National Aeronautics and Space Administration

Level-2 Land Surface Temperature Emissivity, and Cloud Mask

Glynn Hulley[1], Robert Freepartner[1], Robert Radocinski[1], Gerardo Rivera[1], Simon Hook[1] Frank Goettsche[2]

1. Jet Propulsion Laboratory, California Institute of Technology

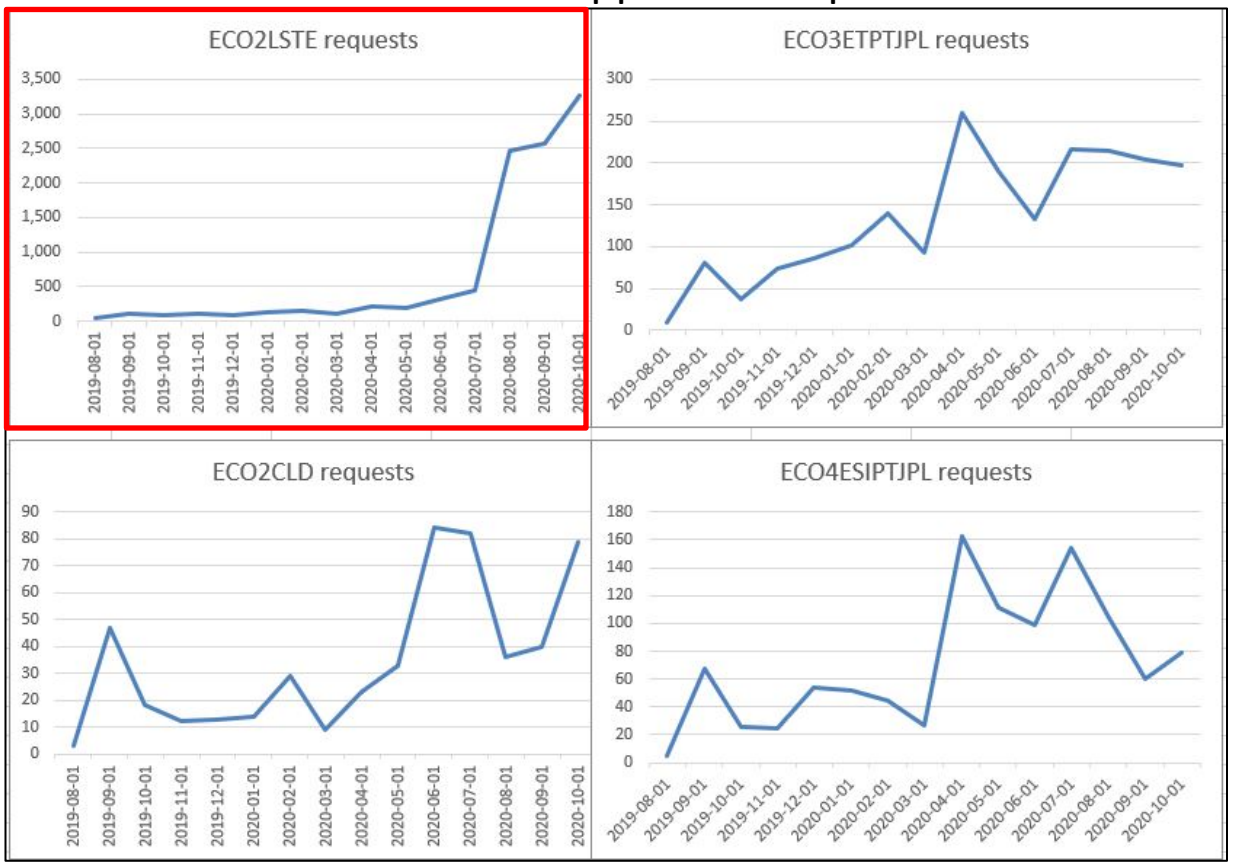
2. Karlsruhe Institute of Technology

ECOSTRESS Virtual Science Team meeting, 1 December, 2020

Outline

1. L2 highlight
2. Cloud mask update
3. Stage-2 Validation

LPDAAC AppEEARS requests



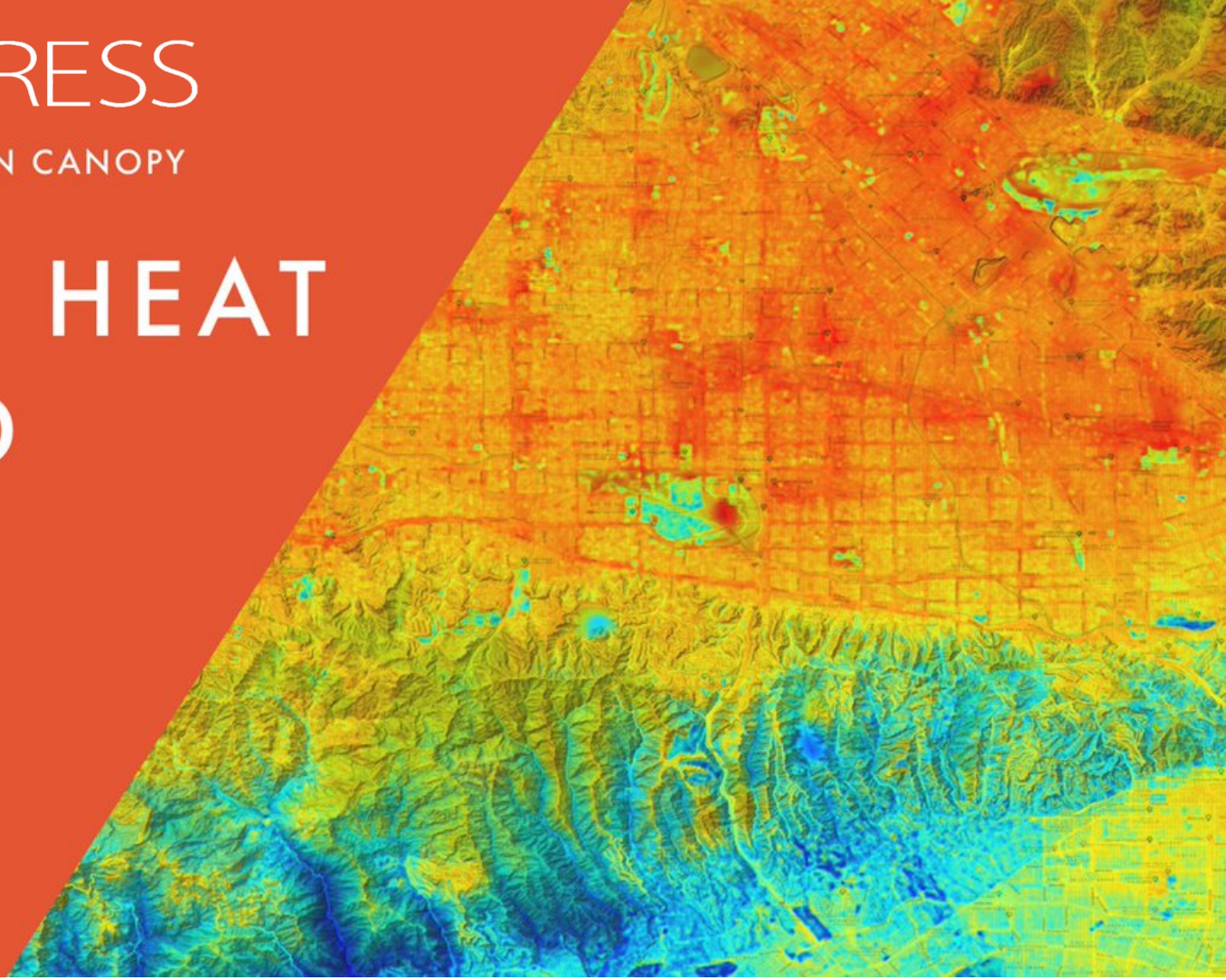
ECOSTRESS

EARTH HACKS + URBAN CANOPY

URBAN HEAT ISLAND

HACKATHON

17TH - 18TH
OCTOBER 2020



Sanjana Paul,
Cofounder & Executive director, Earth Hacks

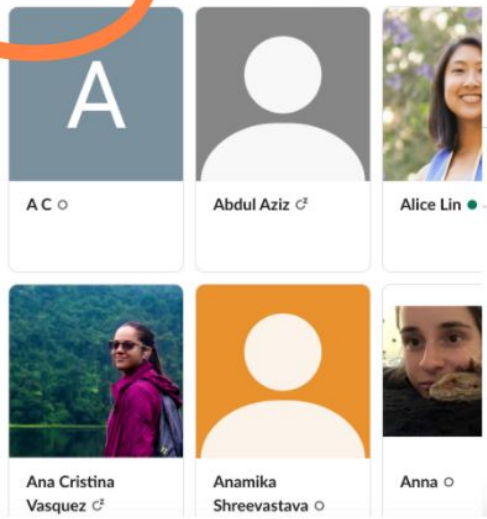
Katie Patrick,
Founder, Urban Canopy, Hello World Labs

103 People working on 21 cities

Members

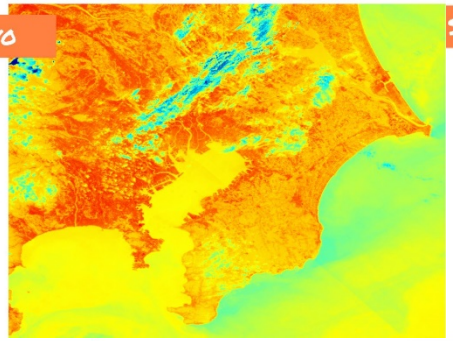
Search name, role or team

103 members

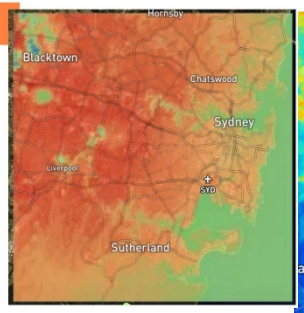


Name	Owner
asian-team-mapping	Elton Chan
Beijing	Li Ming Tan
Berlin	Lucia Layritz
CA Central Valley, 2020.07.27	John Noble
El Chicago Fuego	Bill Yen
Hackathon Recordings	Sanjana Paul
Heaters Gonna Heat_SaoPaulo_Tampa	Trista Brophy
Houston	Edward Pettitt
LEOG_SYDNEY	Leonardo Gonzalez
Los Angeles, 2020.08.14	John Noble
Mumbai	Alice Lin
New York City	Audrey Acken
Newcastle NSW Aus	Karenne Jurd
Philadelphia	Leandra Lipat
Portland	Anna Hugney
San Diego	Drew Resnick
Seattle	Anna Hugney
Silicon Valley, 2020.08.03	John Noble
Tacoma	Phillip Carew
Team San Jose	hannahchatham
Vancouver	Lucia Layritz

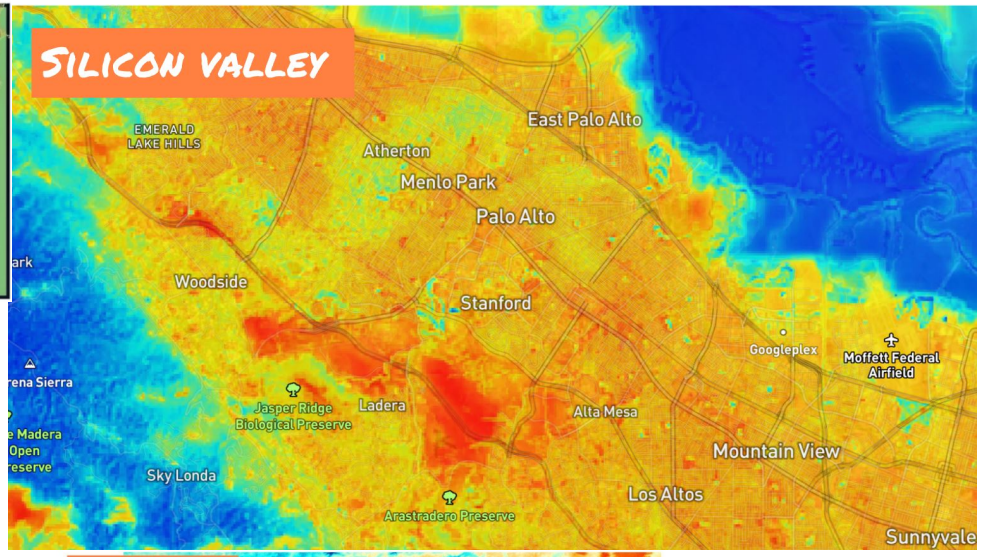
Tokyo



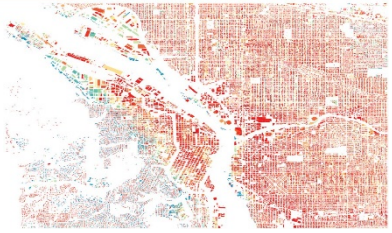
Sydney



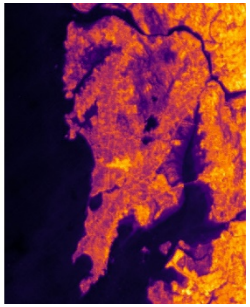
Silicon valley



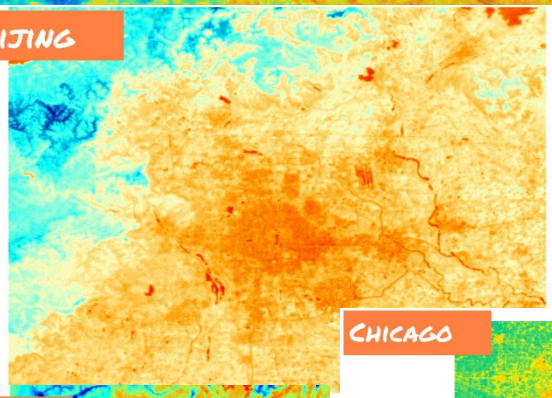
Portland



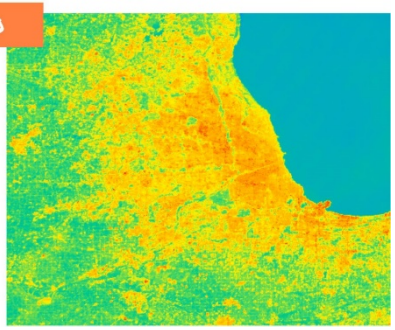
Mumbai



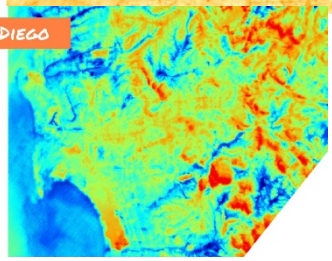
Beijing



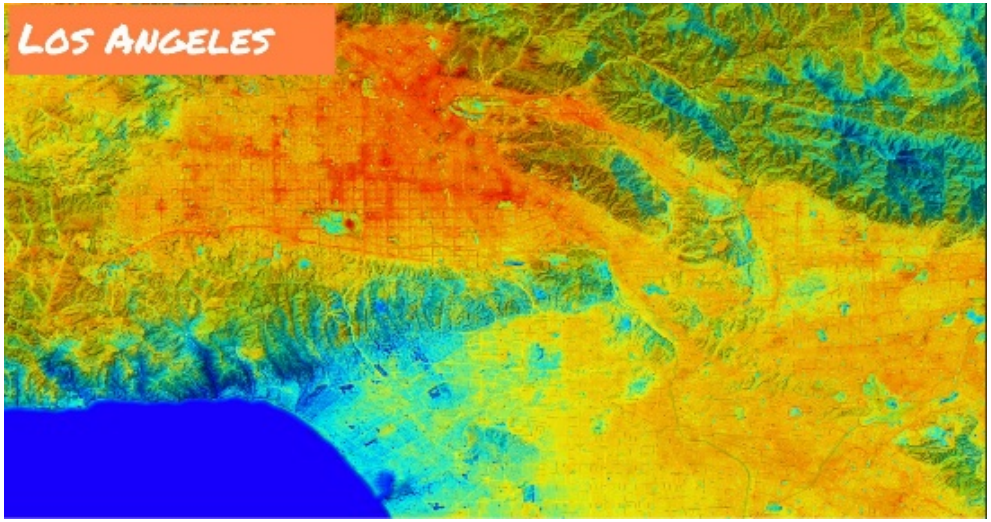
Chicago



San Diego



Los Angeles



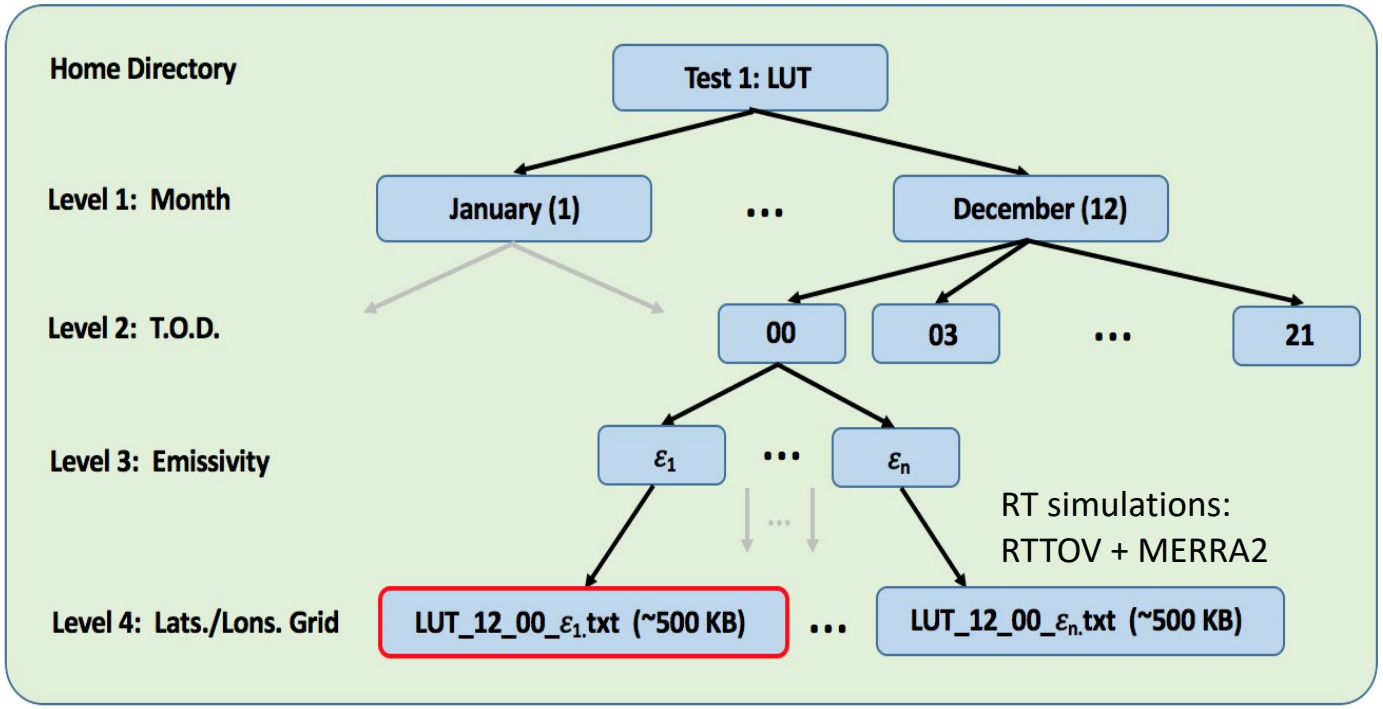
TIR-only Cloud Mask Update

- ECOSTRESS has two TIR cloud tests:
  1. BT11: Band 4 brightness temperature threshold (day/night, elevation)
  - Commission errors for clouds over cold background
  - Omission errors for low, warm summertime clouds

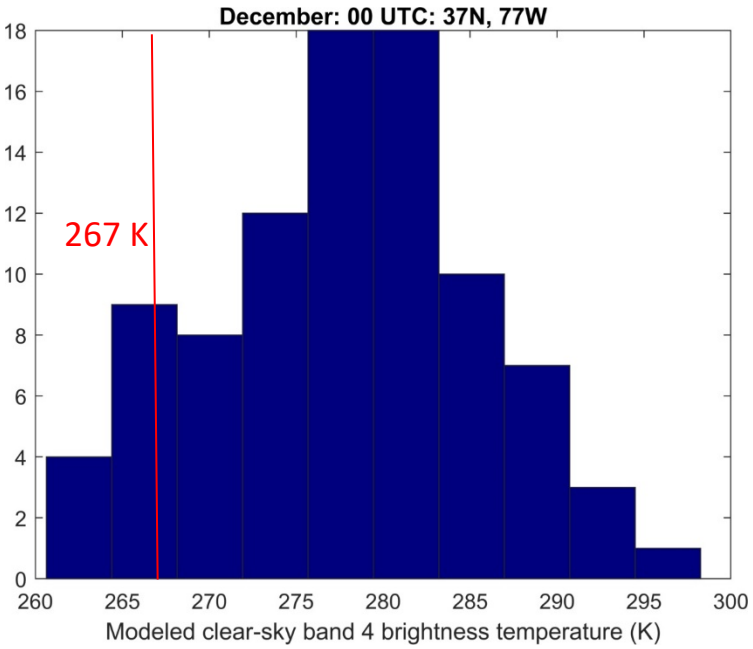
  2. BT11 – BT12: Band 4 – 5 brightness temperature difference threshold for thin cirrus

  <u>But due to variable overpass and high spatial resolution:</u>

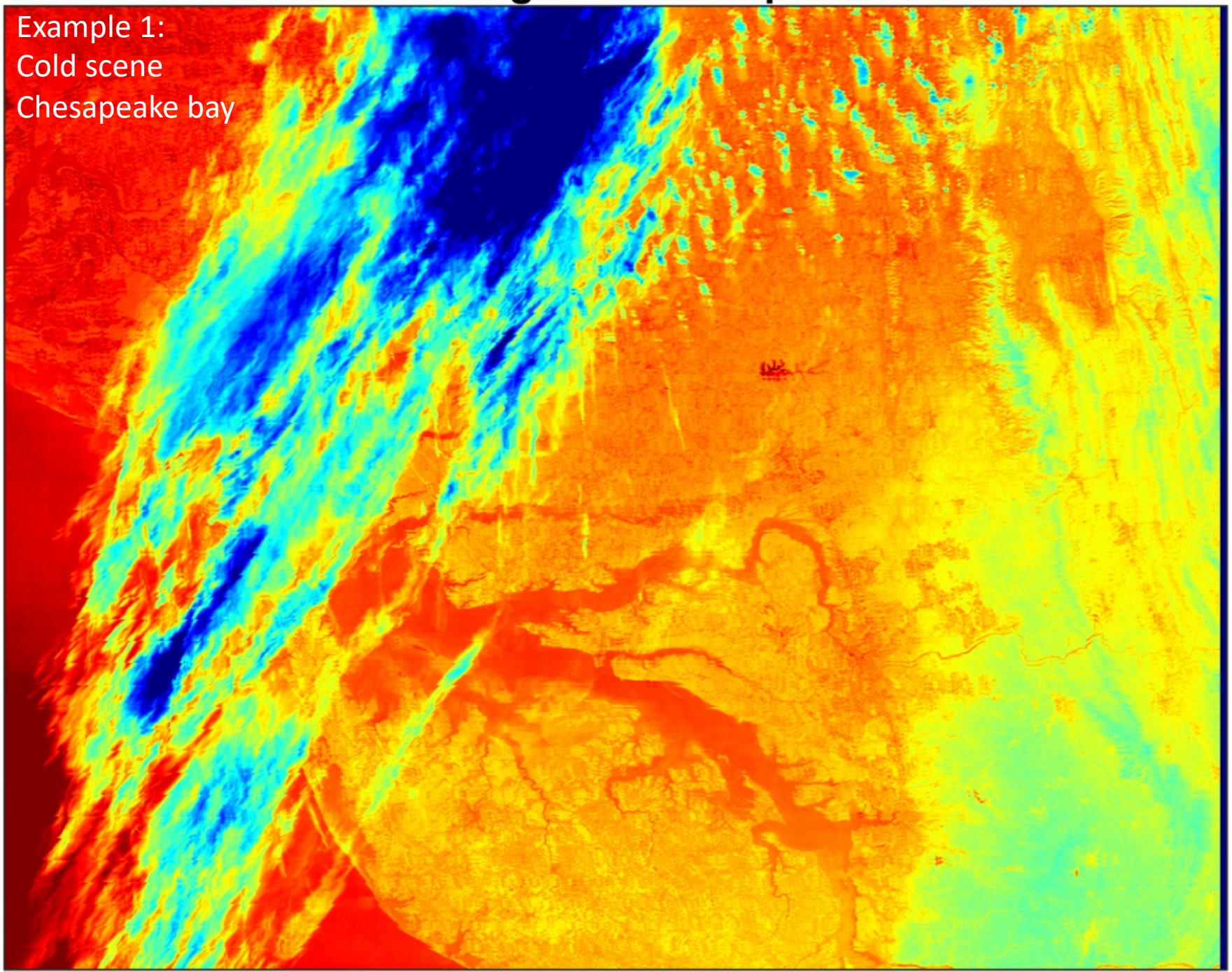
  1. BT11 threshold (location, hour of day, month, elevation)



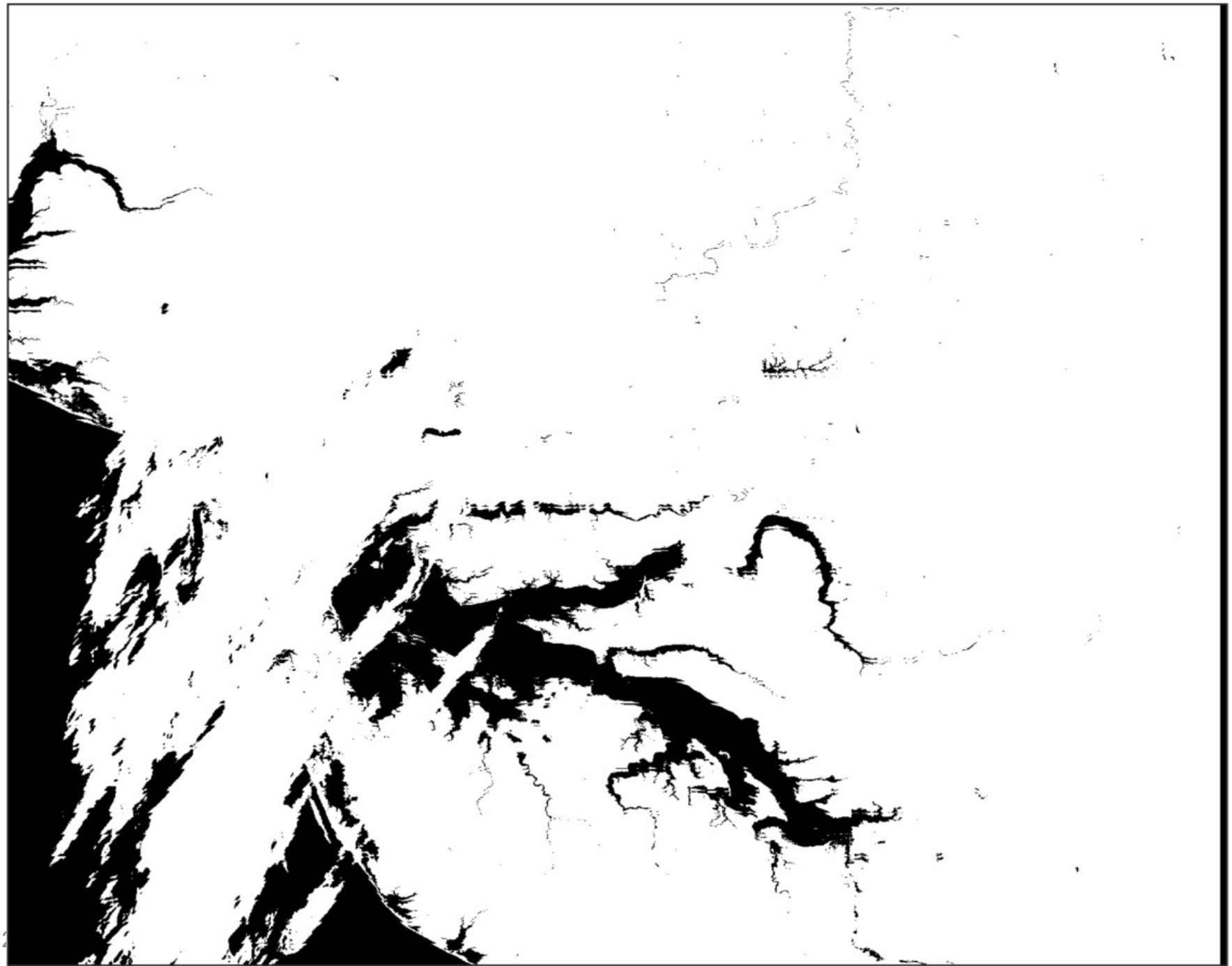
Threshold = Q1 – 1.5*IQR
Q1 = 25th percentile
IQR = Interquartile range
(75-25th percentile)



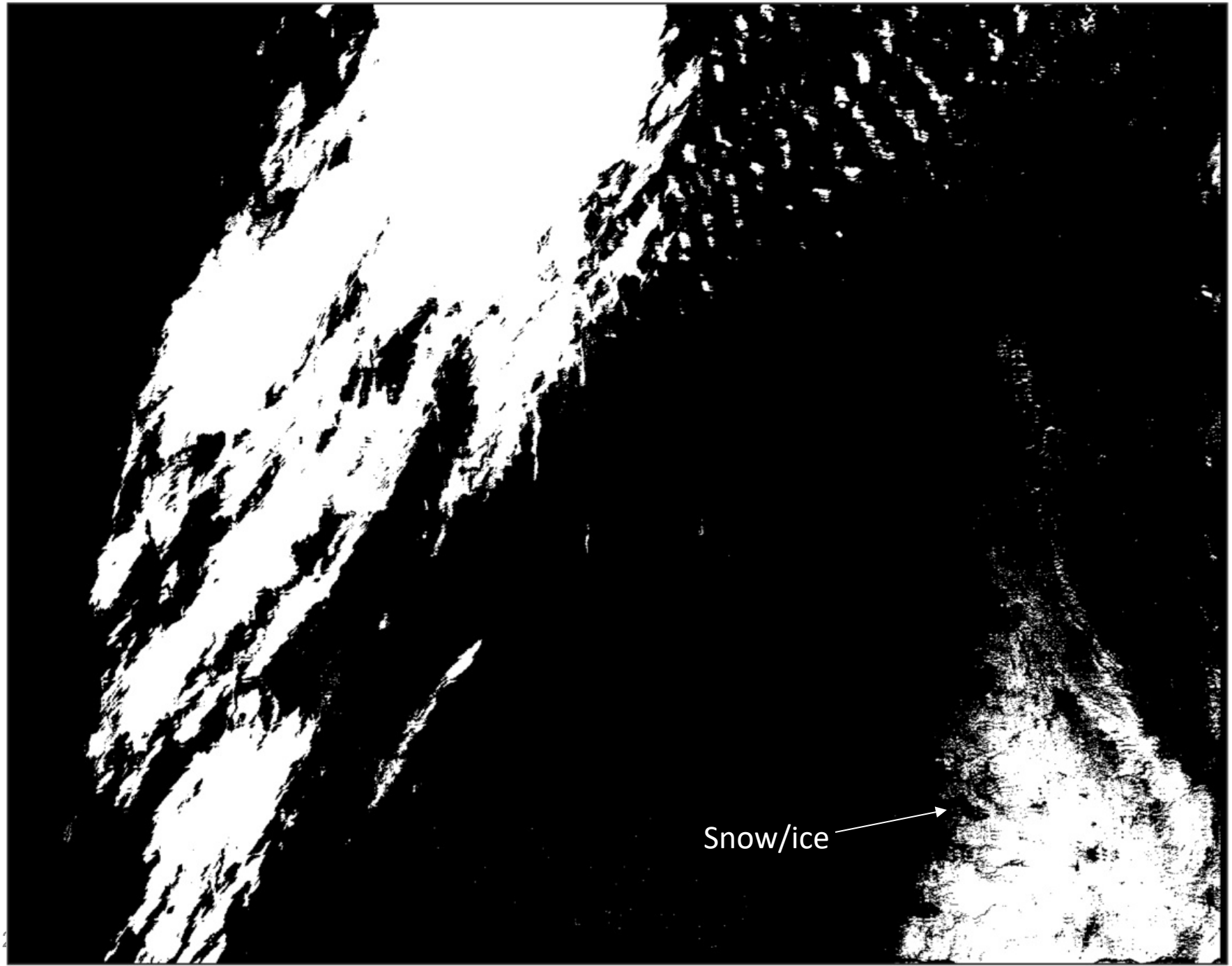
Band 4 Brightness Temperature



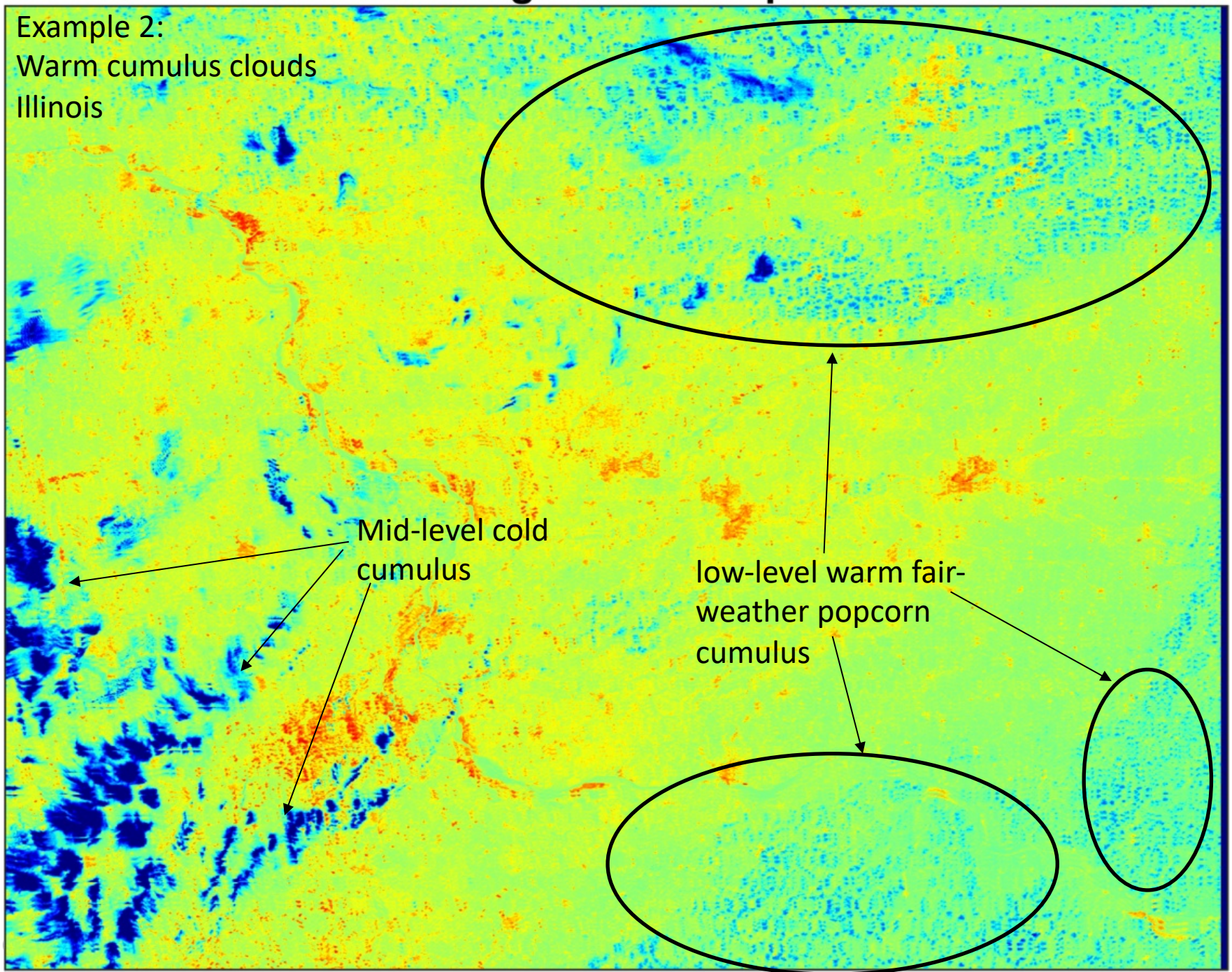
ECO2CLOUD V1



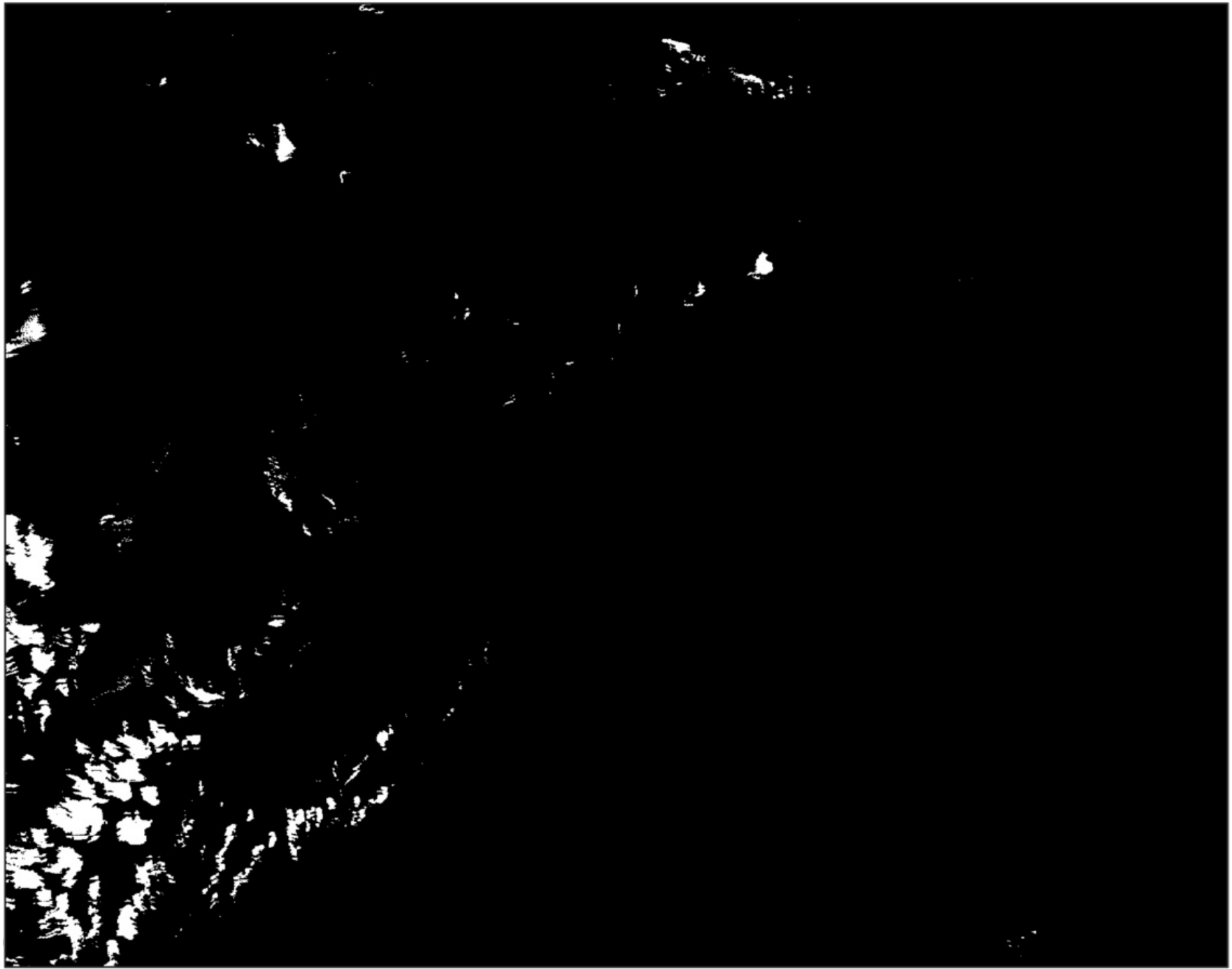
ECO2CLOUD V2



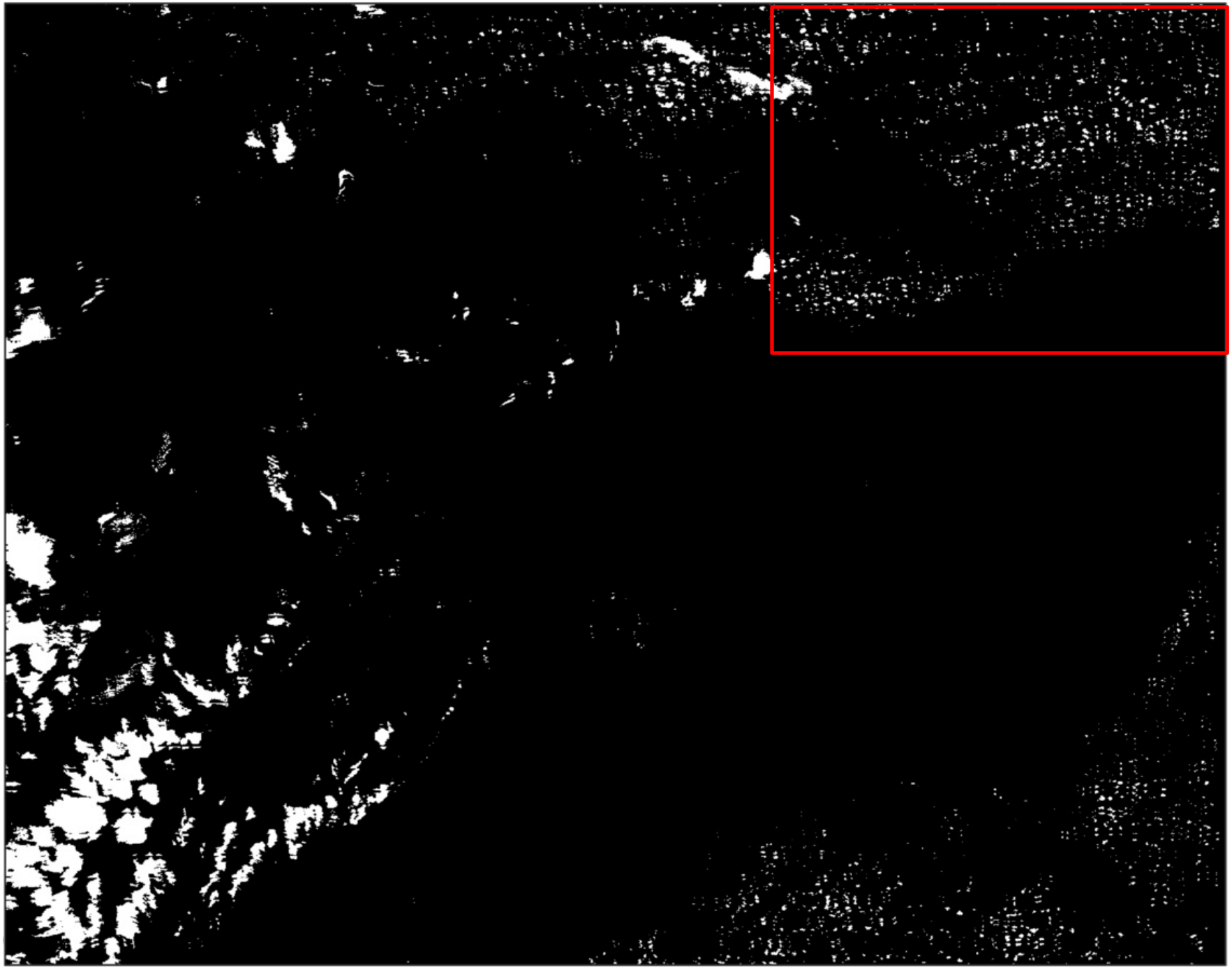
Band 4 Brightness Temperature

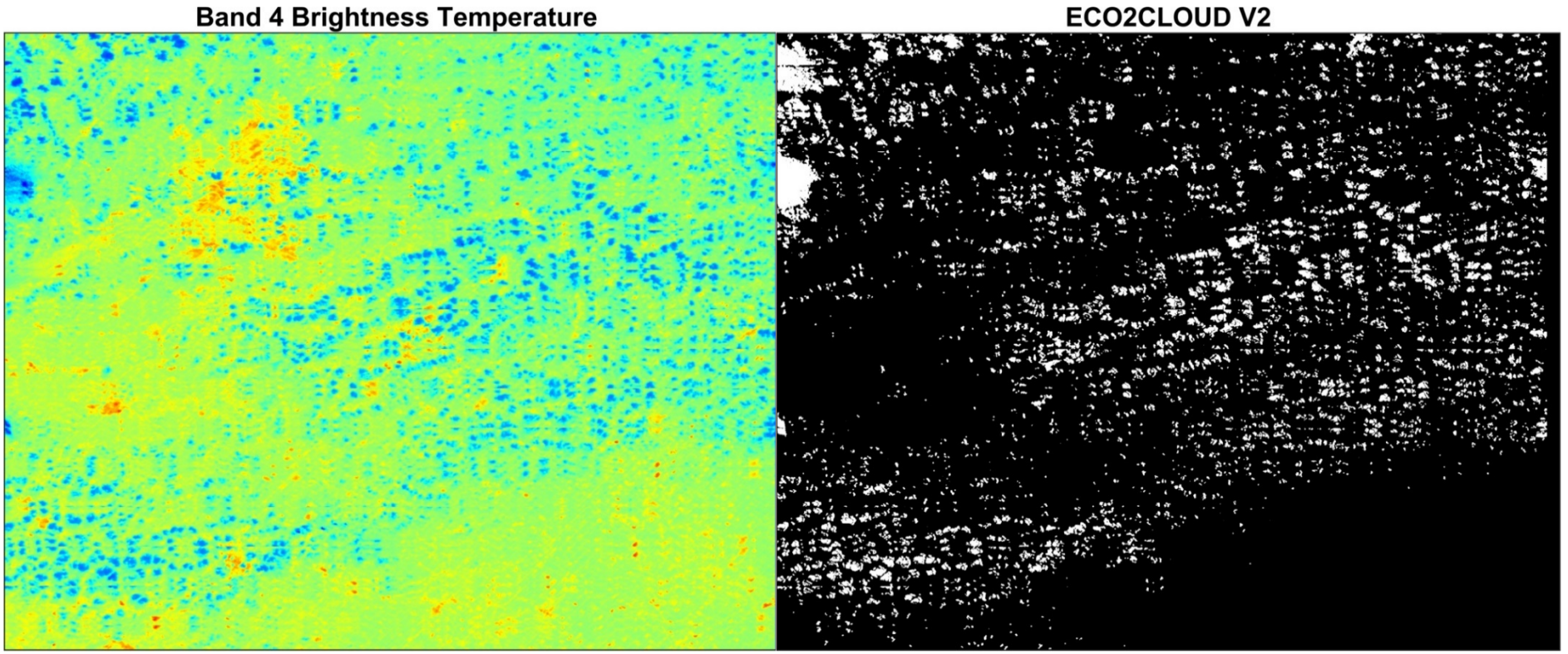


ECO2CLOUD V1



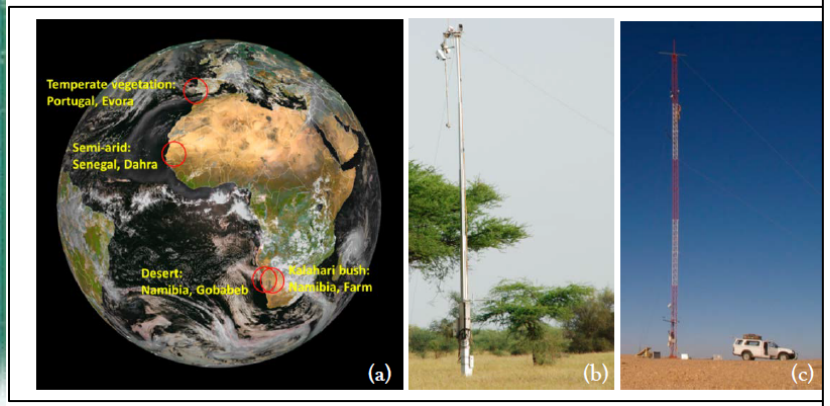
ECO2CLOUD V2

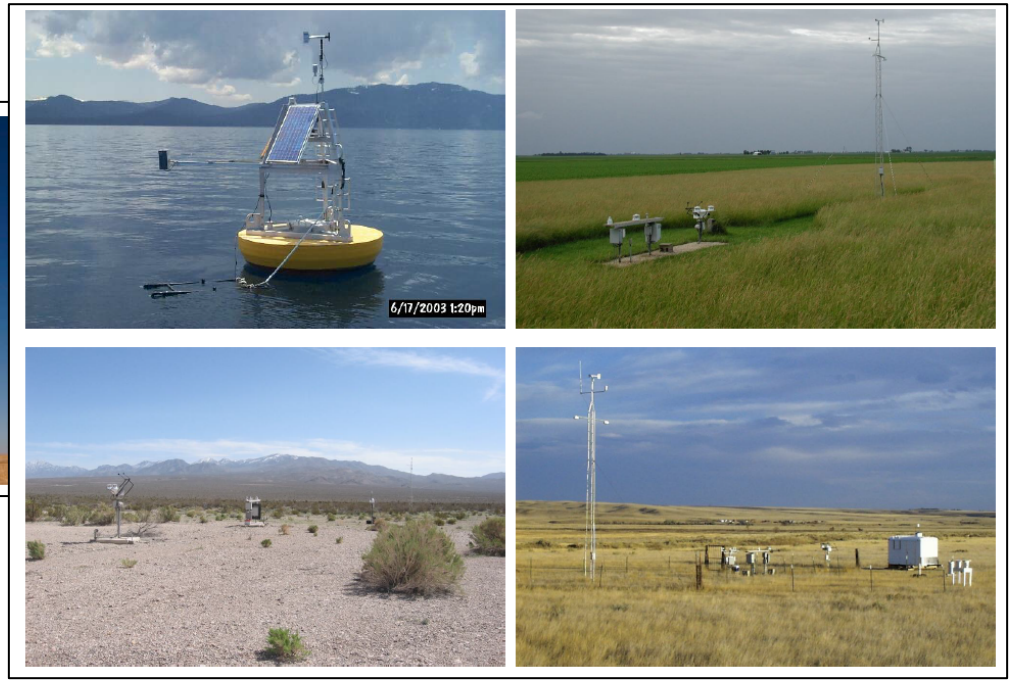



Band 4 Brightness Temperature
ECO2CLOUD V2

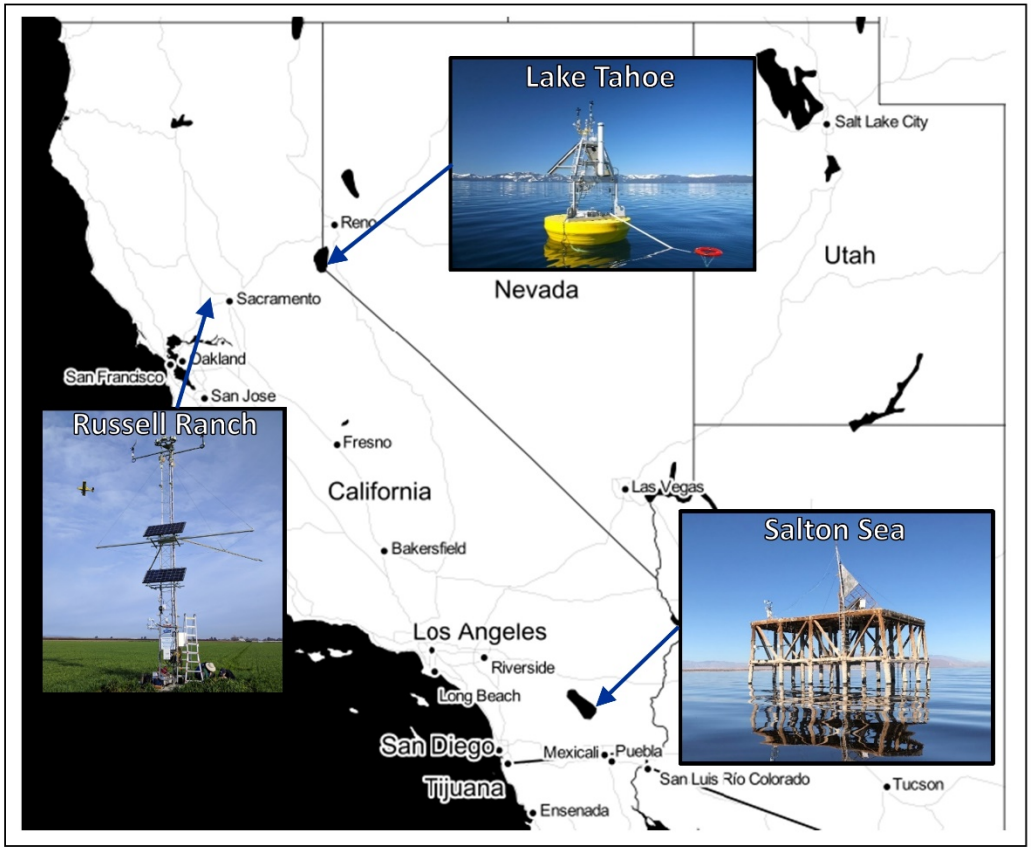
CEOS LST validation best practices

1. Temperature-based validation
2. Radiance-based validation
3. Sensor LST product intercomparisons
4. Time-series analysis



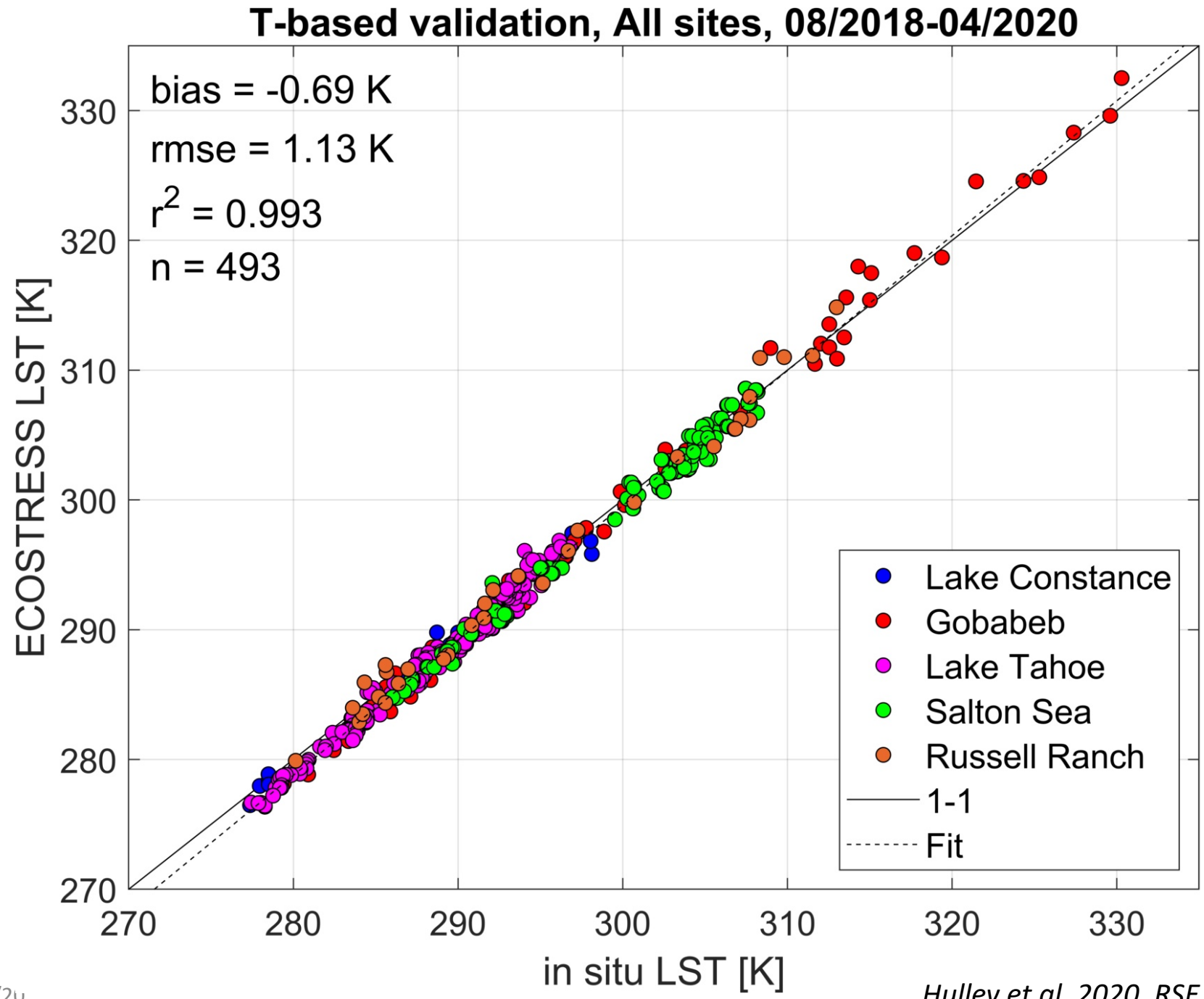


Temperature-based sites



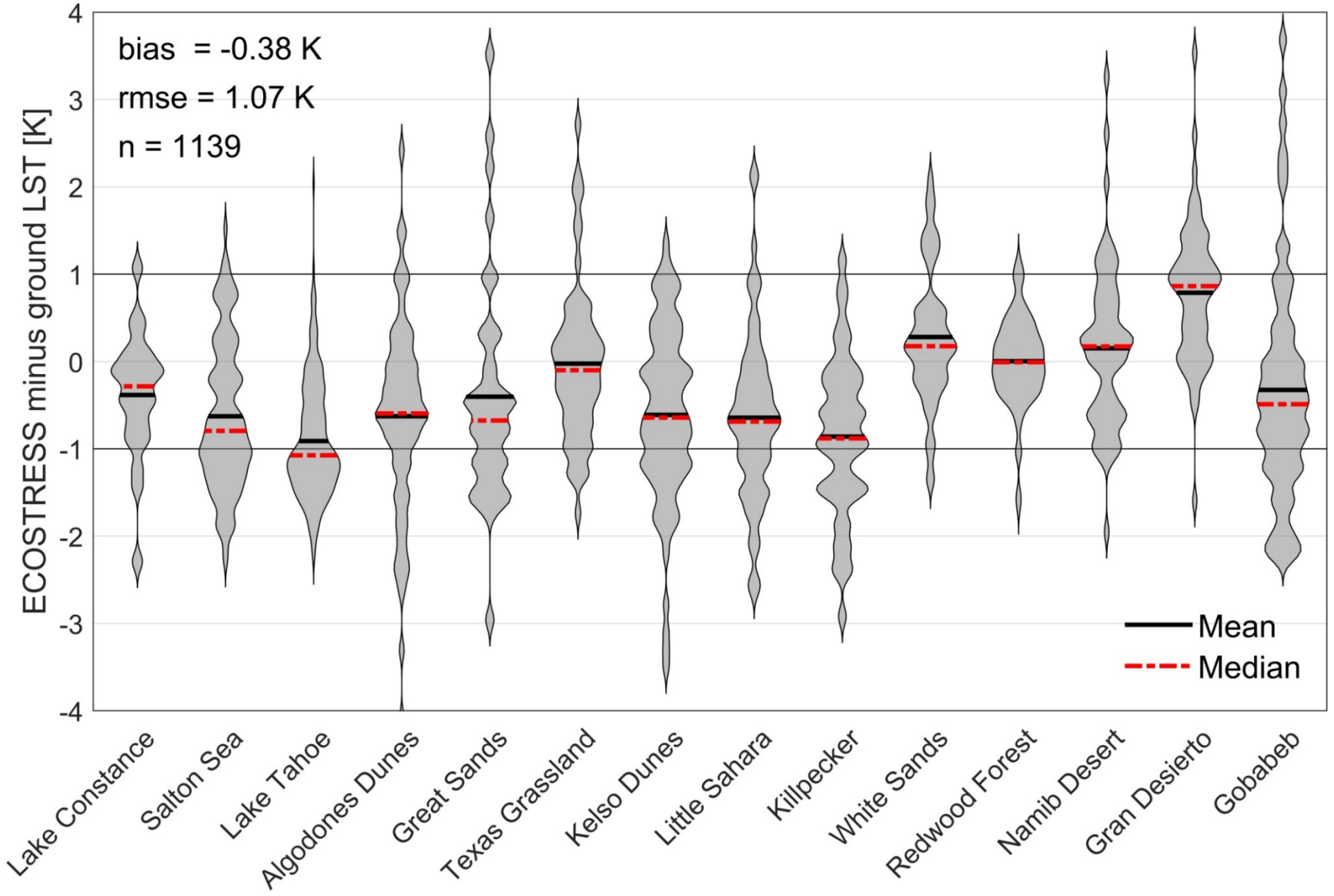
Gobabeb, Namibia

Lake Constance, Switzerland



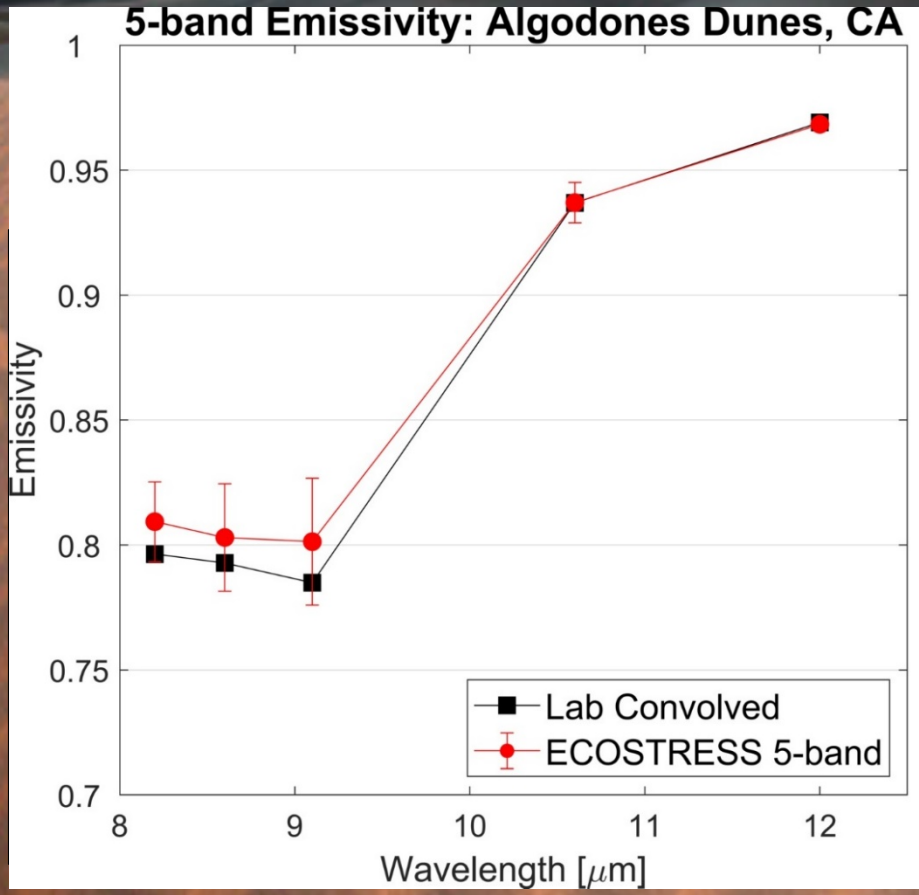
Hulley et al. 2020, RSE

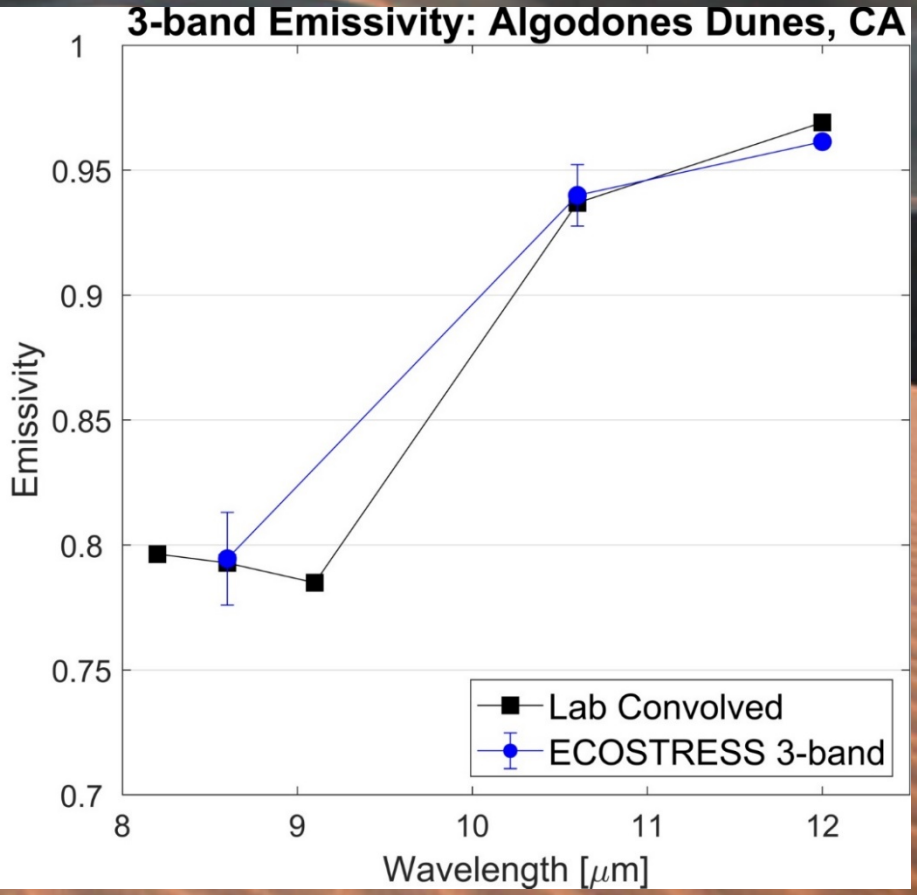
LST validation summary: T-based and R-based sites

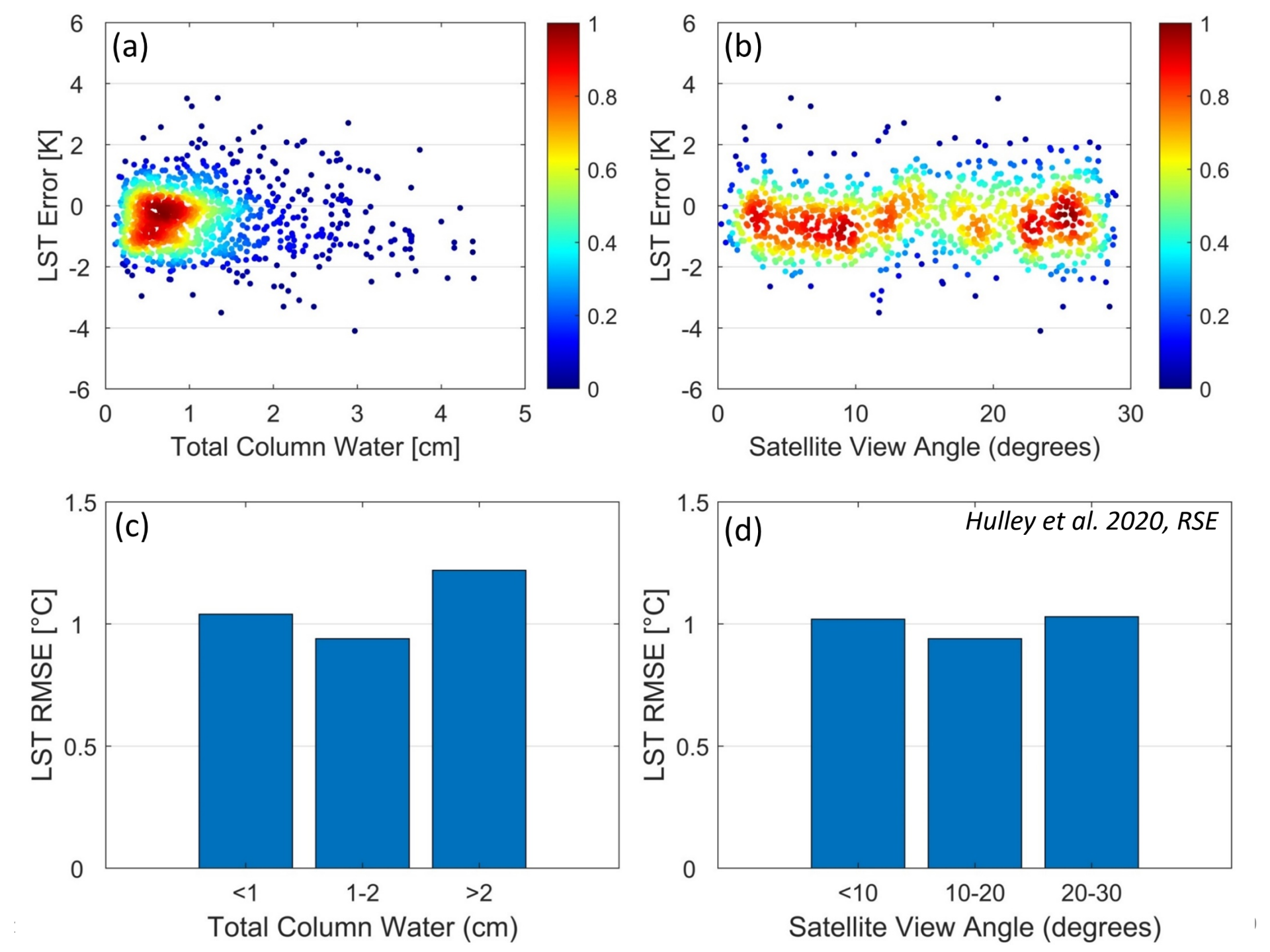


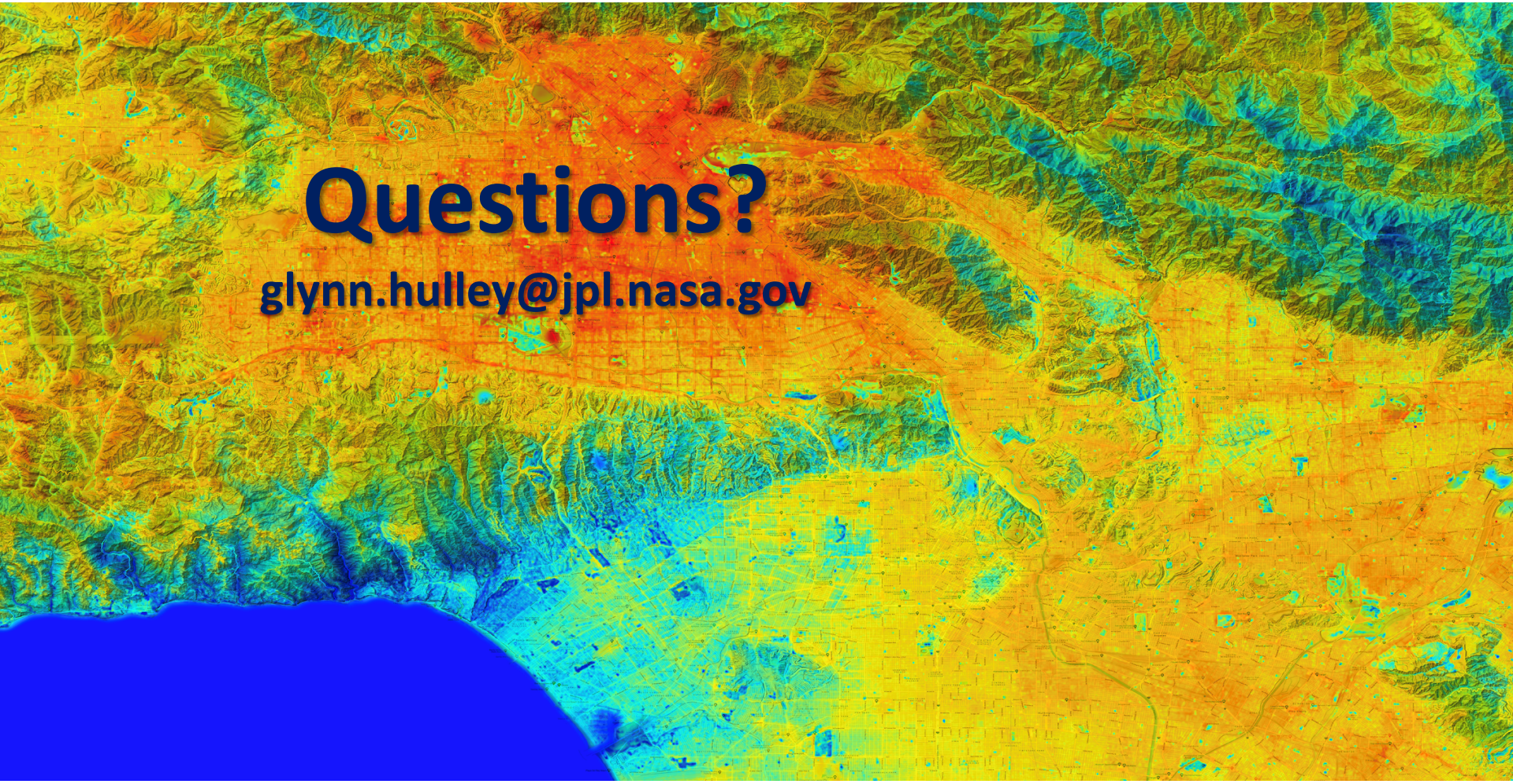
Hulley et al. 2020, RSE

Algodones Dunes, CA






(a)
LST Error [K]
Total Column Water [cm]
(b)
Satellite View Angle (degrees)
(c)
LST RMSE [°C]
<1
1-2
>2
Total Column Water (cm)
(d)
Hulley et al. 2020, RSE
<10
10-20
20-30
Satellite View Angle (degrees)


Questions?
glynn.hulley@jpl.nasa.gov