Cloud statistics at Barrow, Alaska from a two-year infrared cloud imager deployment

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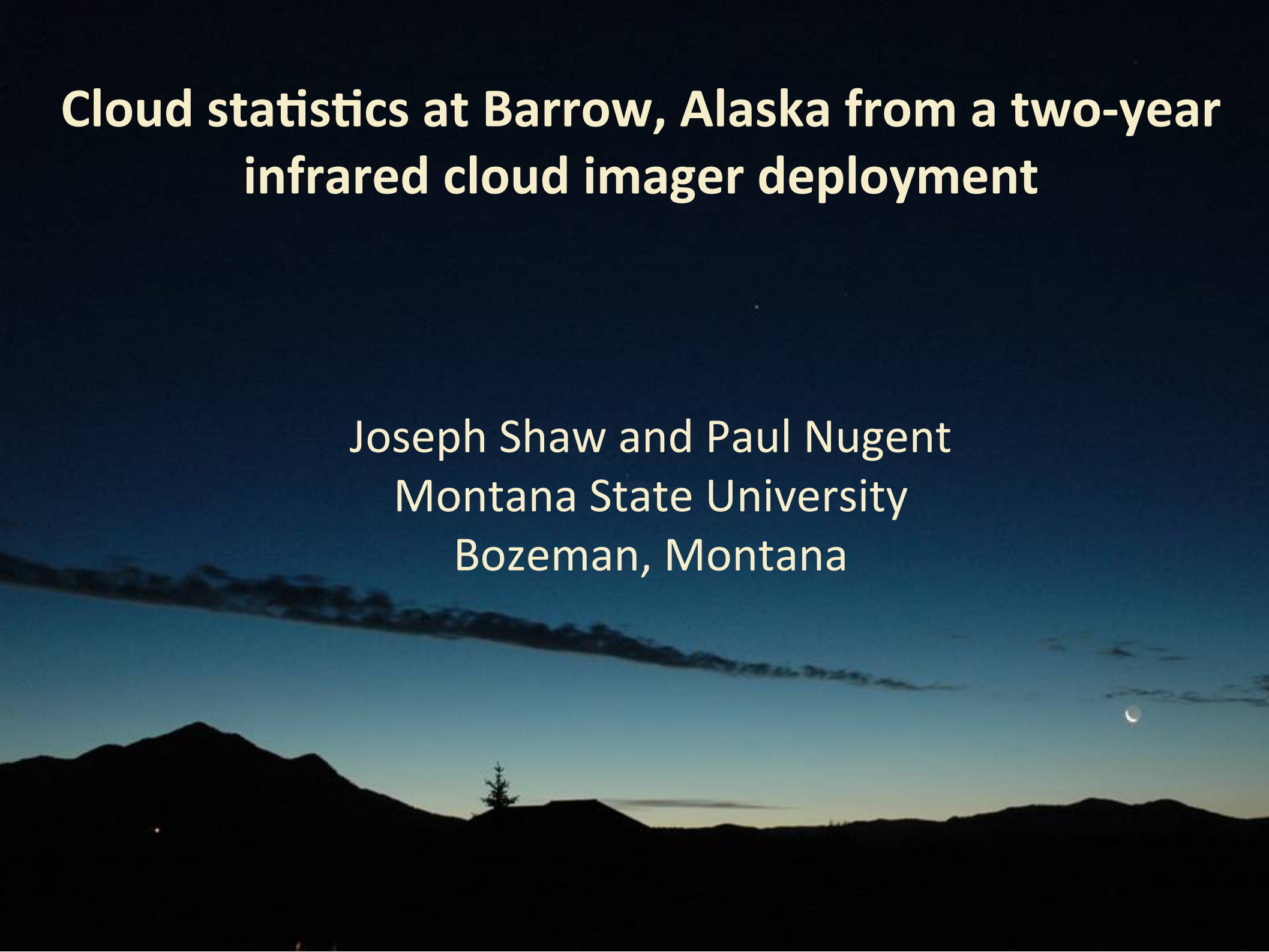
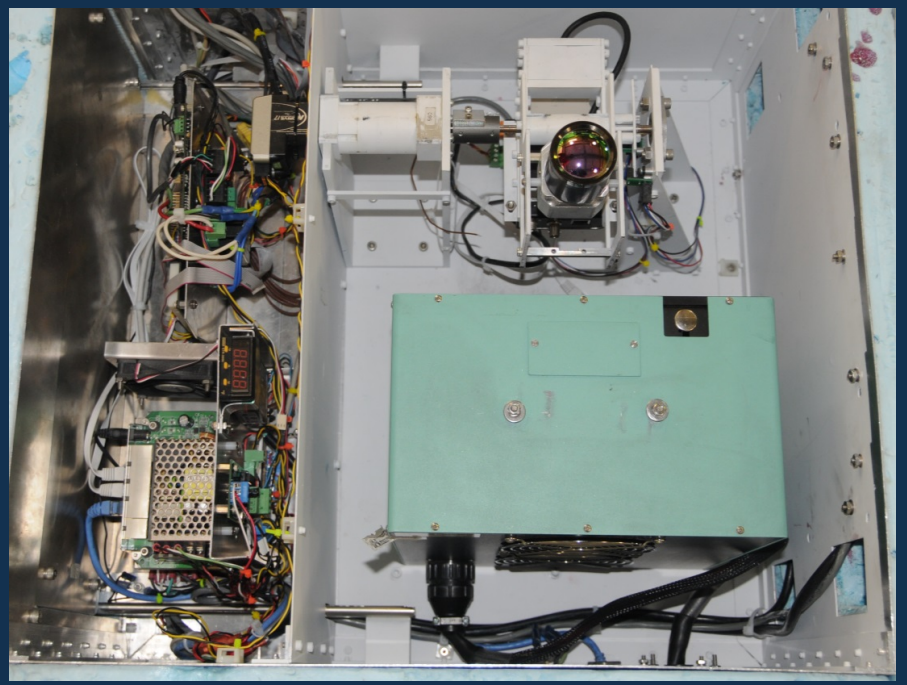
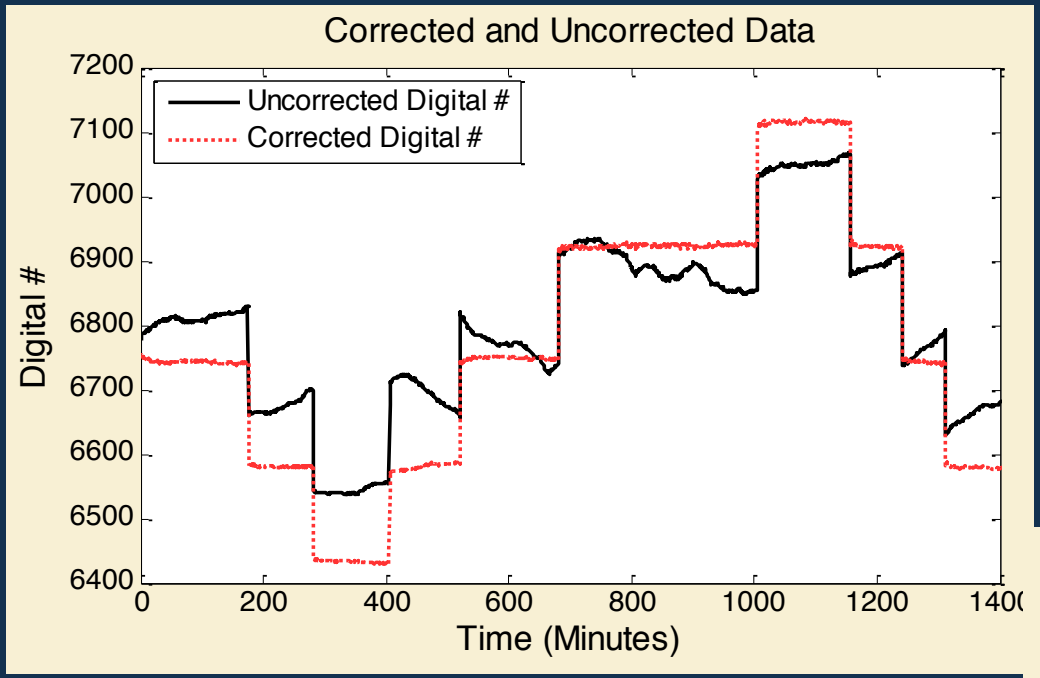
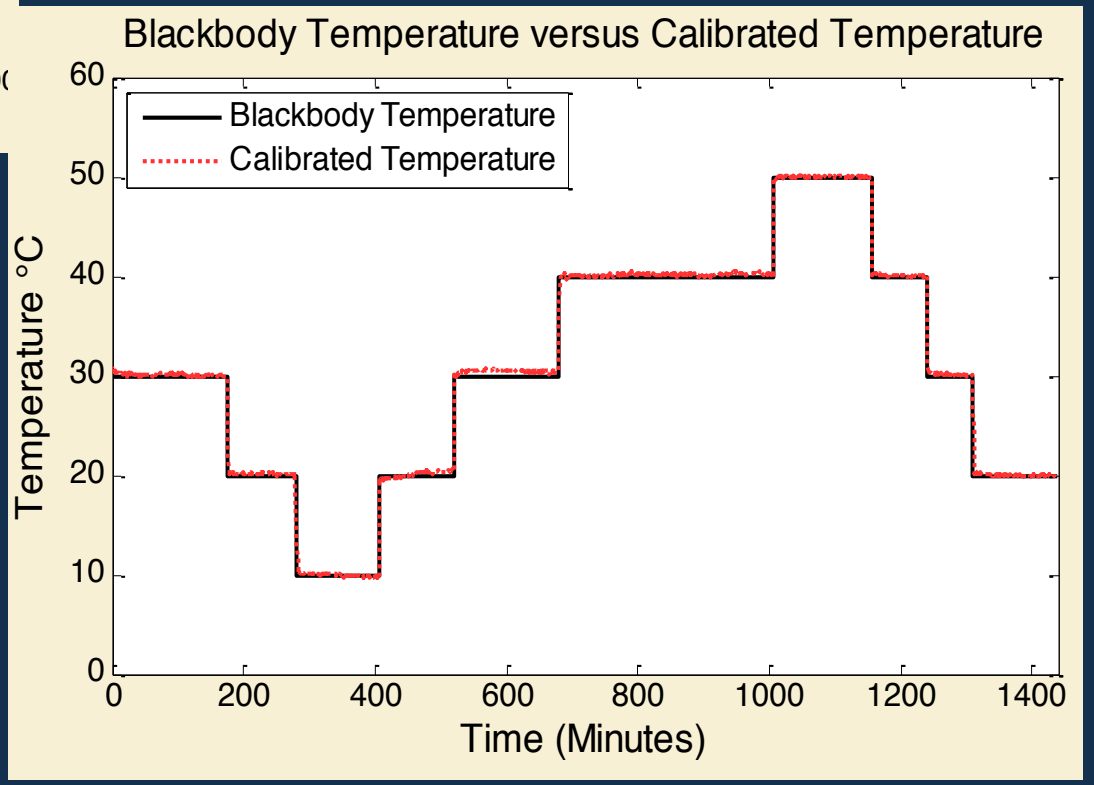


ICI in Barrow, Alaska: 2012-2014

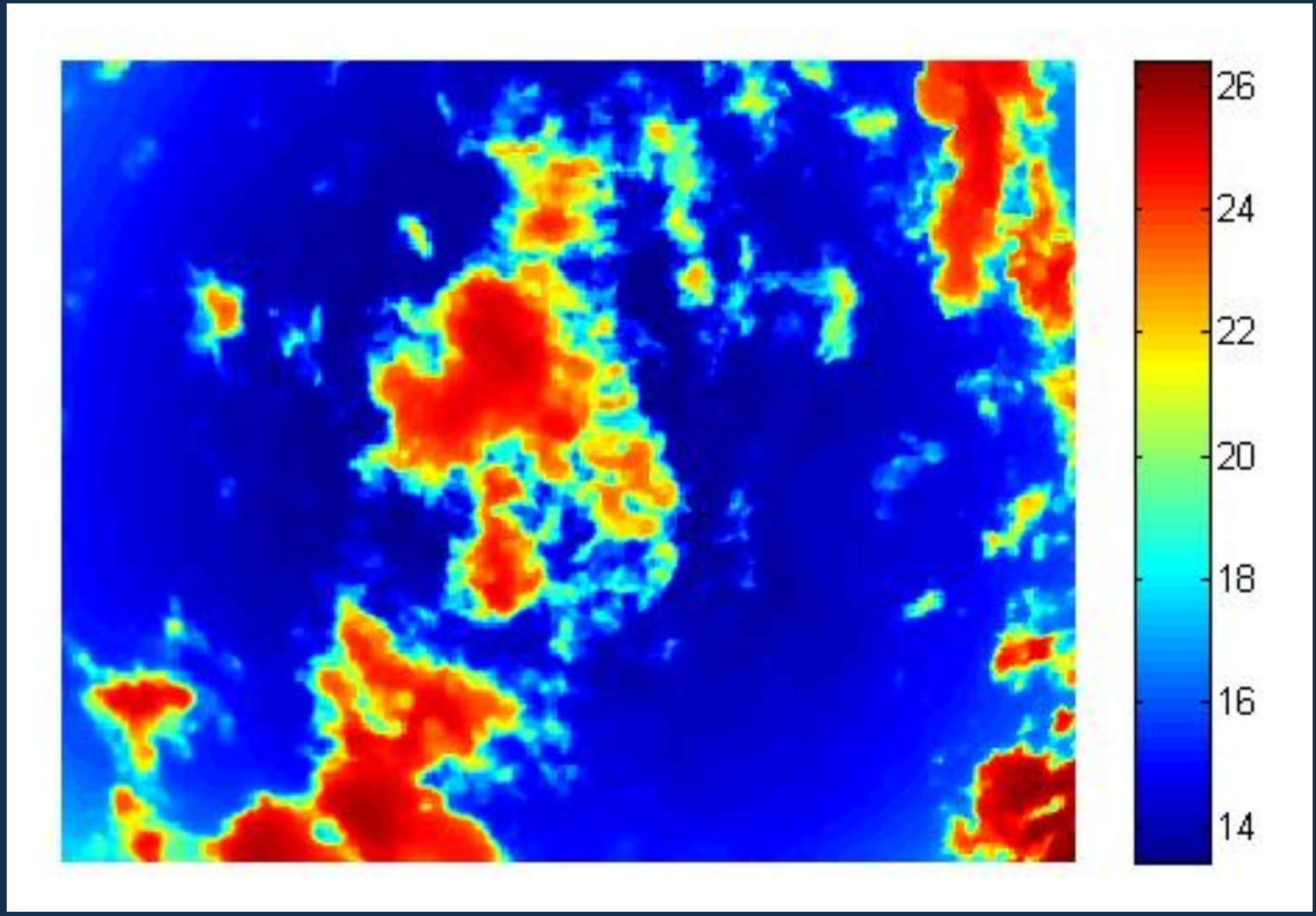


Radiometrically calibrated uncooled IR detector

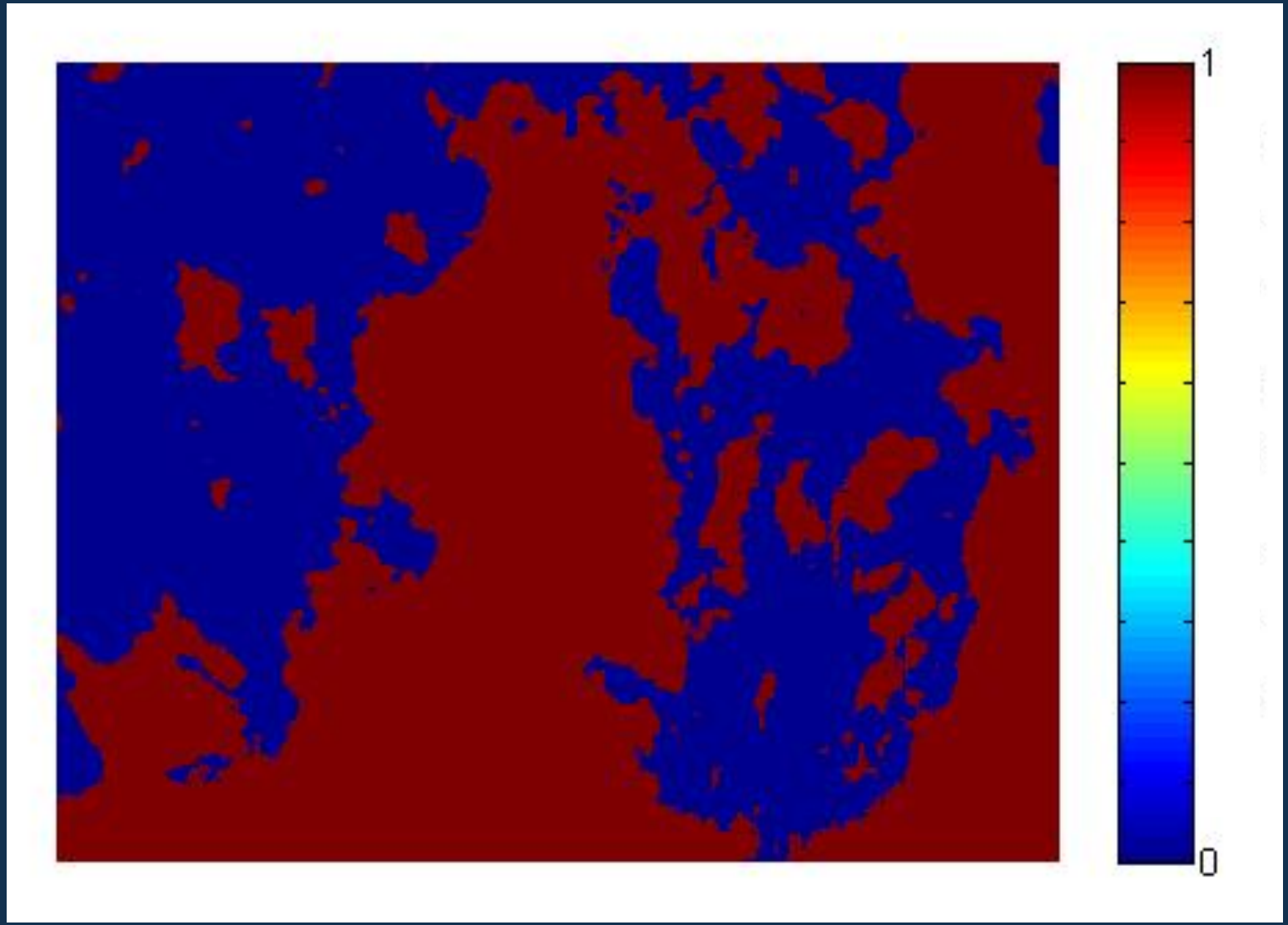




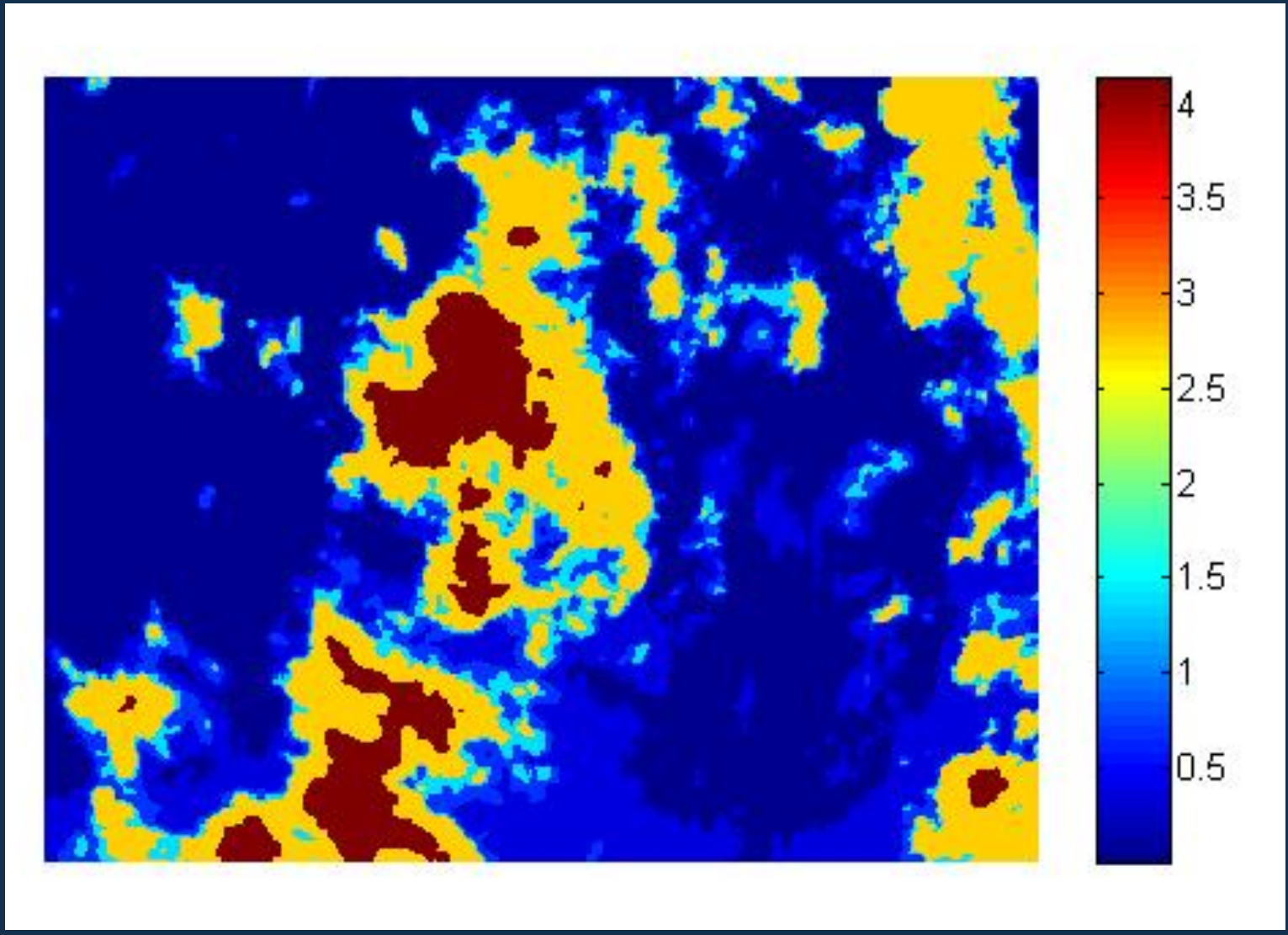
Radiance image



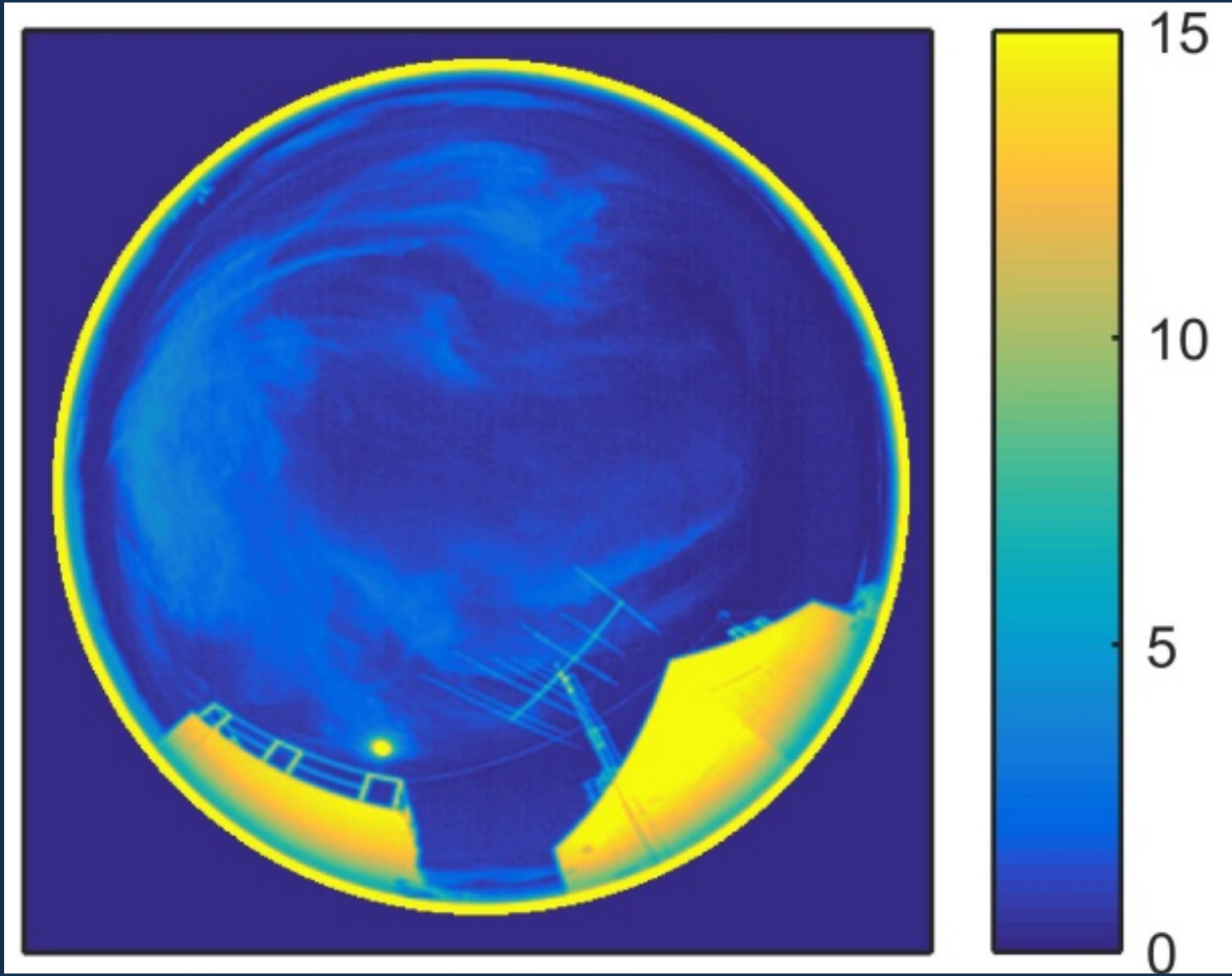
Cloud/no cloud image



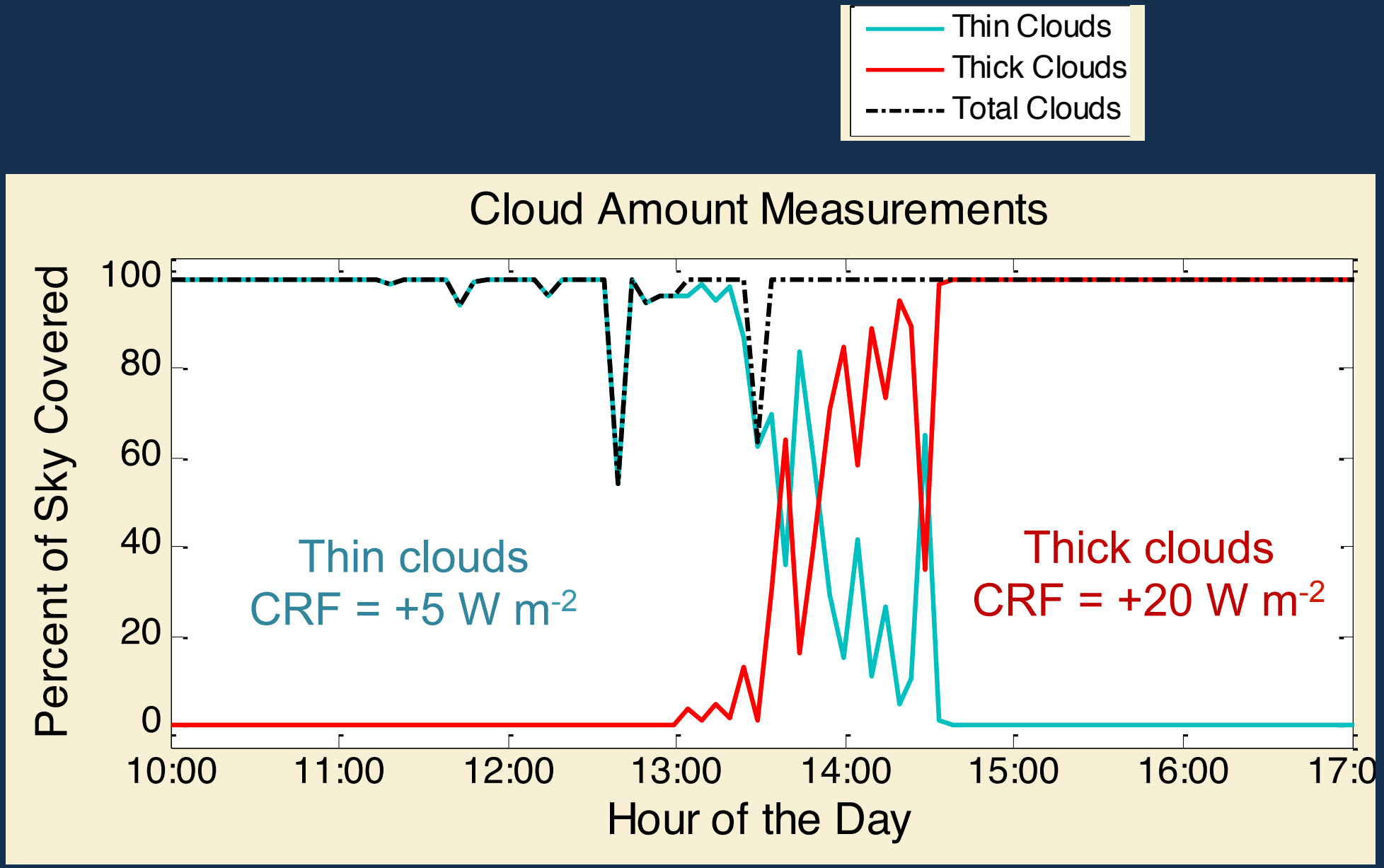
Cloud optical depth image



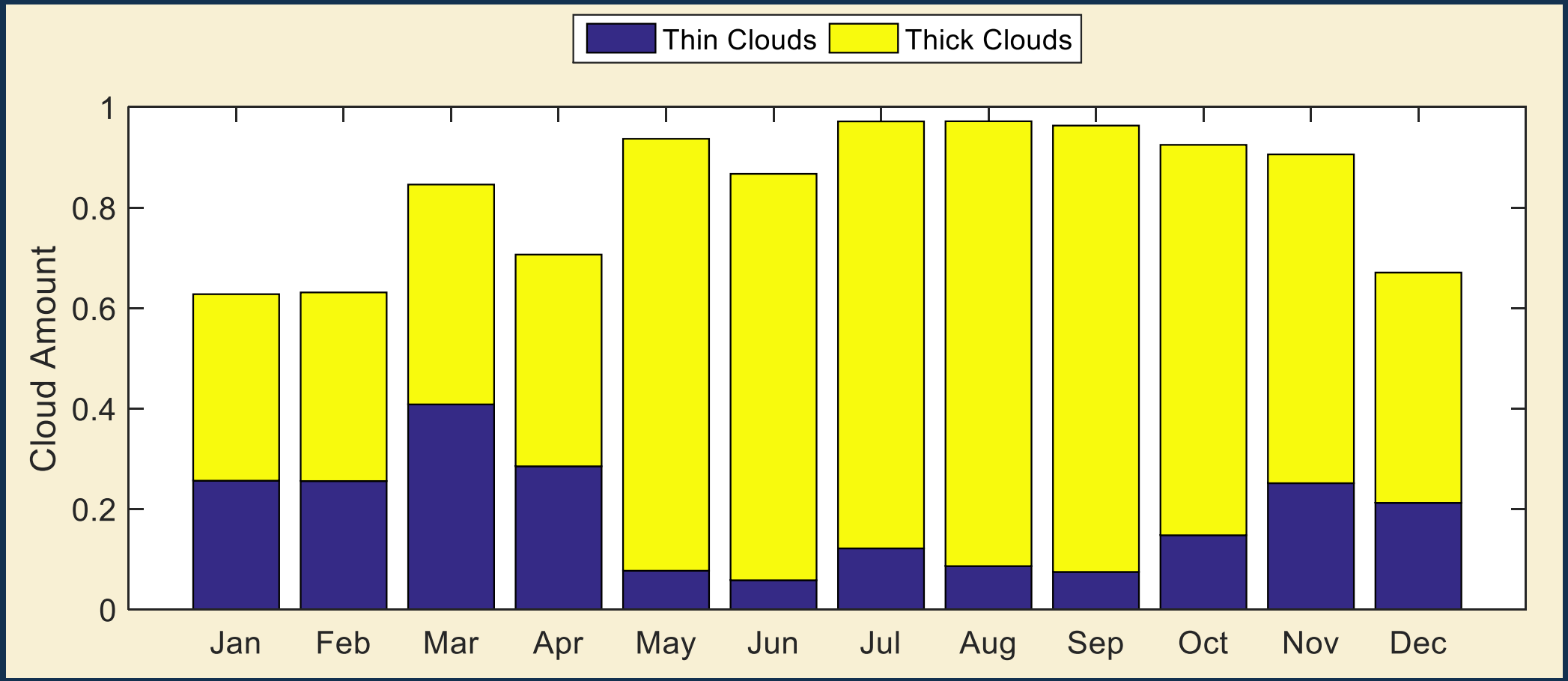
All-Sky ICI



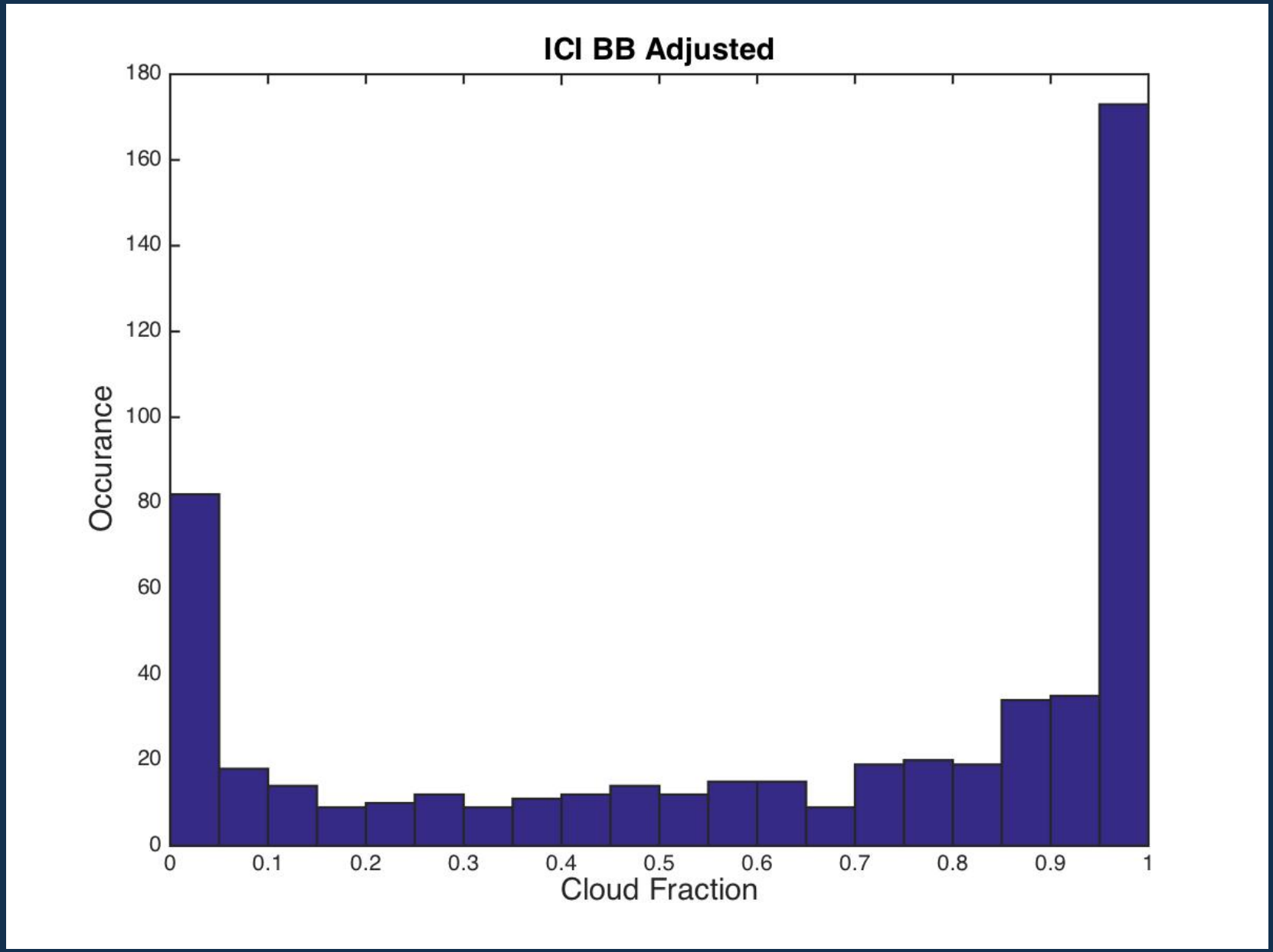
”Overcast” with variable cloud OD



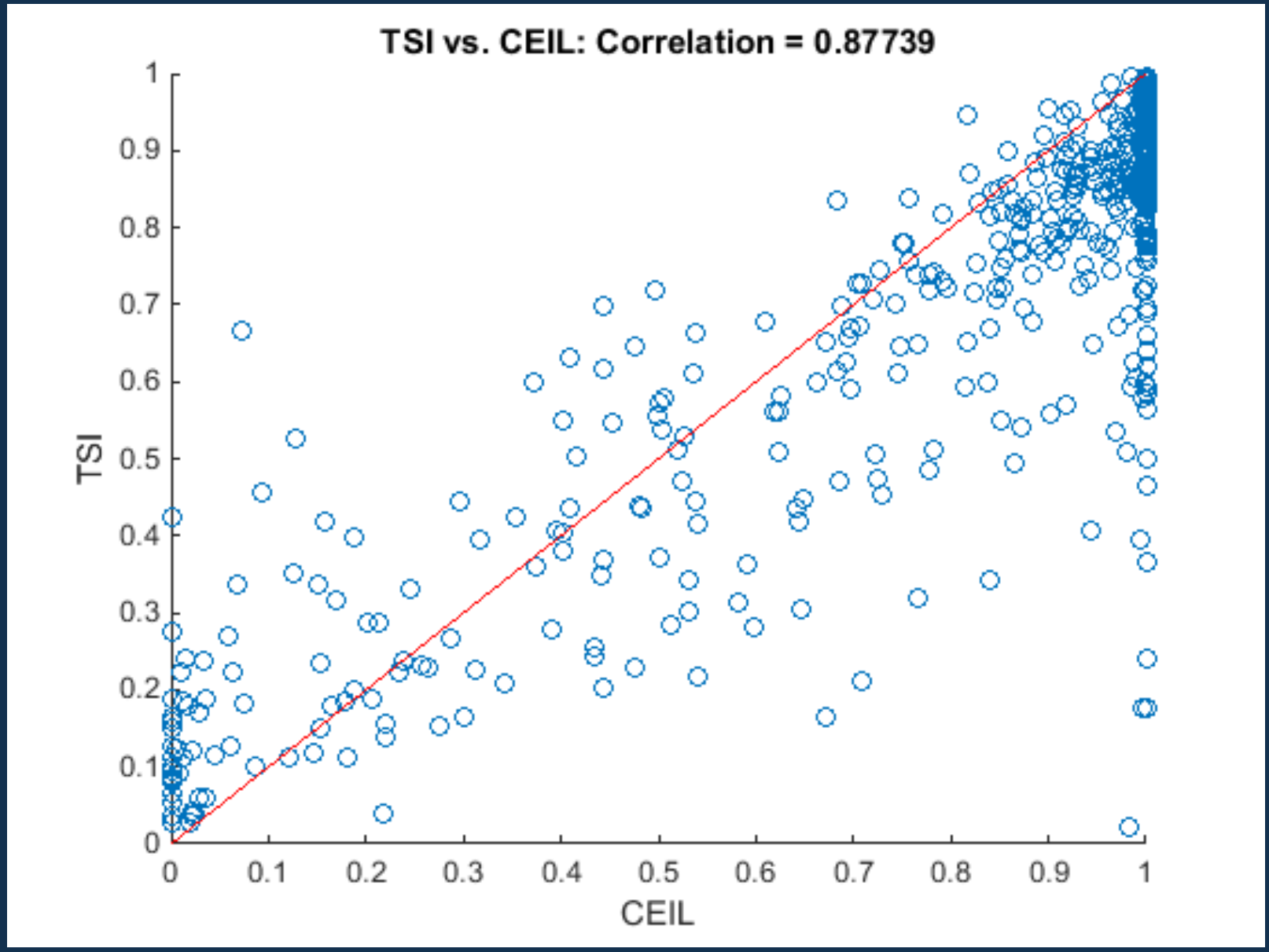
Annual Cloud Cycle at Barrow



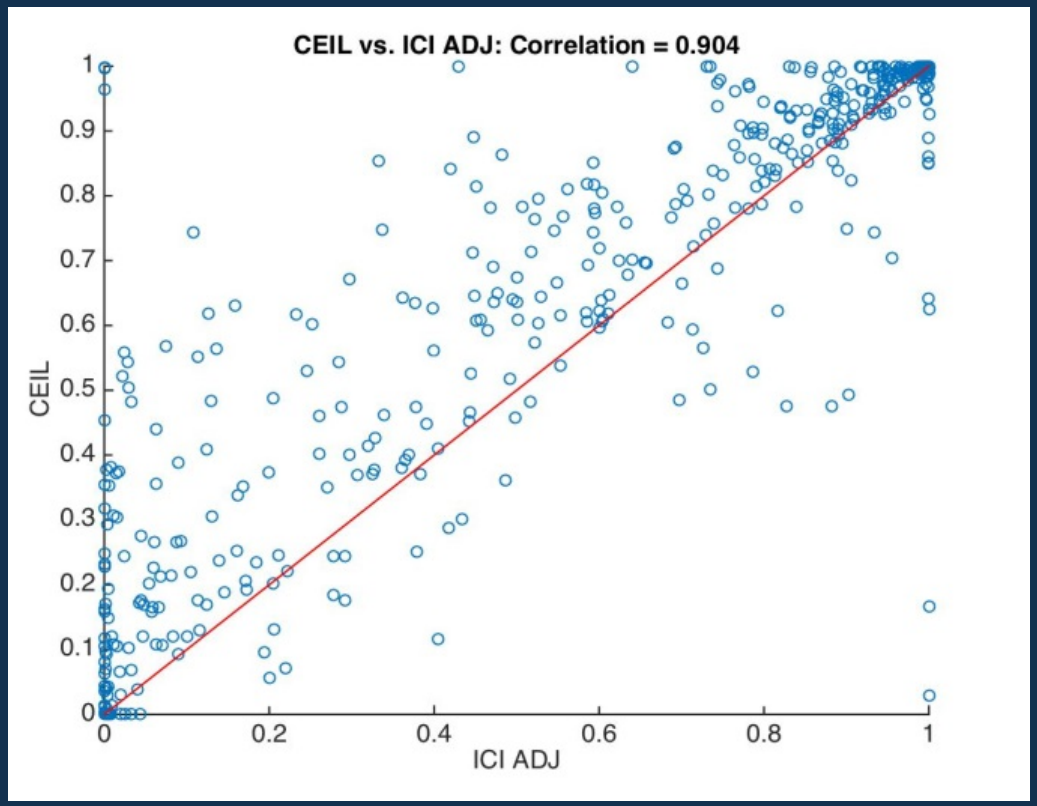
Two-year histogram of cloud fraction



Typical correlation ~0.9 for different ARM sensors

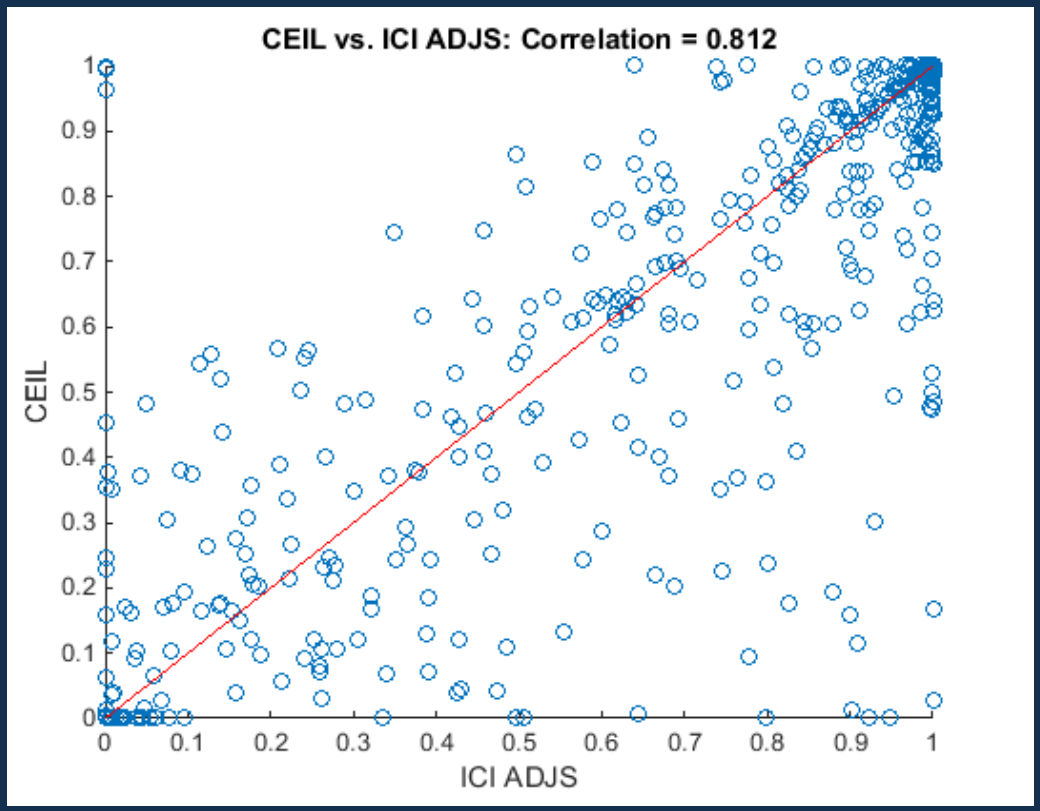


Best correlation with ARM data requires higher cloud-OD threshold



OD threshold = 1.0

OD threshold = 0.25

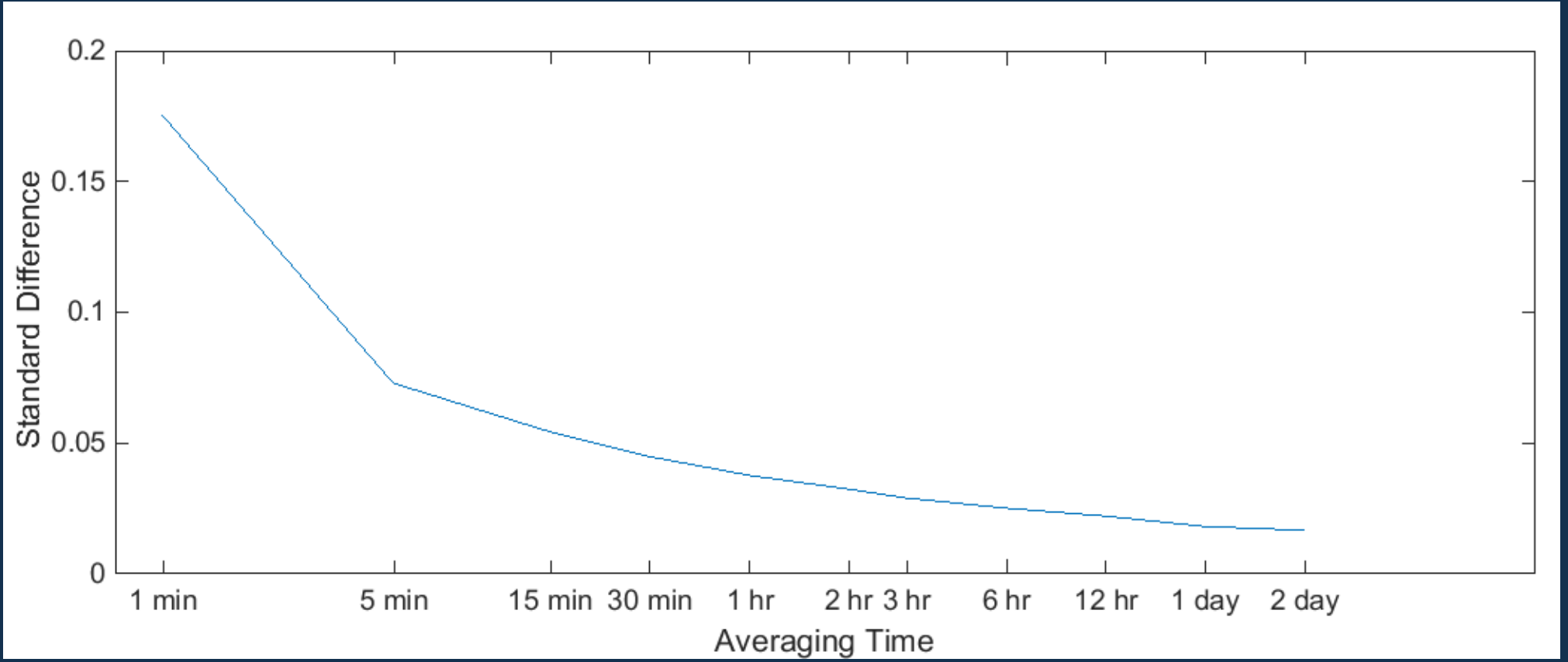


Conclusions

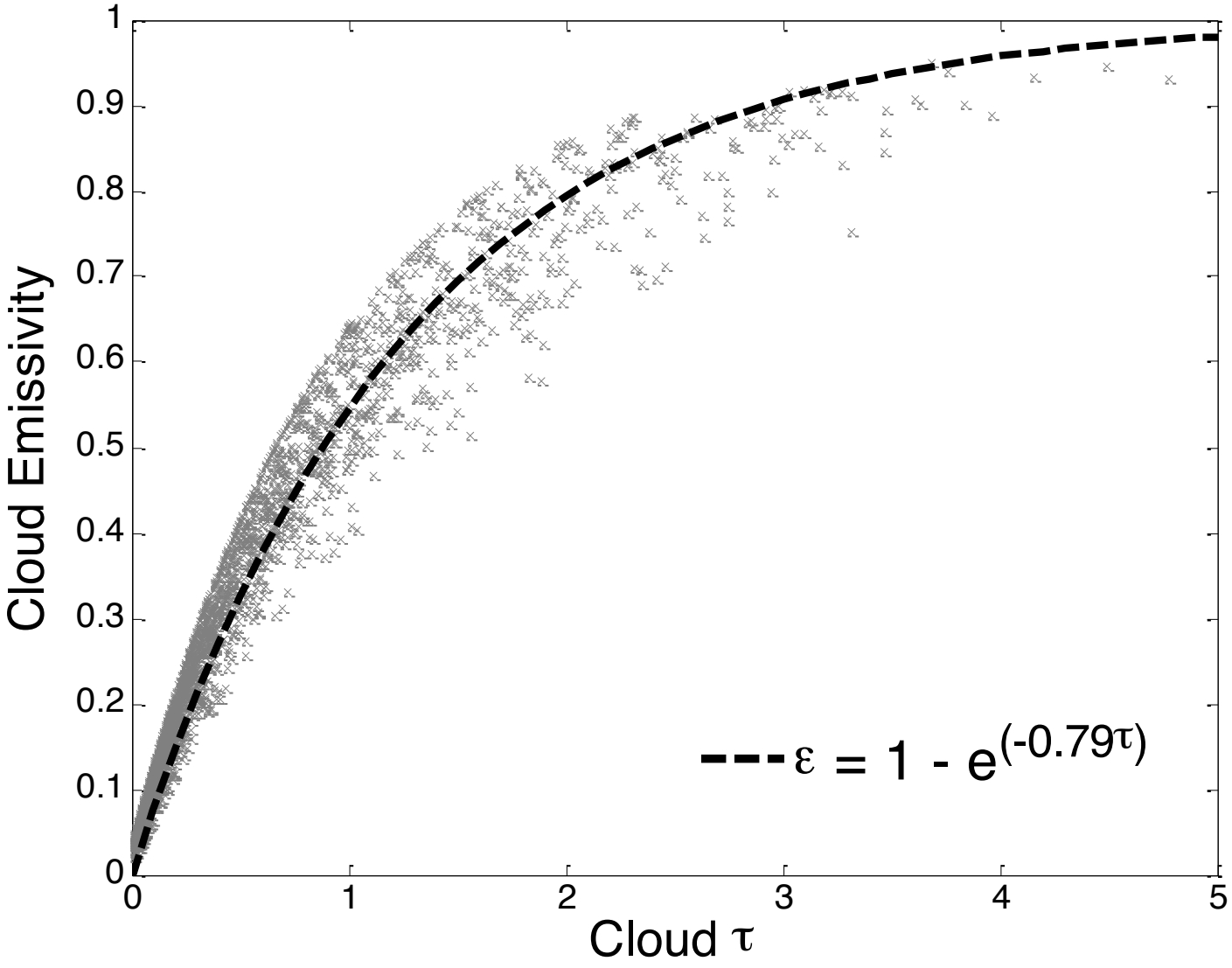
- Infrared imaging is well suited to measuring Arctic clouds
- Two-year deployment provided many instrument lessons
- Difference between full-image and zenith statistics depends on averaging time
- We saw more thin clouds than other sensors at the ARM/NSA site
- Interested in collaborations to use spatial and temporal information

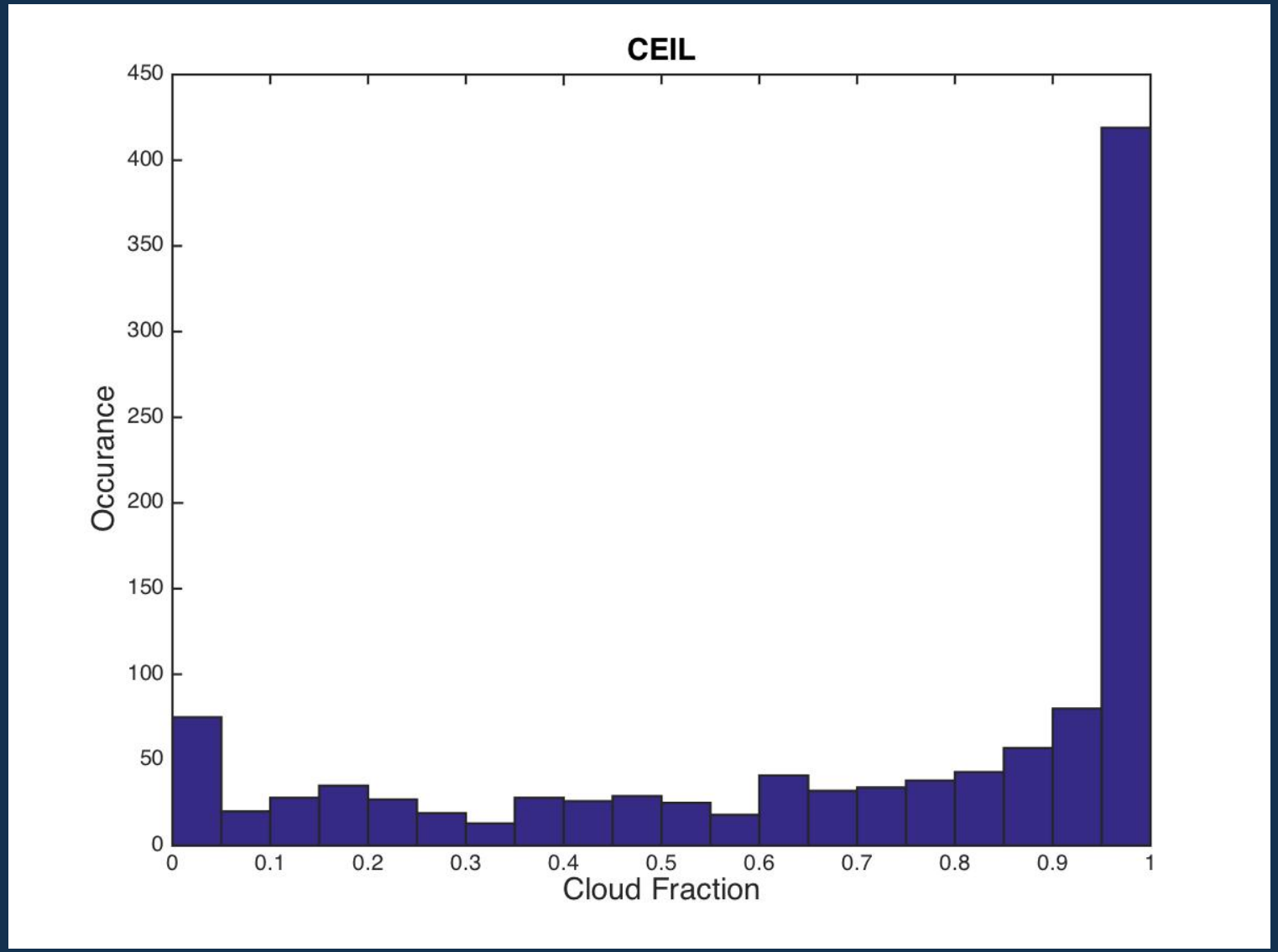
We gratefully acknowledge financial support from the NSF Arctic Observing Network and deployment support from the DoE ARM NSA Site.

Difference between full-image statistics and zenith statistics depends on averaging time

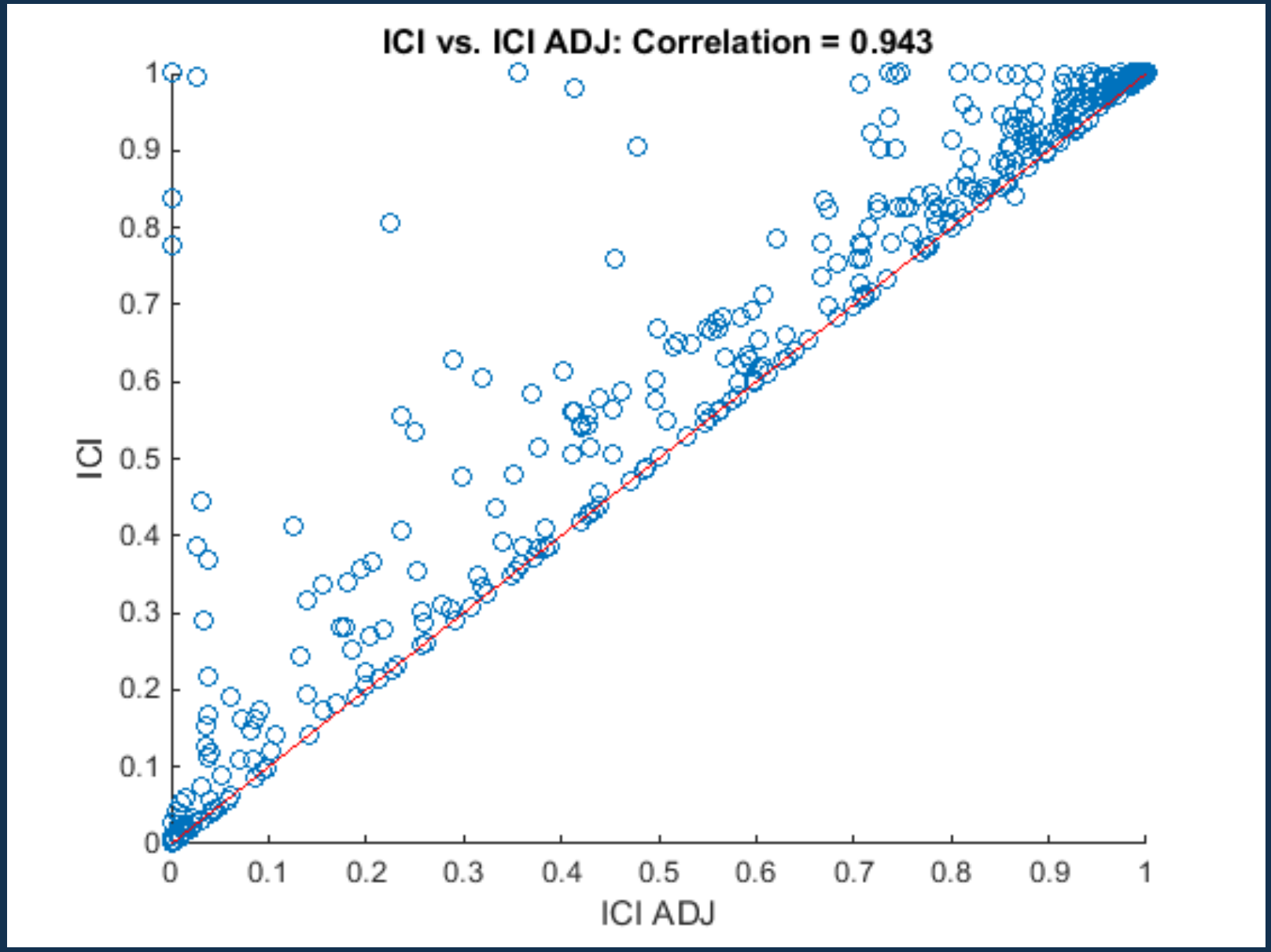


IR imager is sensitive to OD ≤ 4




CEIL
Occurance
Cloud Fraction
0
50
100
150
200
250
300
350
400
450
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

ICI with and without blackbody



Infrared Cloud Imager (ICI)

Compact system

IR imaging provides day-night consistency

Nighttime visible

Nighttime IR