VALIDATION OF DESIS SURFACE REFLECTANCE PRODUCT WITH MEASUREMENTS ON GROUND

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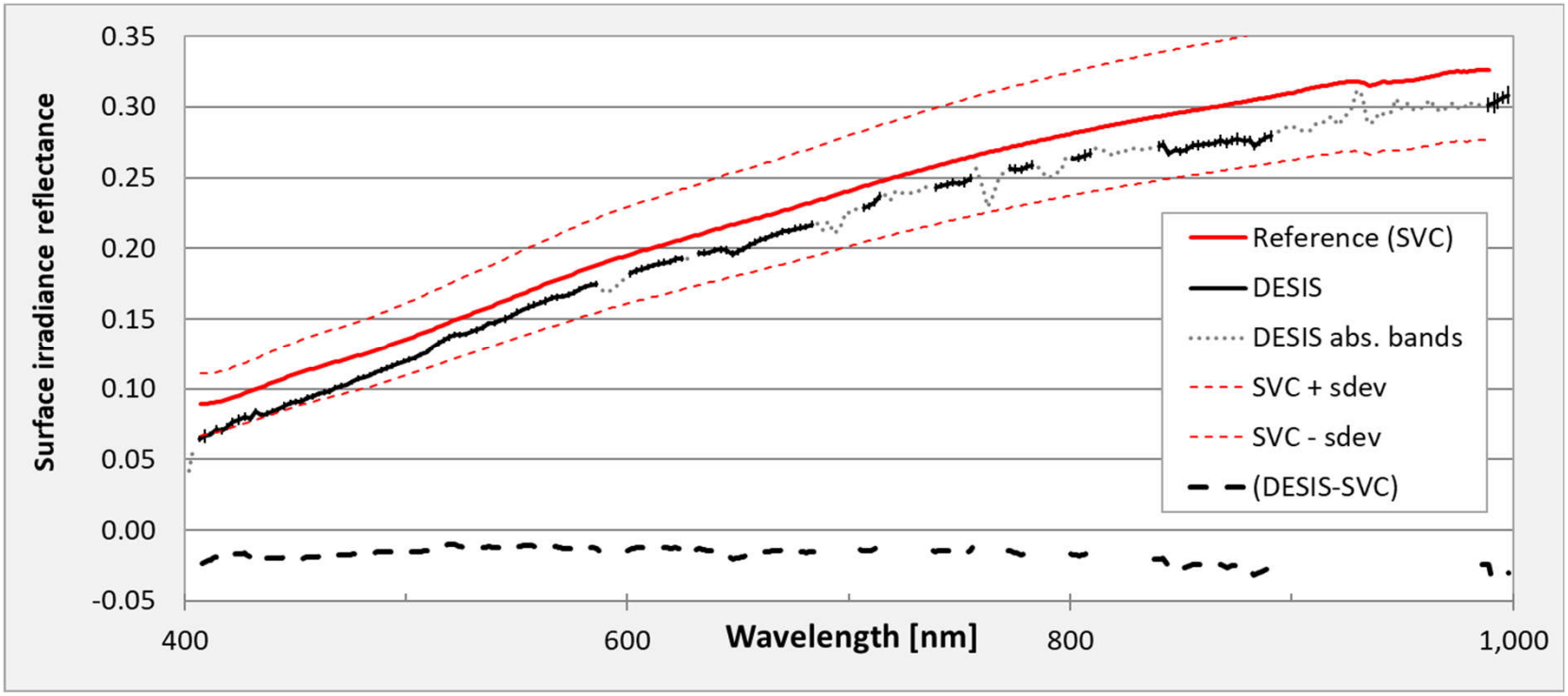
EOC, DLR

DESIS SURFACE REFLECTANCE over soil

Test site Potsdam, 06.08.2020; DESIS processor V02.13

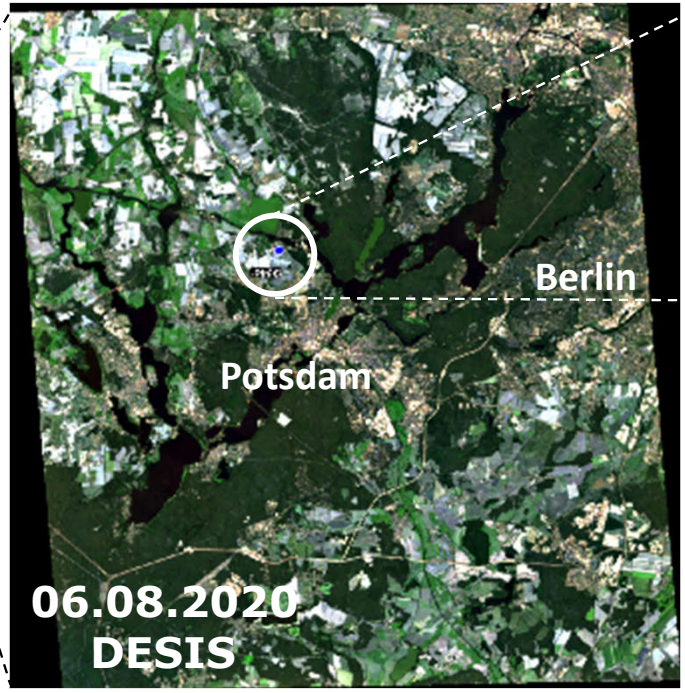


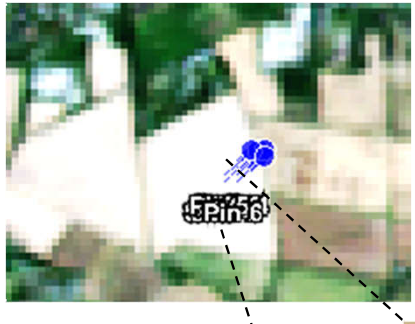
- SR (PACO) within 1-sigma of reference measurements
- Systematic lower SR than reference mean: RMSE = 0.02 (11%)
- High spectral correctness: Pearson correlation = 0.998

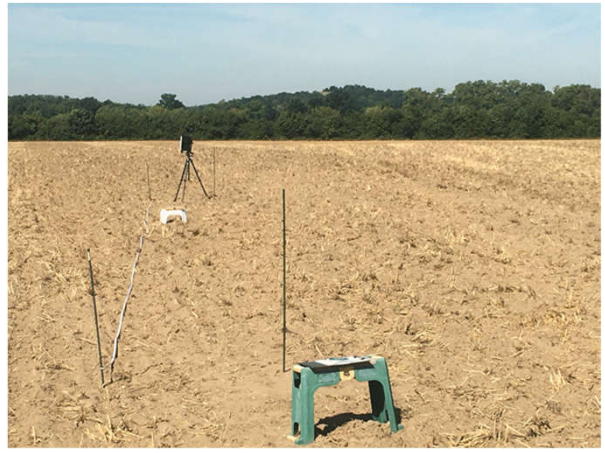
► *What is the story?*

Test site: harvested corn field in Potsdam (52.42°N, 13.04°E)

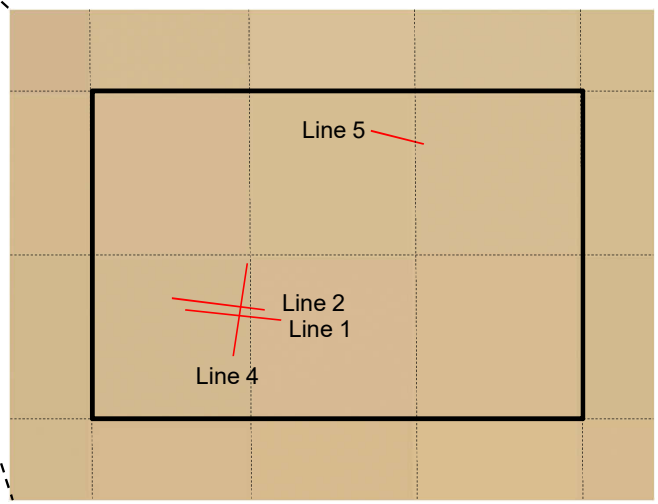
Credit: GingkoMaps-Projekt
http://www.ginkgomaps.com/







Size of field:
600m x 600m



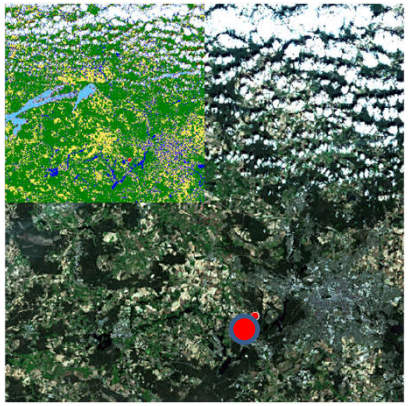
Variability within DESIS pixel area (complete field < 4%)

Convolved to S2-band		B1	B2	B3	B4	B5	B6	B7	B8	B8A
3 x 2 pixel	sdev/mean	1.1%	0.8%	0.8%	0.5%	0.6%	0.2%	0.5%	0.4%	0.6%
5 x 4 pixel	sdev/mean	2.0%	1.6%	1.4%	1.0%	1.2%	0.9%	1.1%	0.9%	1.0%

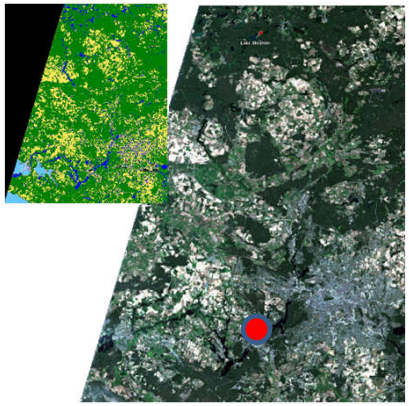
DESIS-HSI-L2A-DT0483953296_005-20200806T142658-V0213-SPECTRAL_IMAGE

Available measurements

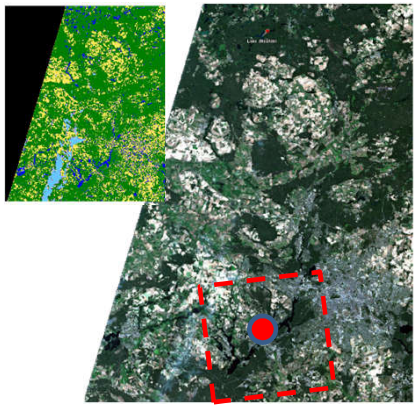
S2A: 30.07.2020; *10:20*



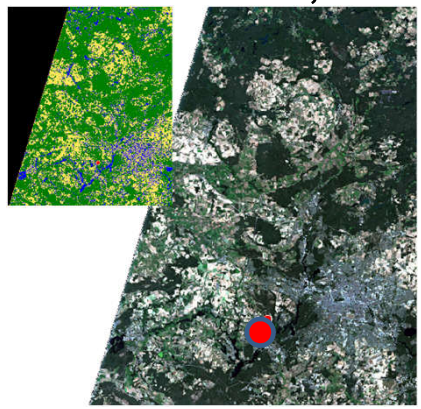
S2B: 01.08.2020; *10:06*



S2A: 06.08.2020; *10:11*



S2B: 11.08.2020; *10:06*



DESIS: 06.08.2020; *14:27*

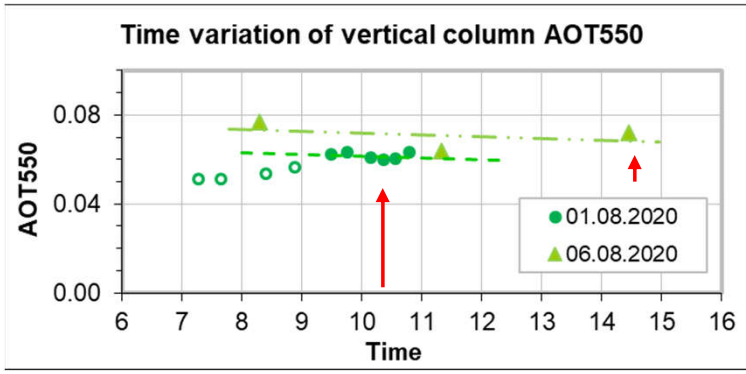
SVC (SR)

► applicable to 06.08 ?

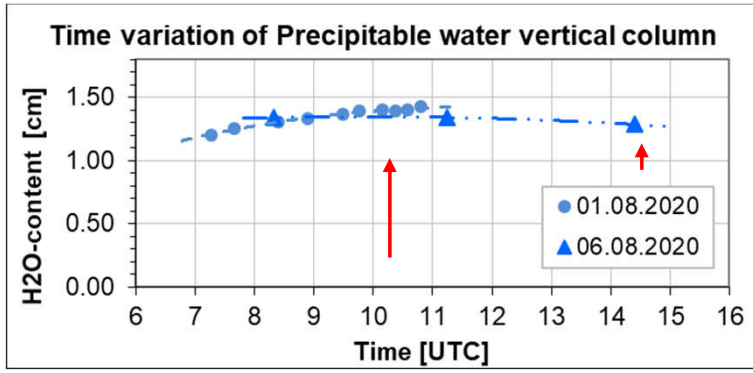
sun-photometer (AOT, WV, O3) **sun-photometer** (AOT, WV, O3)

Atmospheric conditions / AOT & WV

AOT_{550nm} (Median ±sdev)		30.07	01.08	06.08	11.08
Sunphotometer	time avg. ± 15 min		0.06 ± 0.002	**0.07** ± 0.006	
Sentinel-2 (Sen2Cor 2.8, ESA core product)	area avg. 9x9 km²	0.08	0.08 ± 0.0	0.09 ± 0.0	0.17
Sentinel-2 (PACO, DESIS processor V02.13)	area avg. 9x9 km²			0.10 ± 0.02	
DESIS (PACO, DESIS processor V02.13)	area avg. 9x9 km²			0.09 ± 0.02	

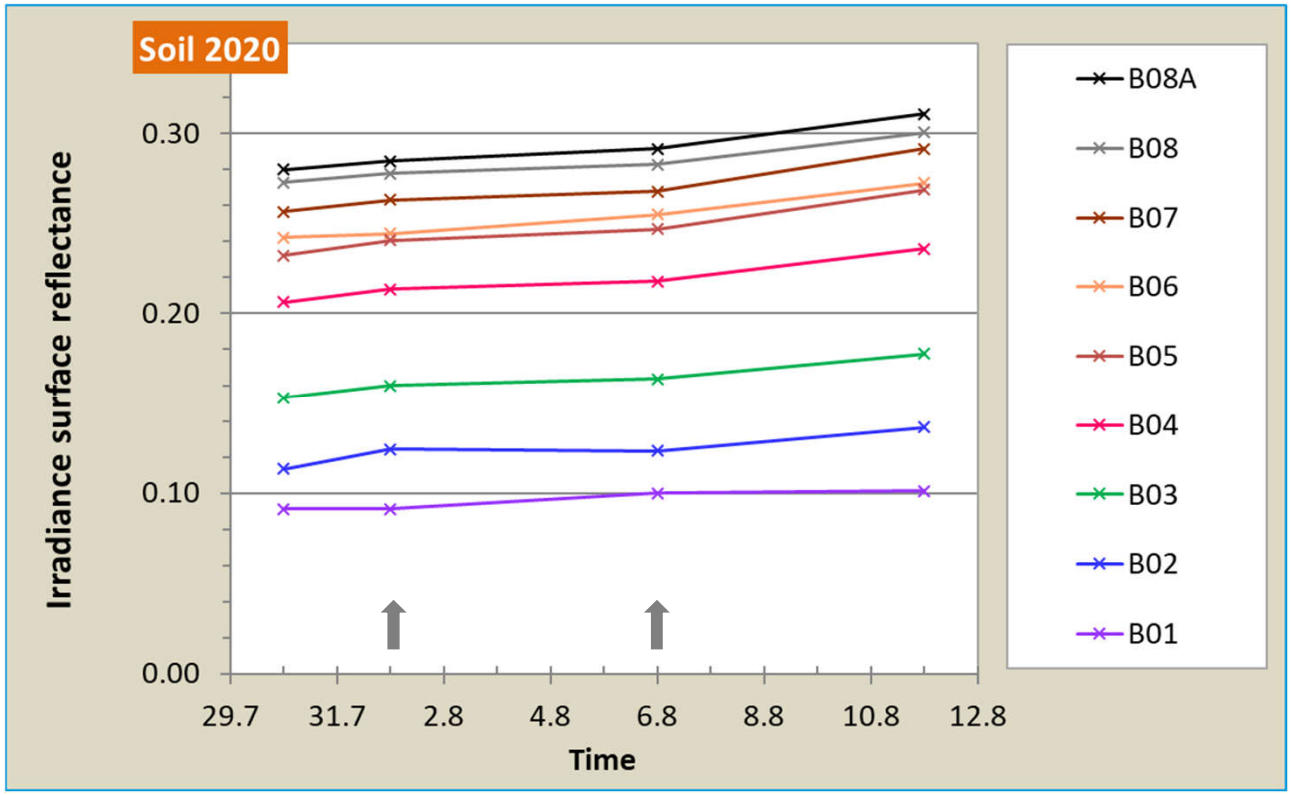


WV (Median ±sdev) [cm]		30.07	01.08	06.08	11.08
Sunphotometer	Time interpolated		1.4 ± 0.01	1.4 ± 0.00	
Sentinel-2 (Sen2Cor 2.8, ESA core product)	area avg. 9x9 km²	1.0	1.7 ± 0.2	1.7 ± 0.2	2.1
Sentinel-2 (PACO, DESIS processor V02.13)	area avg. 9x9 km²			2.0 ± 0.1	
DESIS (PACO, DESIS processor V02.13)	area avg. 9x9 km²			2.1 ± 0.1	



- Stable conditions, no significant change from 01. to 06.08.
- Good AOT & WV retrieval accuracy

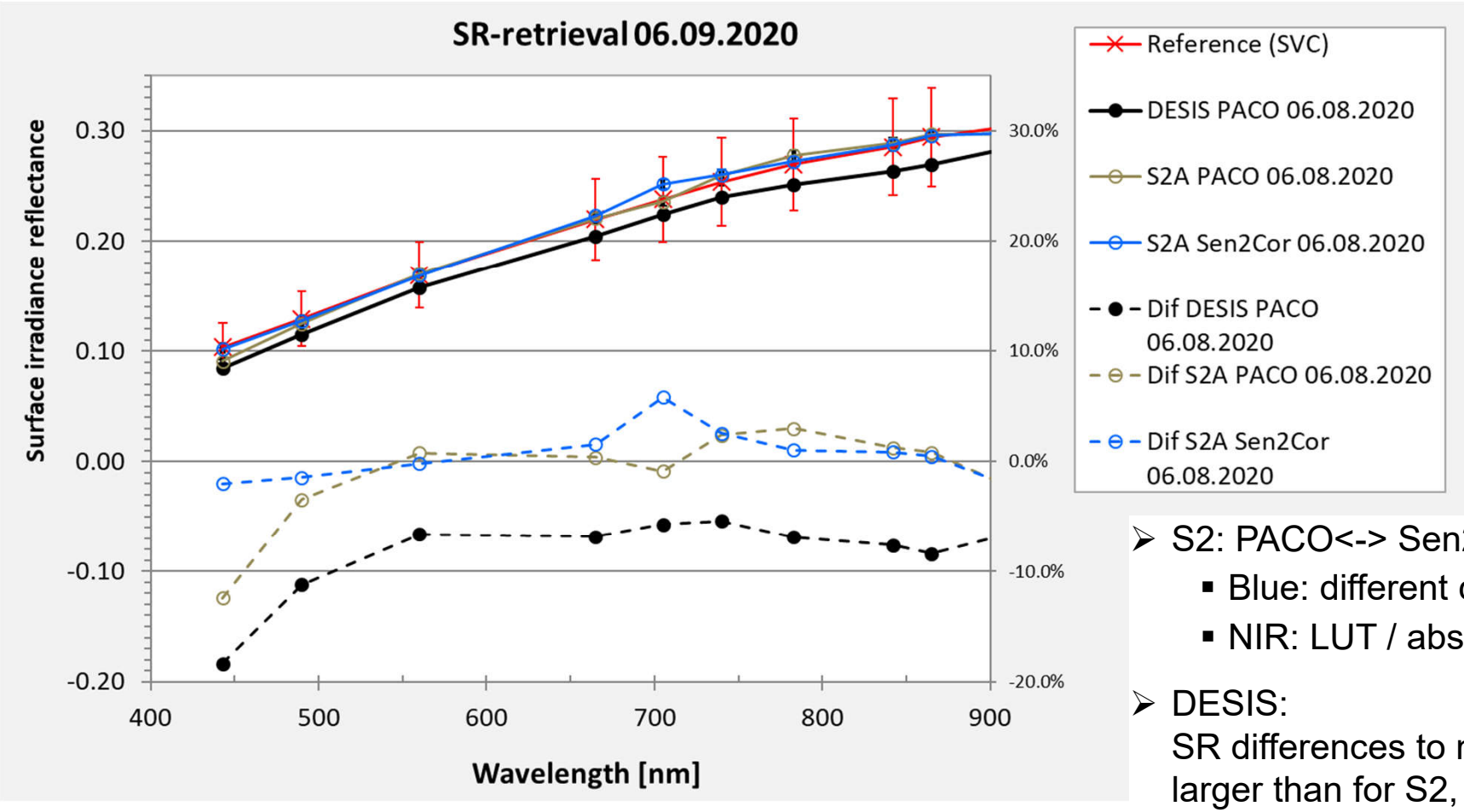
SR time series (Sentinel-2, Sen2Cor)



Band	01.08.2020	06.08.2020	Difference
B1	0.092	0.101	10%
B2	0.127	0.127	0%
B3	0.165	0.169	2%
B4	0.217	0.223	3%
B5	0.244	0.252	3%
B6	0.249	0.260	5%
B7	0.266	0.272	2%
B8	0.281	0.288	2%
B8A	0.287	0.296	3%

- Sen2Cor gives 2-3% higher SR on 06.08 than on 01.08.
- Reference measurement from 01.08 are applicable for 06.08 with little higher uncertainty

SR: S2 and DESIS convolved to S2-bands



	RMSD	Corr.
DESIS PACO	0.02	0.998
S2 PACO	0.006	0.999
S2 Sen2Cor	0.005	0.998

- S2: PACO<-> Sen2Cor, consistent results
  - Blue: different configuration
  - NIR: LUT / absorption models ?
- DESIS:
  SR differences to mean reference < 10%, larger than for S2, but within 1-sigma
  - due to observation time ?

Conclusions

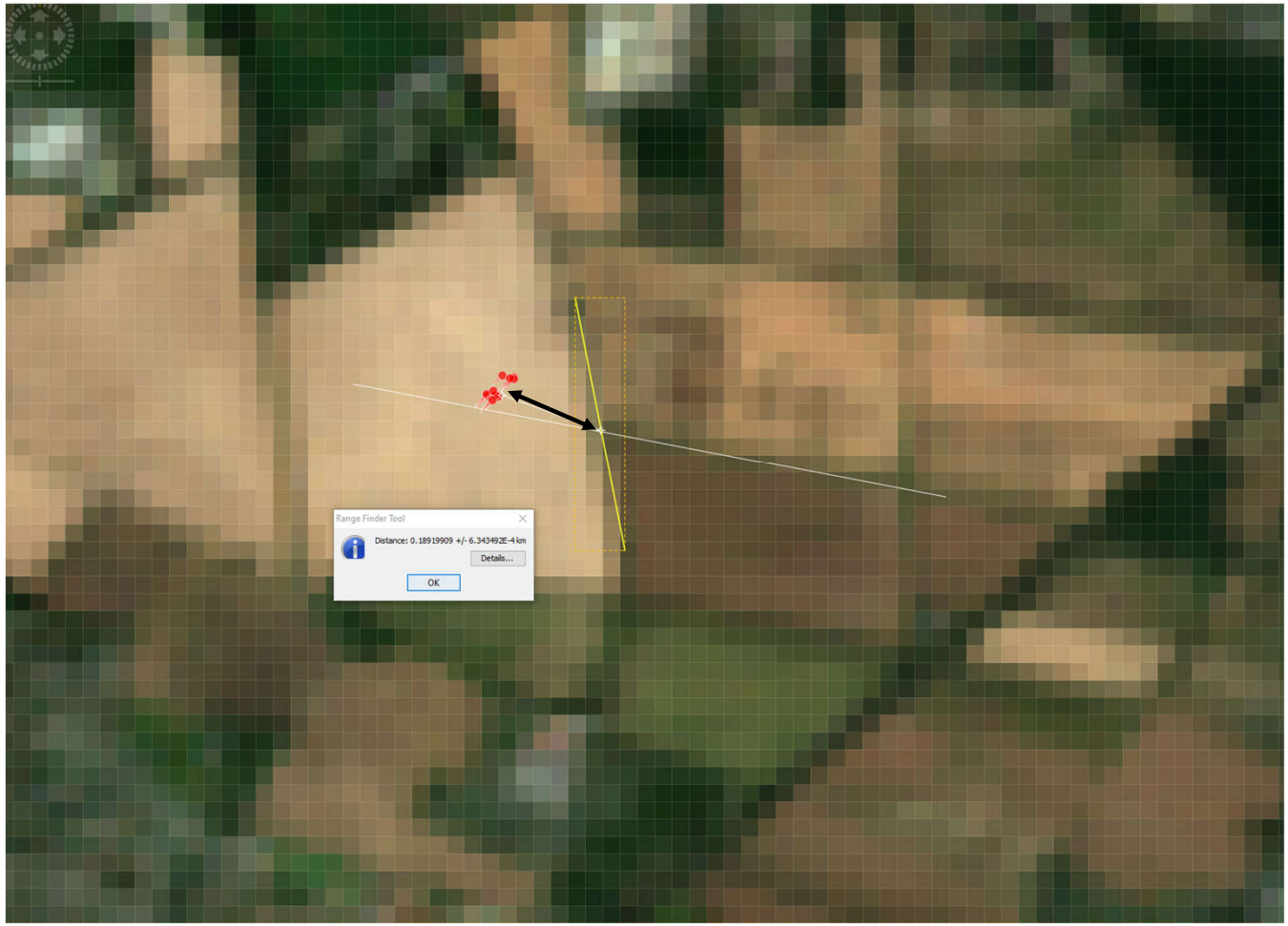
- SR retrieval for DESIS data with PACO is within 1-sigma of variation of reference measurements on ground
  little larger difference to mean reference spectrum than observed for reference data from RadCalNet
  - Only one example, **we need more** !!!
  - Uncertainty of reference data ??? Still not completed.

- PACO DESIS processor gives consistent good results with Sen2Cor for Sentinel-2 data.

- Congratulations! Geolocation accuracy better than ½ pixel.

Backup slides

Geolocation accuracy



- Should be: 182 m
- Is: 189 m