[glɑ:na] East Gothian: Stare

Hyperspectral imaging using a continuous variable bandpass filter

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What?

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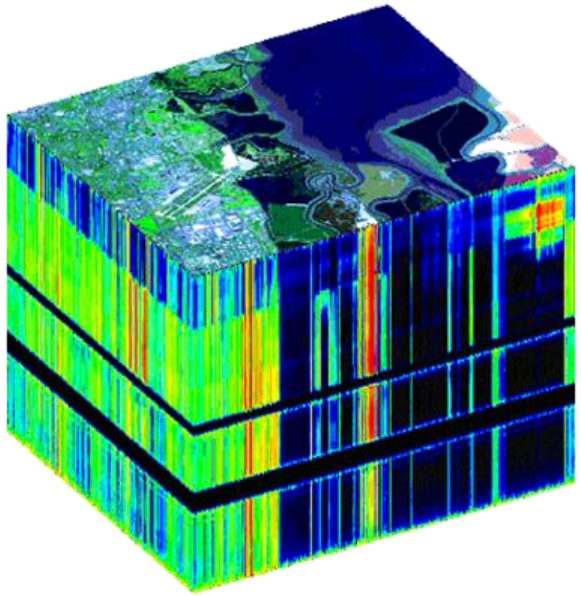
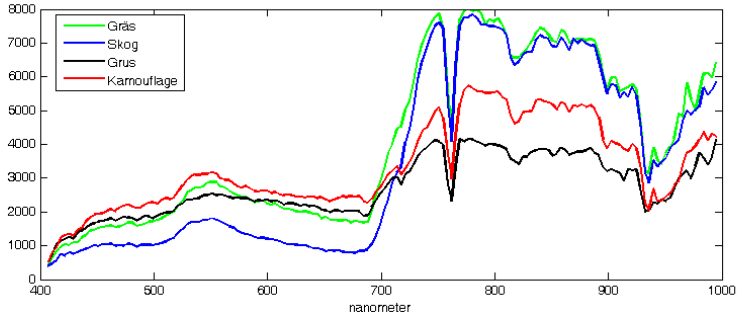
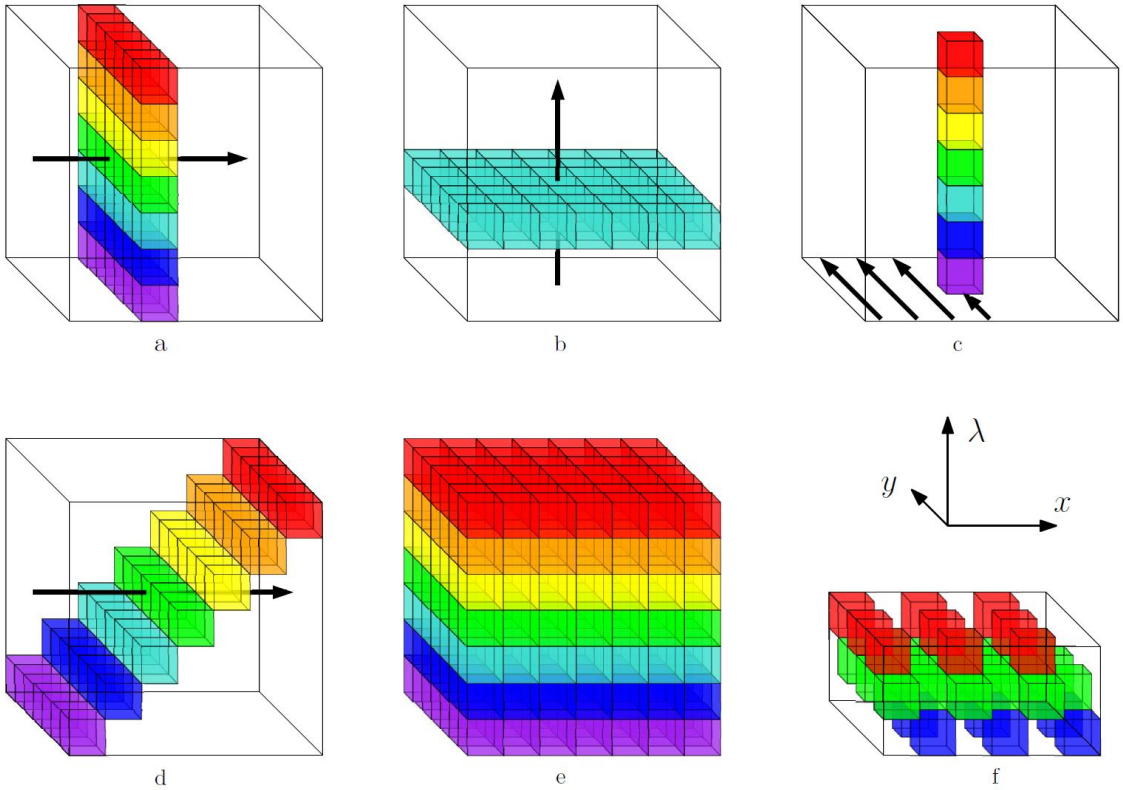
Hyperspectral data






a
b
c
d
e
λ
y
x
f

How?

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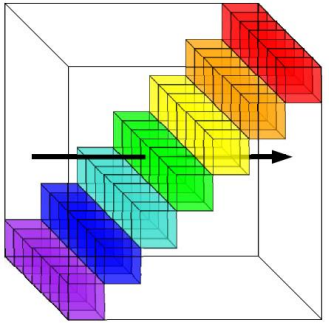
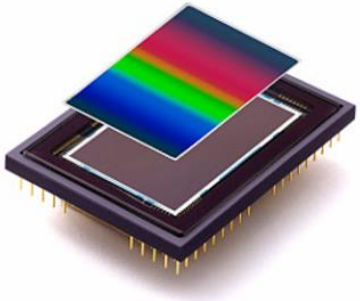
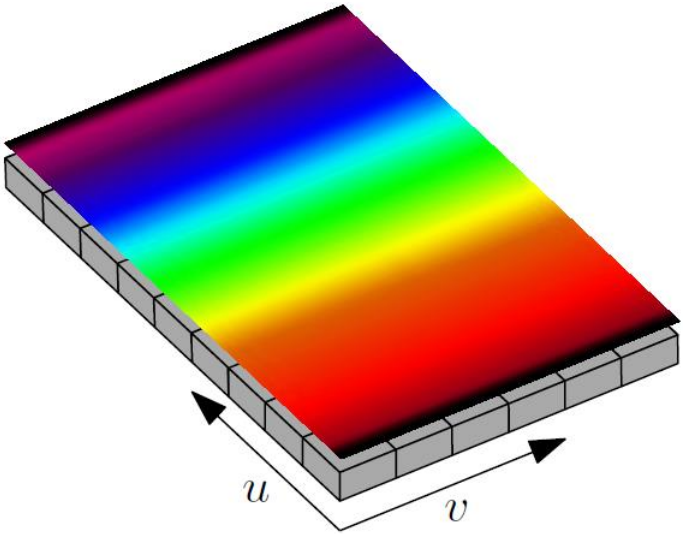
The Glana camera

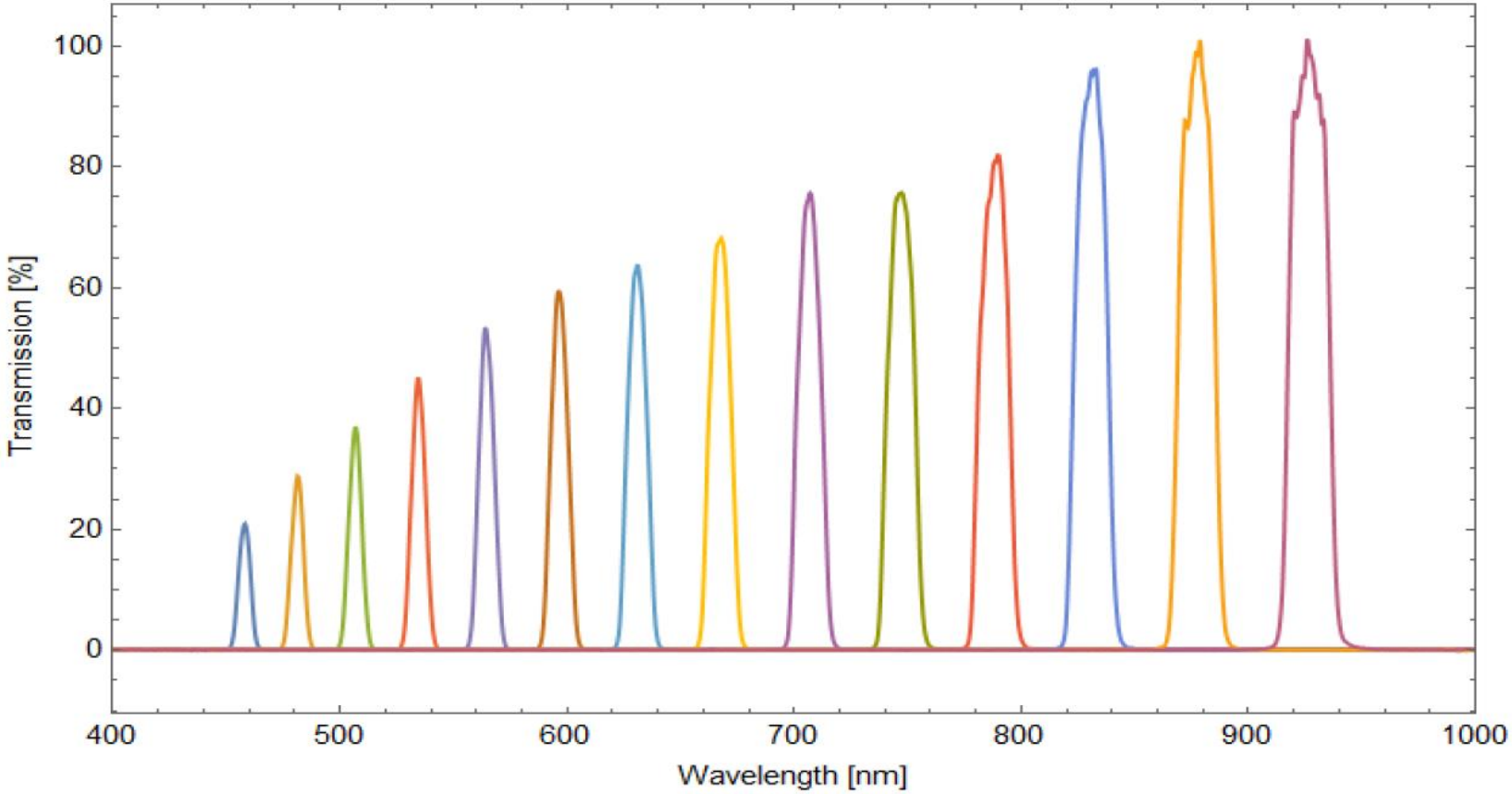


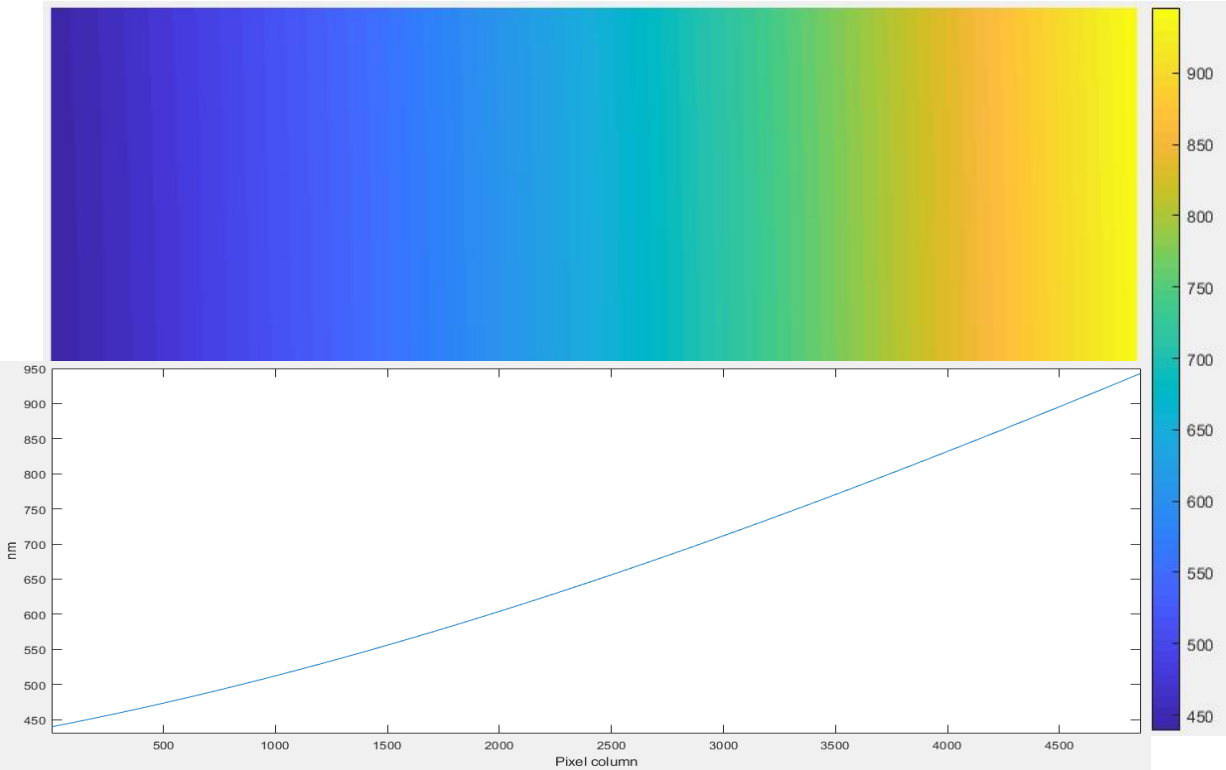


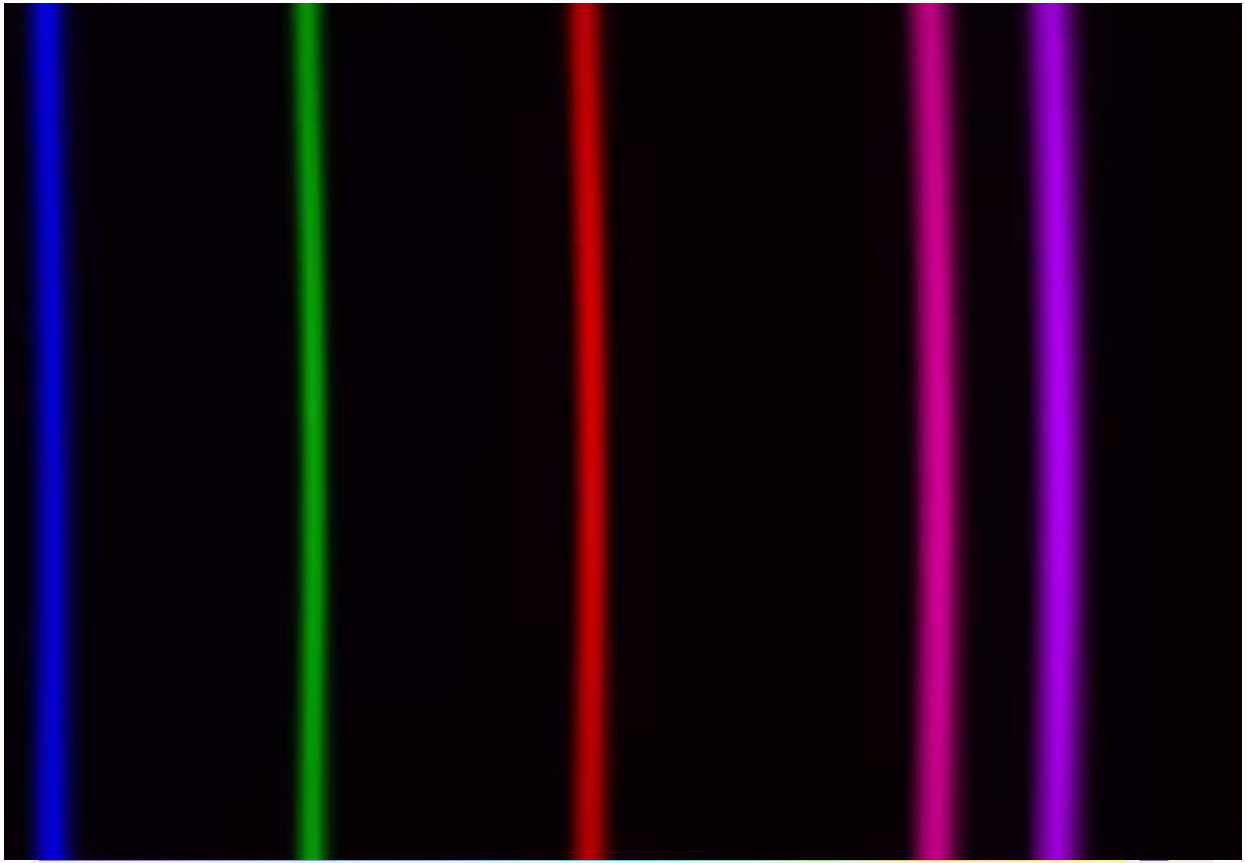
Key component:
Continuously varying band-pass filter



The filter


Transmission [%]
100
80
60
40
20
0
400
500
600
700
800
900
1000
Wavelength [nm]


950
900
850
800
750
700
650
600
550
500
450
nm
500
1000
1500
2000
2500
3000
3500
4000
4500
Pixel column
900
850
800
750
700
650
600
550
500
450



$$\lambda_{Canon90}(nr, nc) = 441.74 + 0.061945\, nc + 0.0000113116\, nc^2 - 5.63836\, 10^{-10}\, nc^3 - 0.00280829\, nr - 1.15454\, 10^{-7}\, nc\, nr + 7.45792\, 10^{-7}\, nr^2$$

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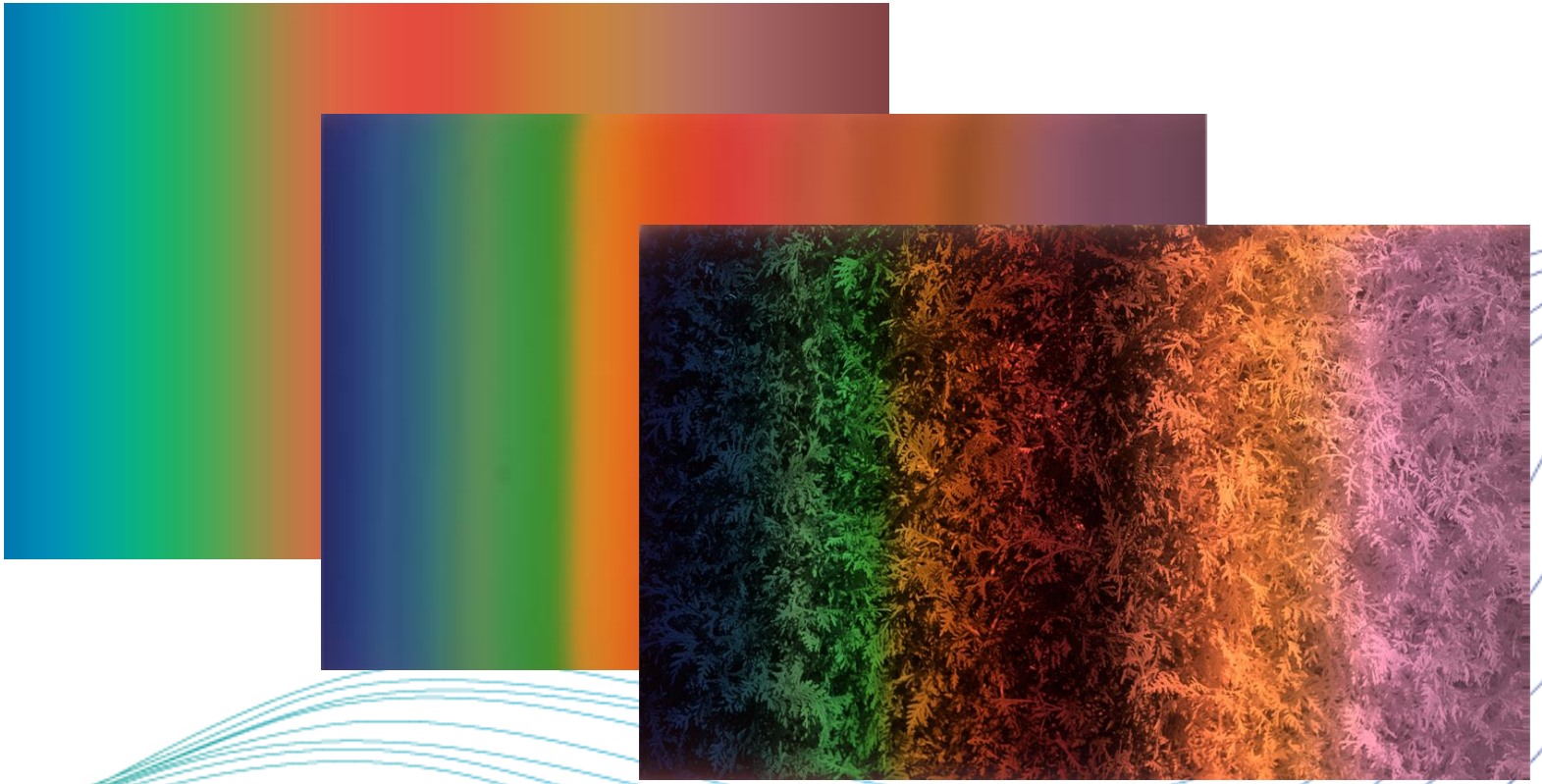

Why?

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Why?

- We can register and reconstruct 3D.
- We get very high spatial resolution.
- We get enough spectral resolution for many applications.
- Area coverage.

3D?

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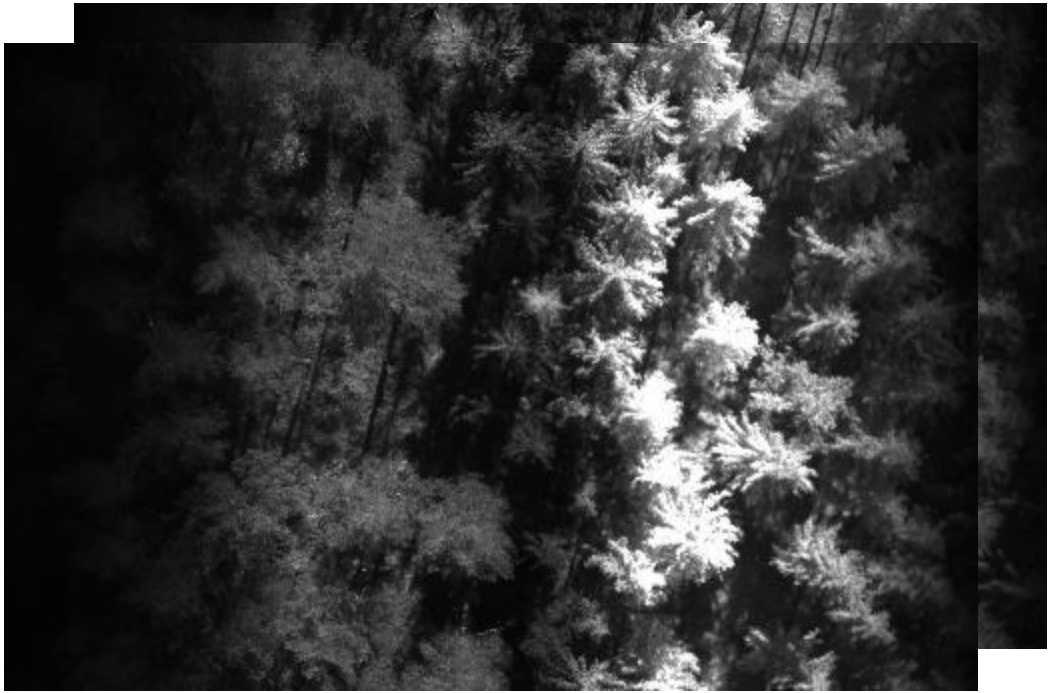

IRL

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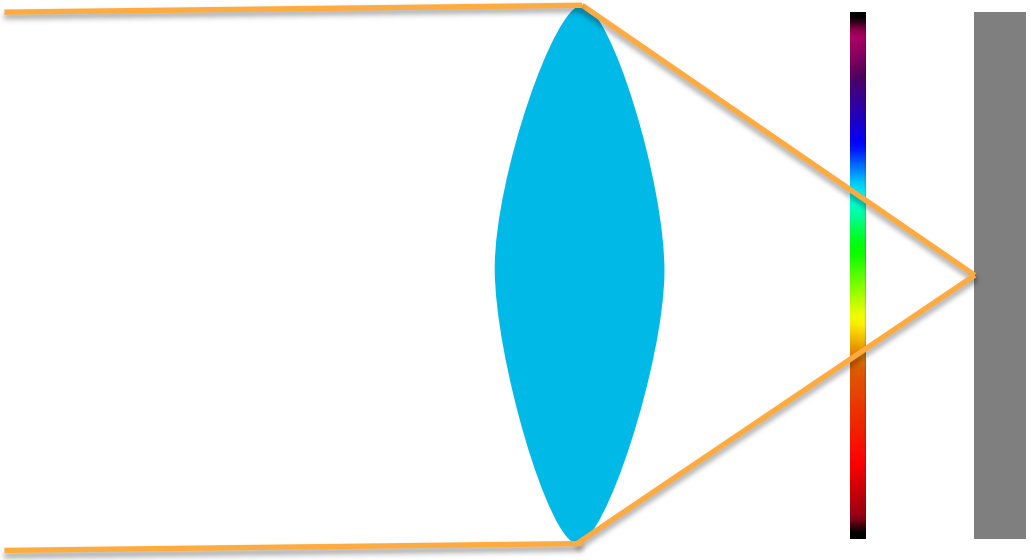

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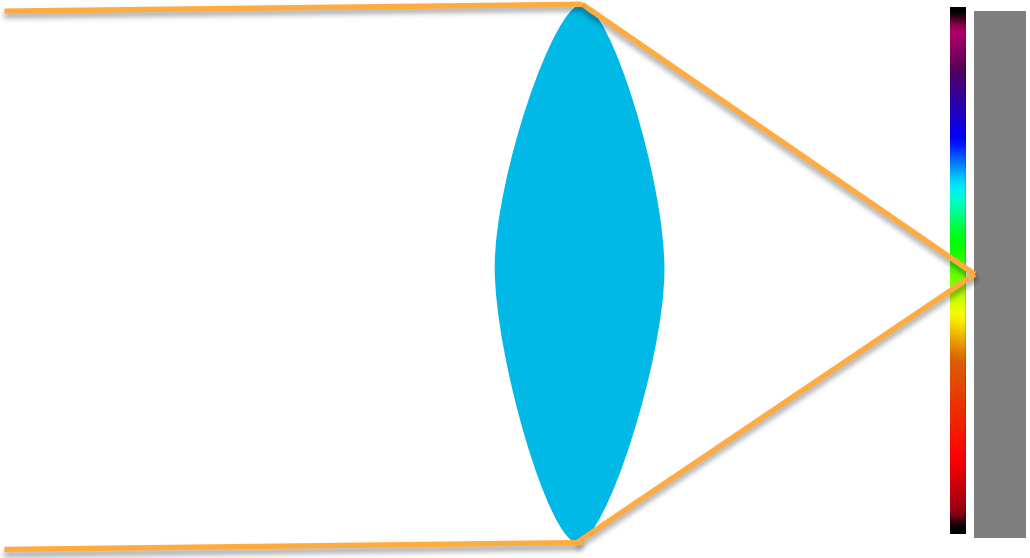

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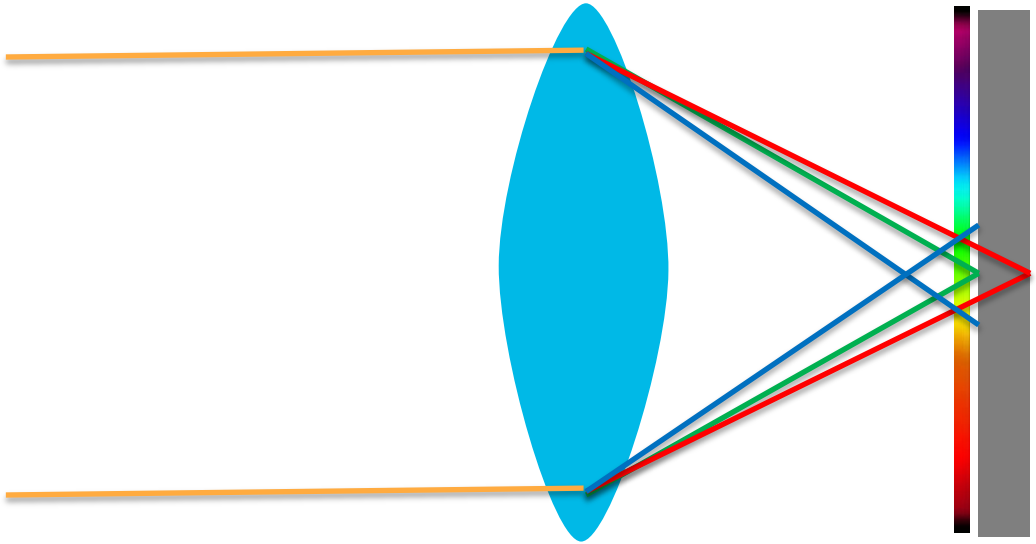

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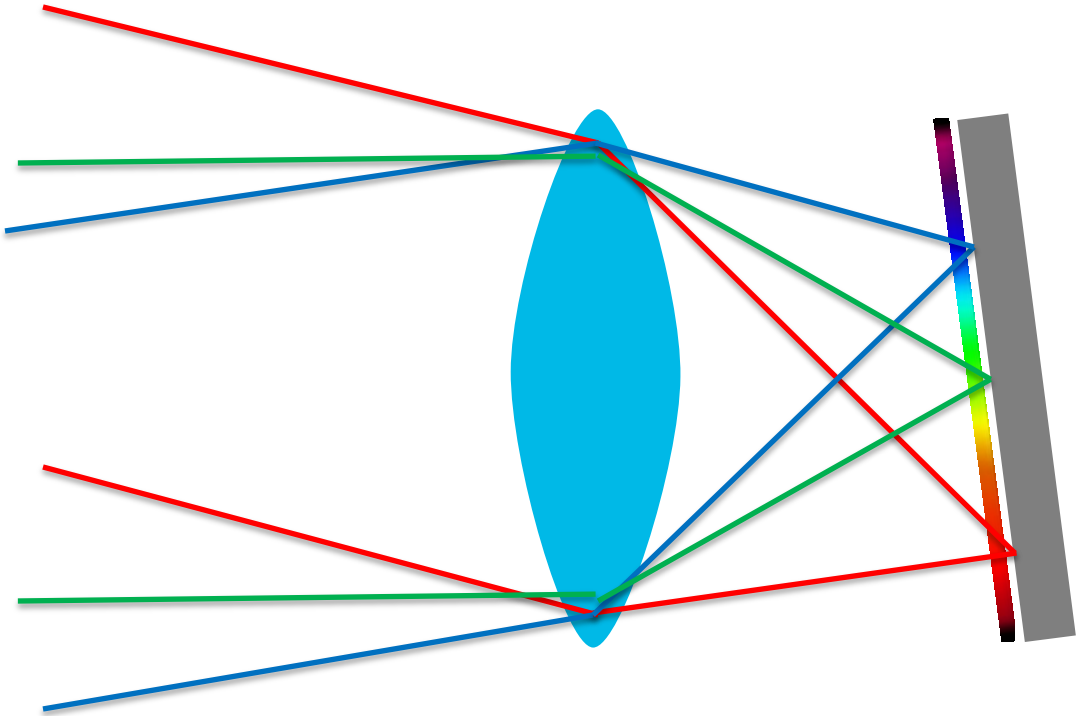

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Camera properties	
Image sensor	OnSemi KAI-16070
Optical format	35 mm
Pixel size	7.4 x 7.4 µm
Resolution	4864 x 3232 pixels (16MP)
Framerate	12fps at 8 bit
Bit depth	8 or 14 bit
Mechanical properties	
Interface	USB 3.1 Gen 1
Lens	Selectable
Lens mount	Canon EF mount
Dimensions	76.2 x 76.2 x 82.6 mm (excl. optics)
Weight	~600 g
Operating temperature	0 to 50 °C
Operating humidity	5 to 95 %, non-condensing
Power	12 V DC, 7.2 W
Spectral properties	
Wavelength range	450nm - 950nm
Spectral bands	48 non-overlapping bands
Spectral bandwidth	Appr. 2% of the central wavelength

Interface	USB 3.1 Gen 1

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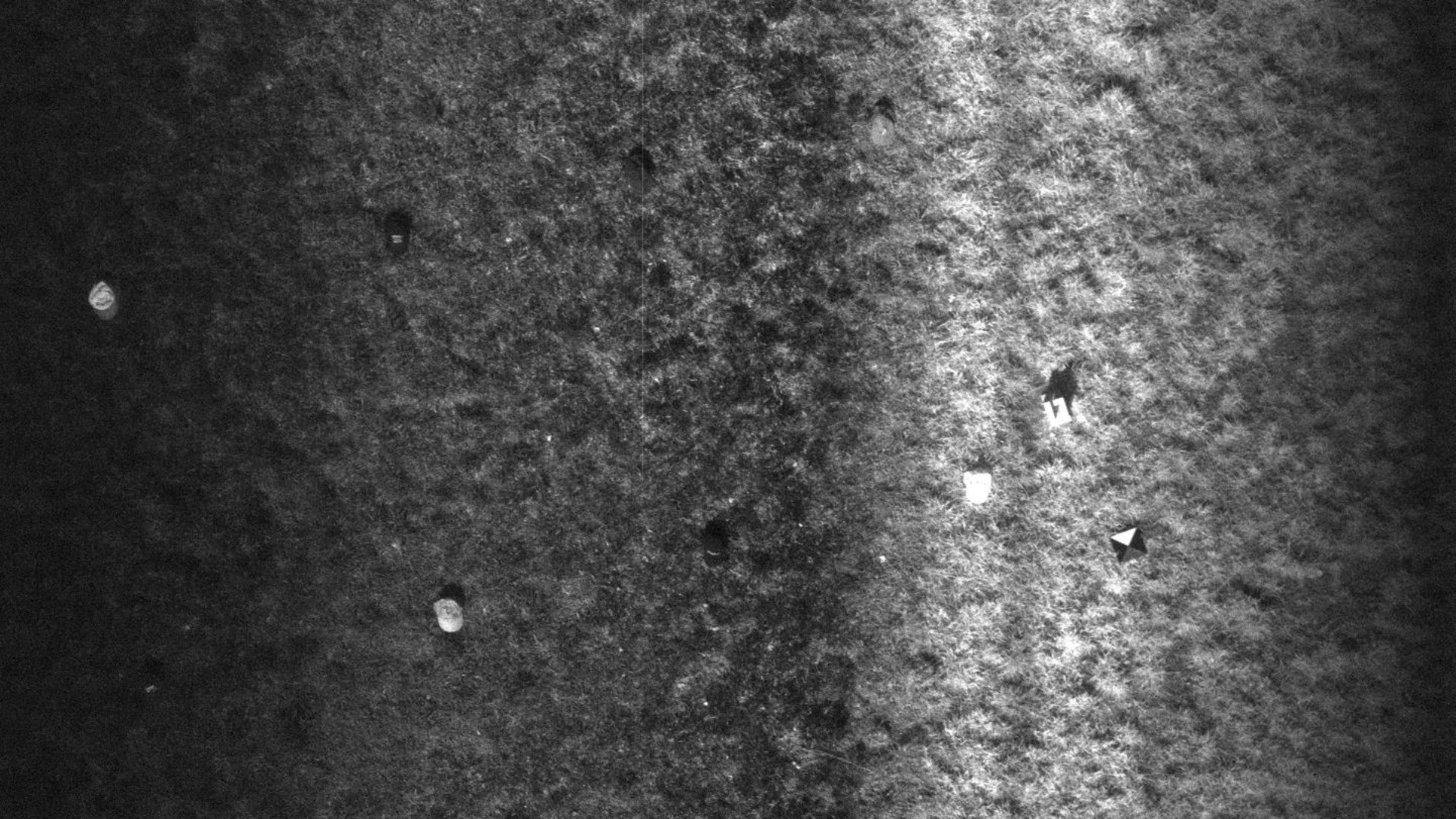

Airport

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3D Reconstruction of Västervik

not so

International Airport

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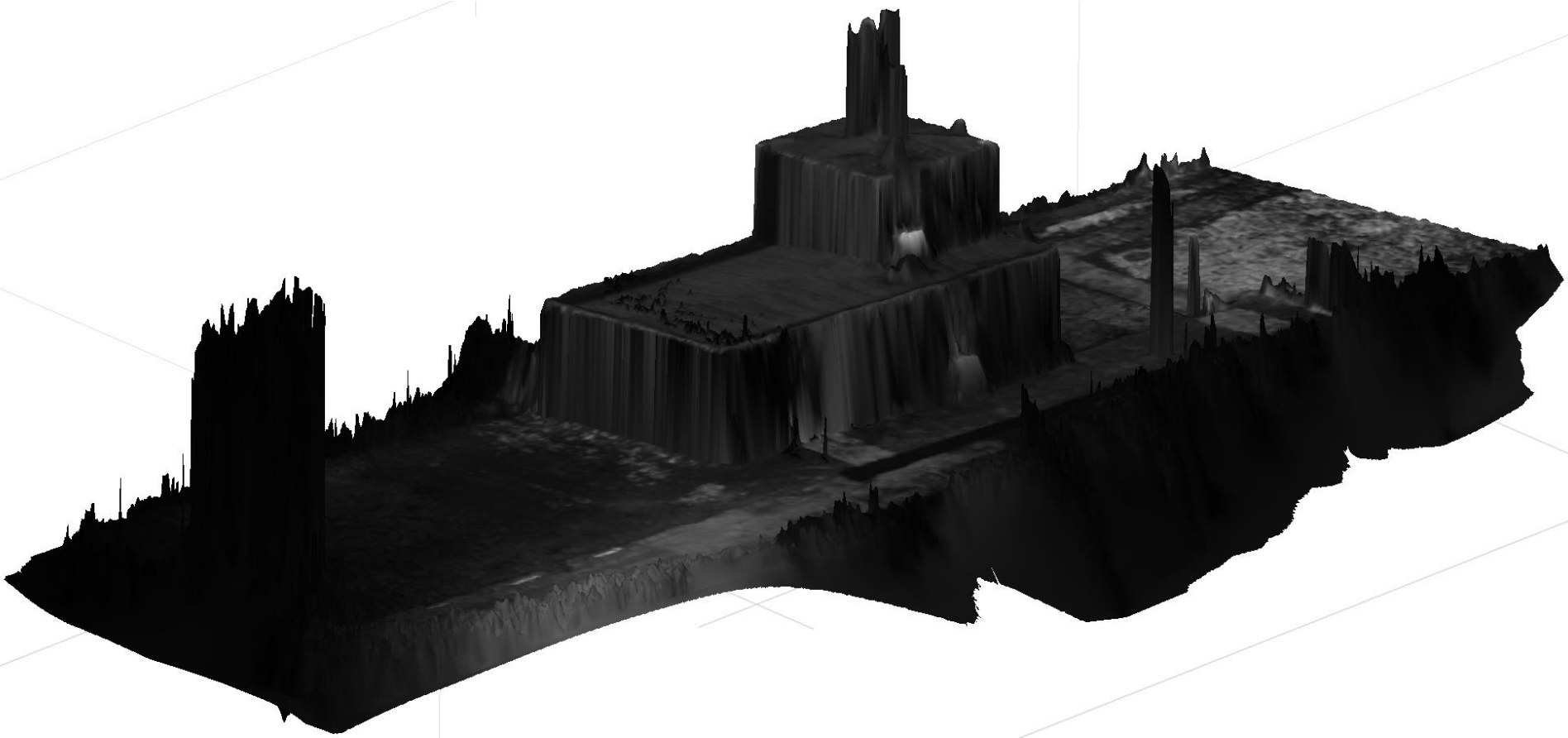
VÄSTERVIK



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Forest

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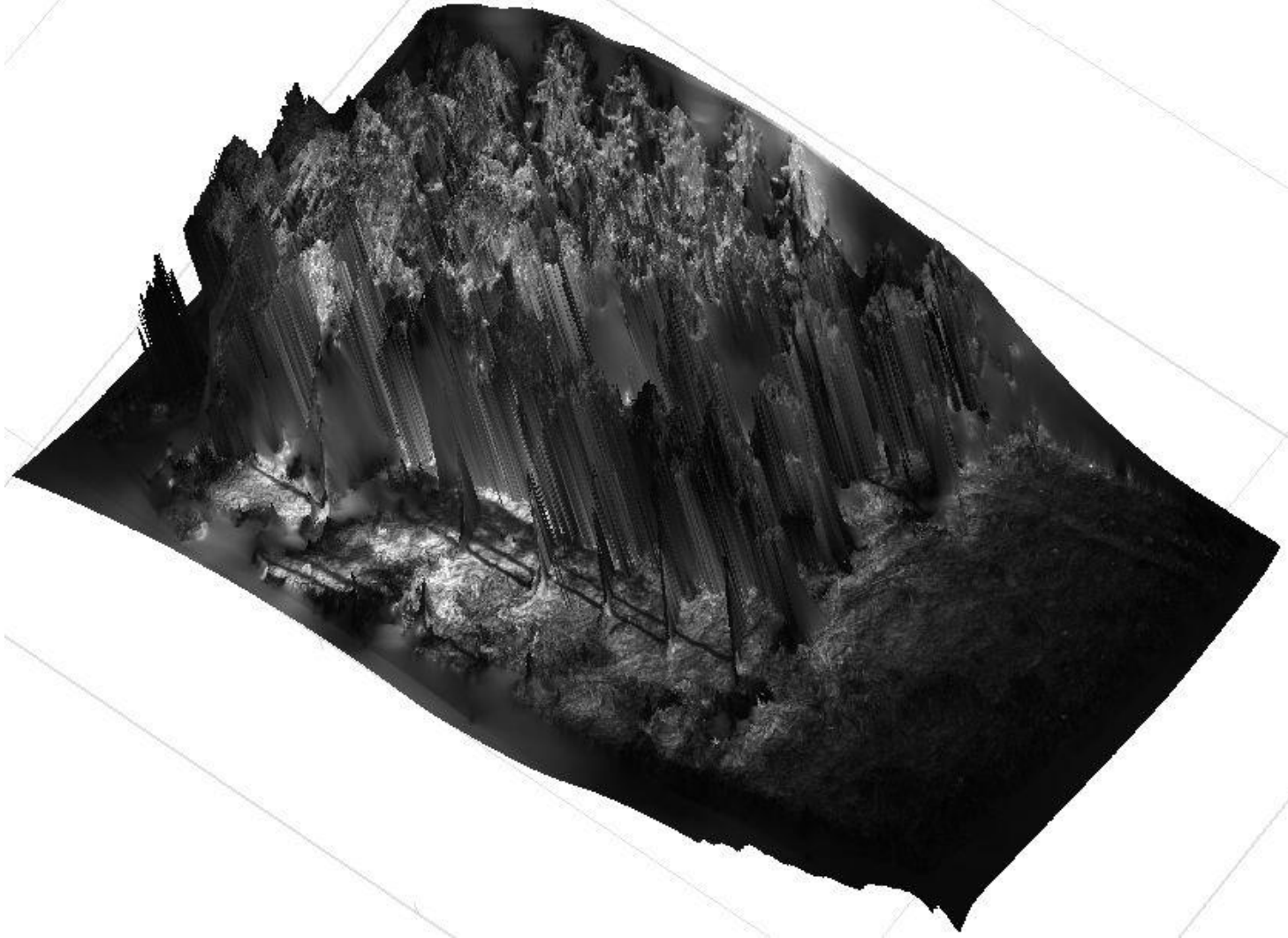

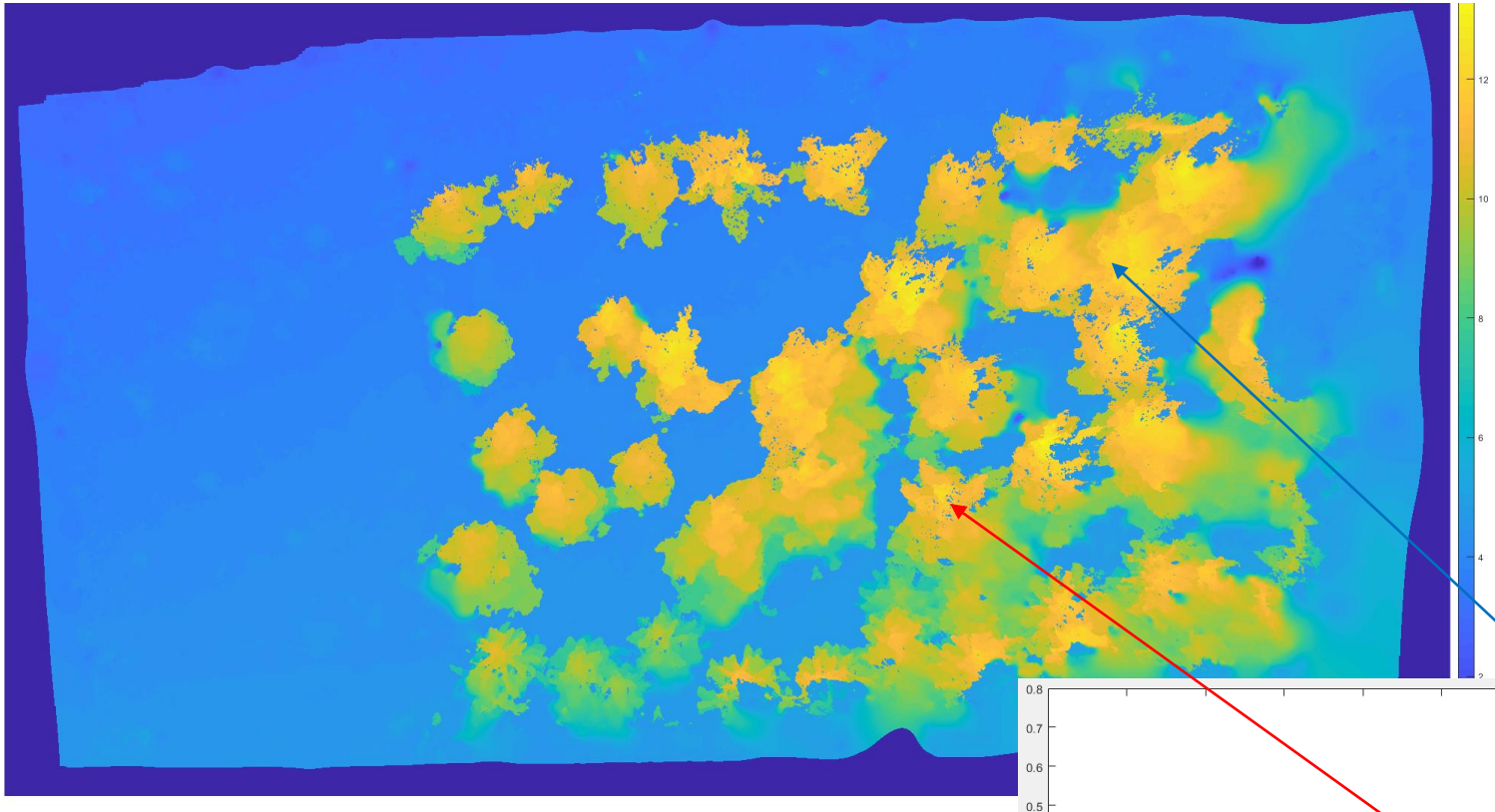

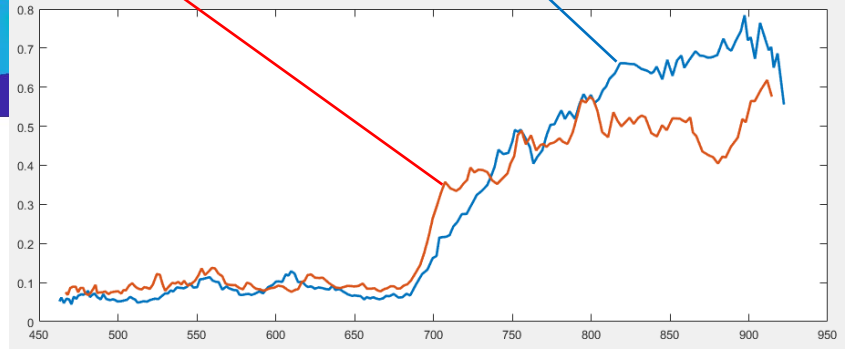

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And now?

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Status & Progress

- A lot of practicalities to solve, with almost no manpower
- Rely heavily on partners (FOI, RMA, RISE, TST)
- We do have the entire processing chain, but still a lot of hacks
- Analysis of camoflage spectra: RMA will present
- Registration of spatio-spectral data: FOI will present