogram of active good pixels: 04:13:44 - 04:15:38 (UT)



UV BG of ground surface

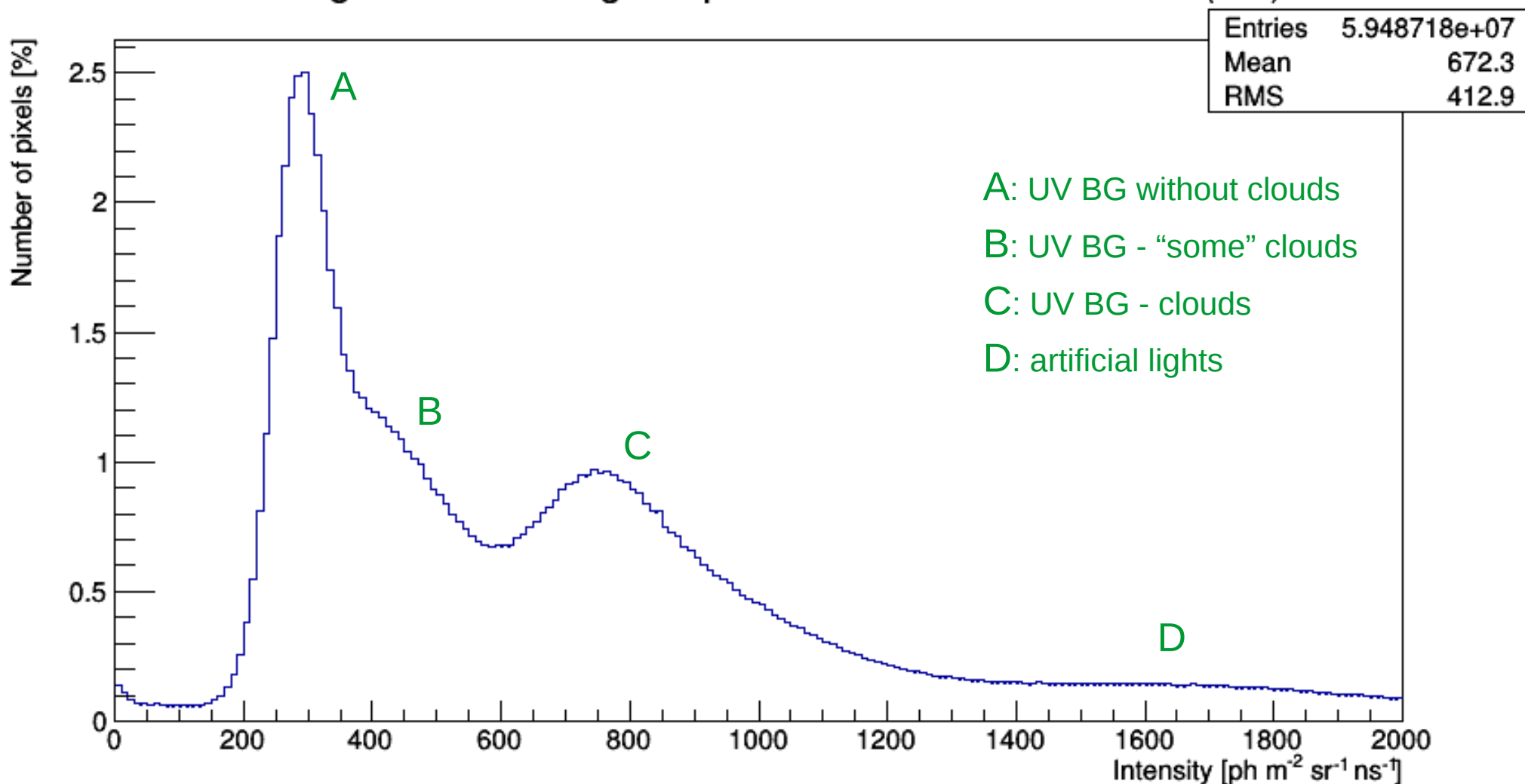
- A – region with lakes
- B – region with young forest
- C – region with forest and river



Overall UV histogram

- Histogram filled with all PDM data corresponds to measurements at conditions mentioned previously

Histogram of active good pixels: 03:08:45 - 05:47:53 (UT)



- We have created UV and IR maps and investigated level of UV background at different conditions
- We have presented that **clouds play much more important role in estimation of UV background than different type of ground surfaces**
- We have estimated that it comes 2.6 times more UV light from clouds than from the ground without clouds (for balloon observation i.e. nadir observation from altitude ~ 38 km)
- We have shown that water surface is too small to gain qualitative comparison between water surface and ground surface even though the level of UV background for different ground surface is almost the same \rightarrow 6% difference is negligible assuming total error 15-25%
- After correction of azimuth, the analysis will be more complex – another cases will be investigated

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