Applications in Agriculture for High Spatiotemporal Resolution ET Datasets

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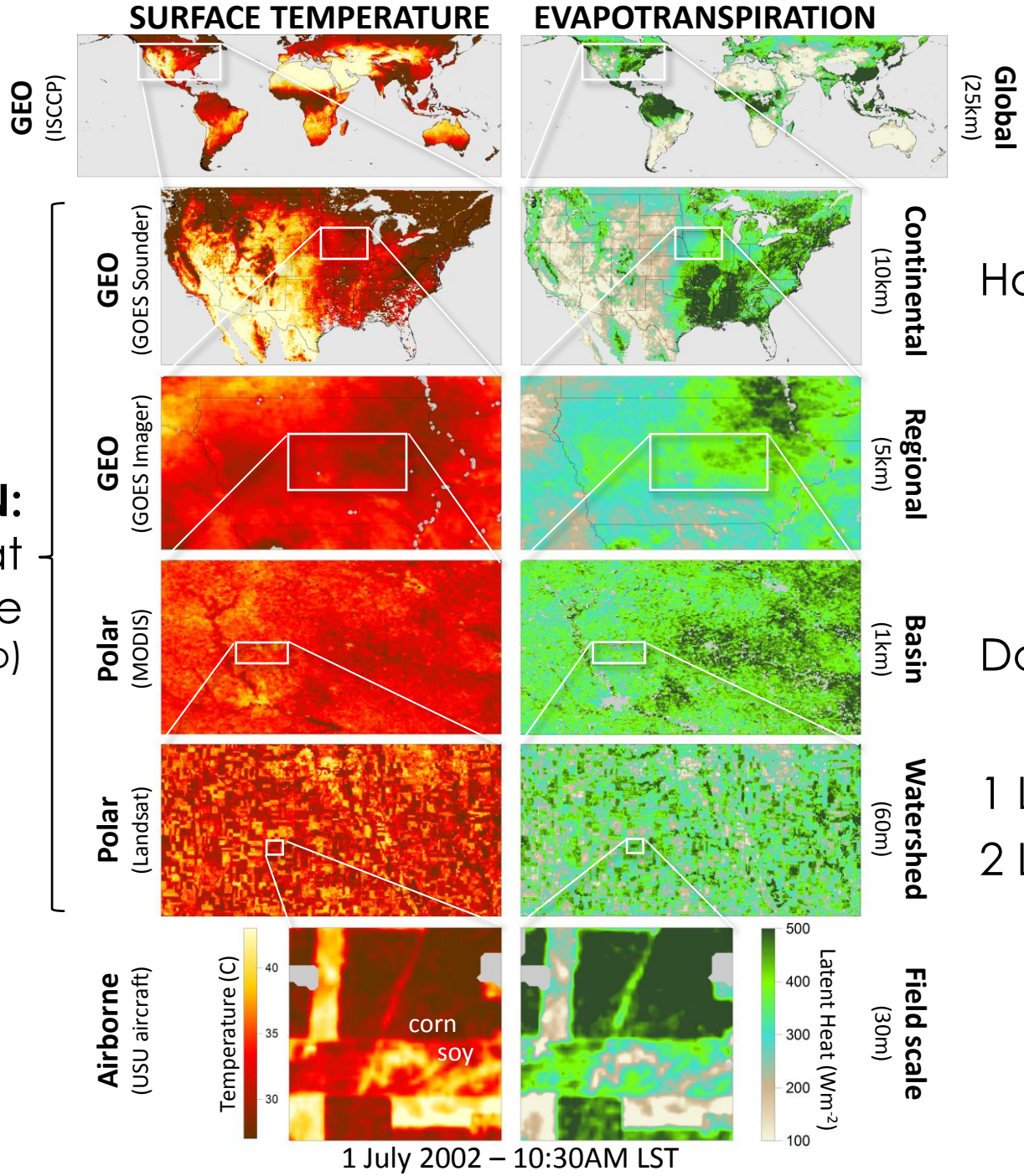


DATA FUSION:
daily ET at field scale
(F. Gao)

Hourly

Daily

1 LS – 16 day
2 LS – 8 day

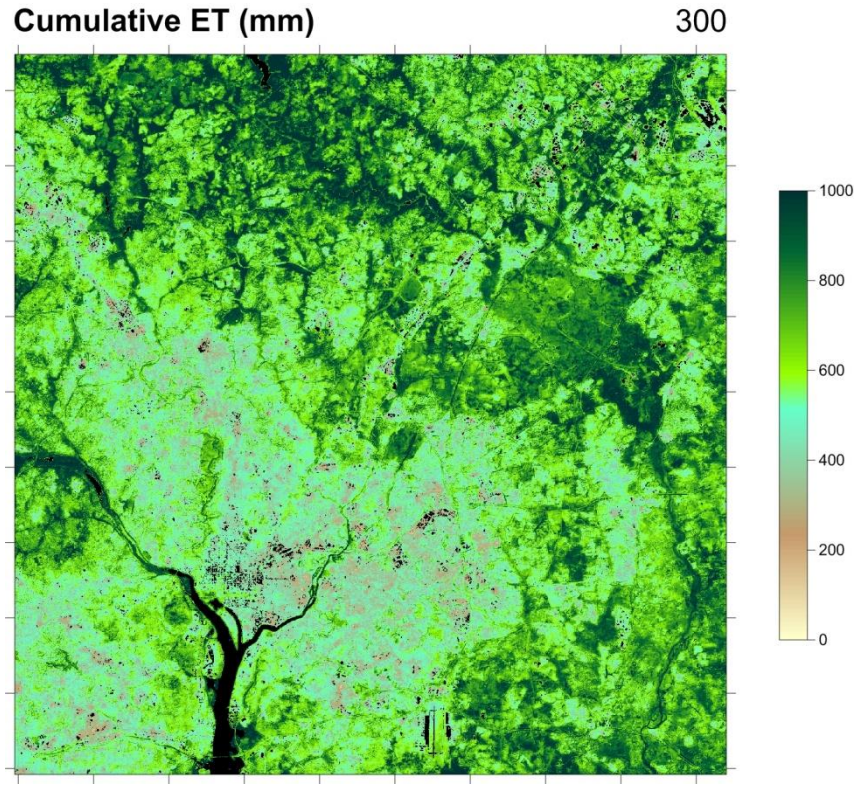
APPLICATIONS FOR HIGH RESOLUTION ET DATACUBES

… water quality

… water use

… water security

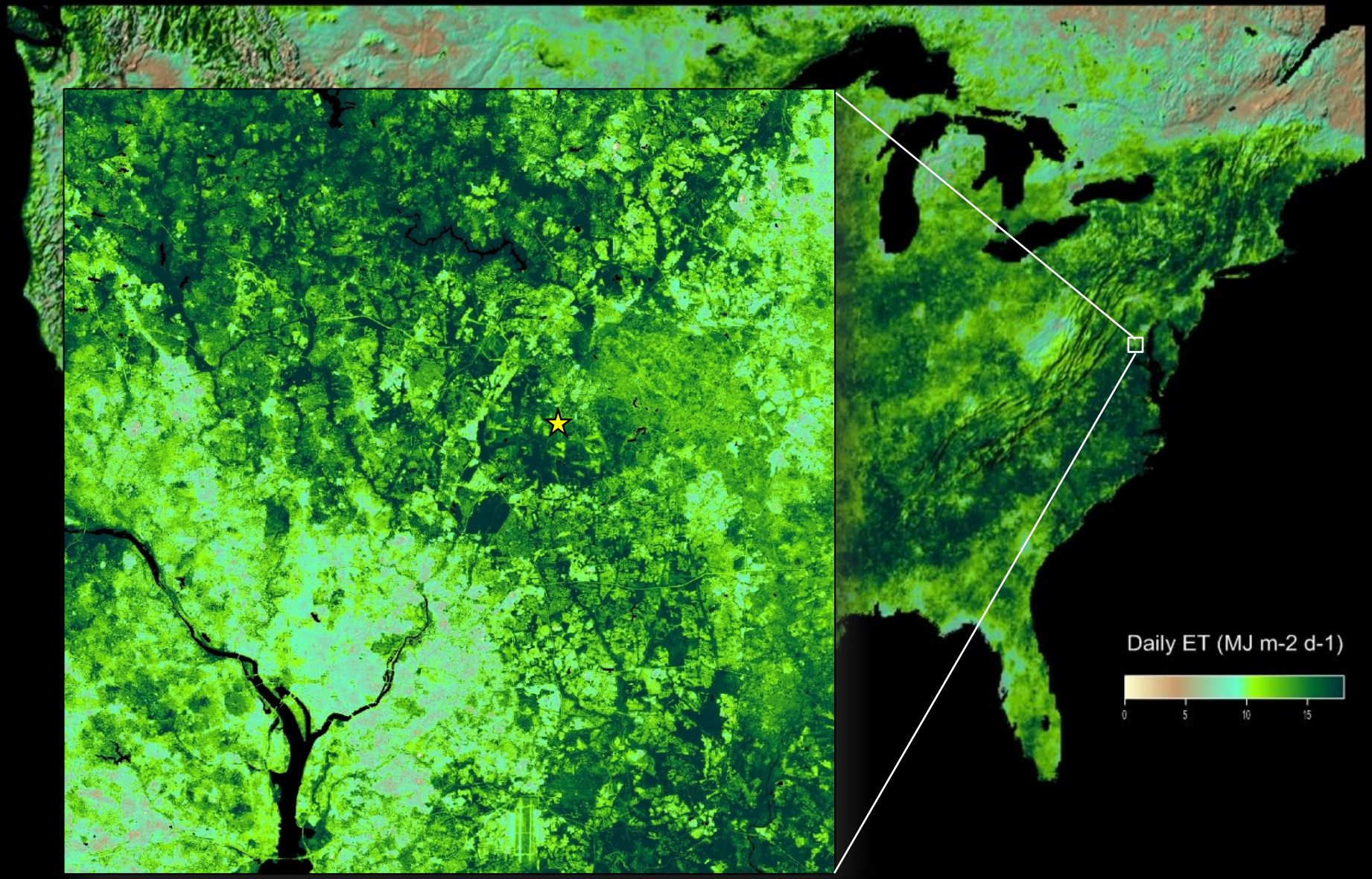
Lower Chesapeake Bay LTAR



Liang Sun, 2016

Landsat 8 - 2014

NOAA – NESDIS – STAR
GOES Evapotranspiration and Drought Product System (GET-D)



NOAA – NESDIS – STAR
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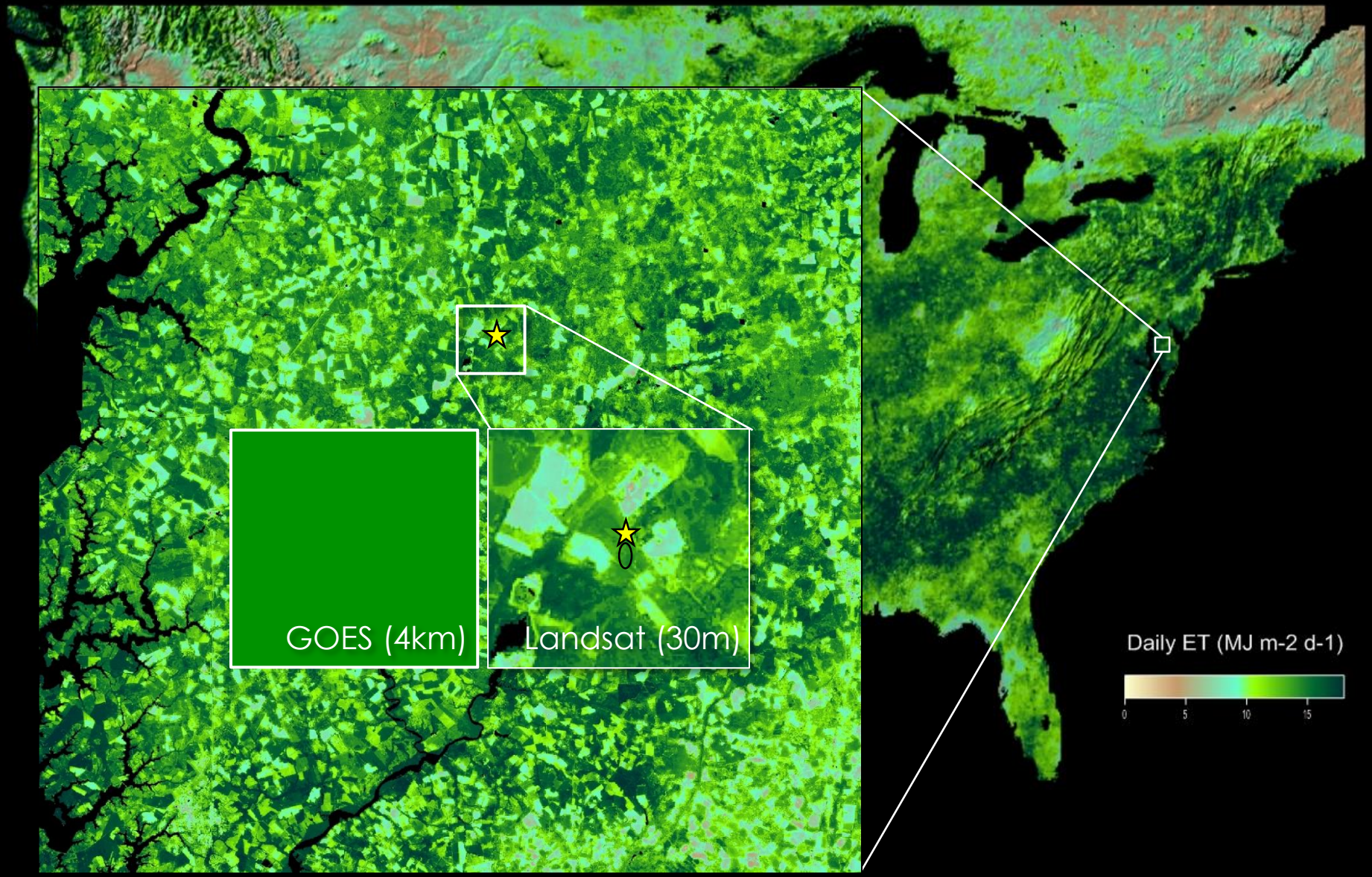
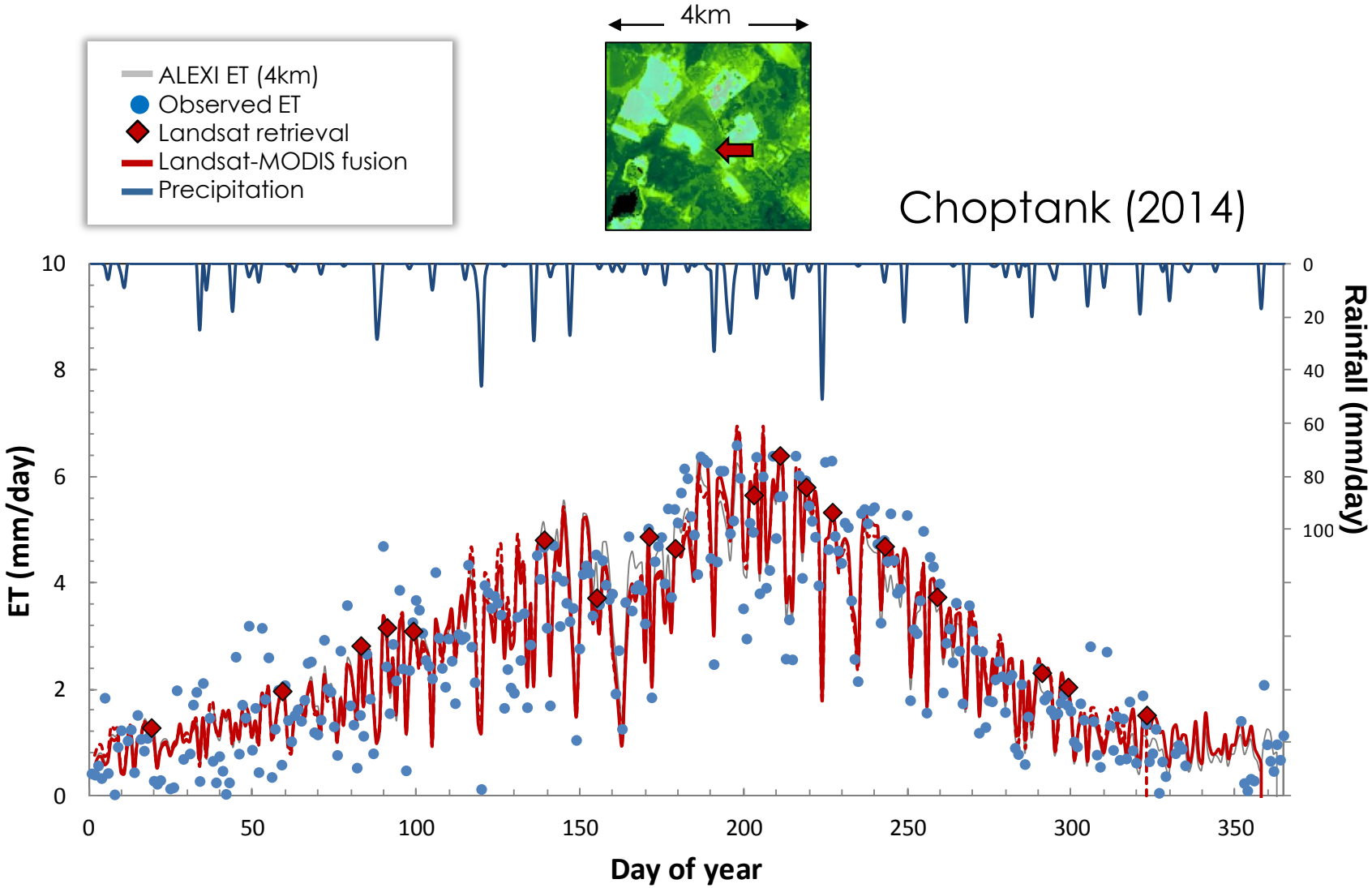


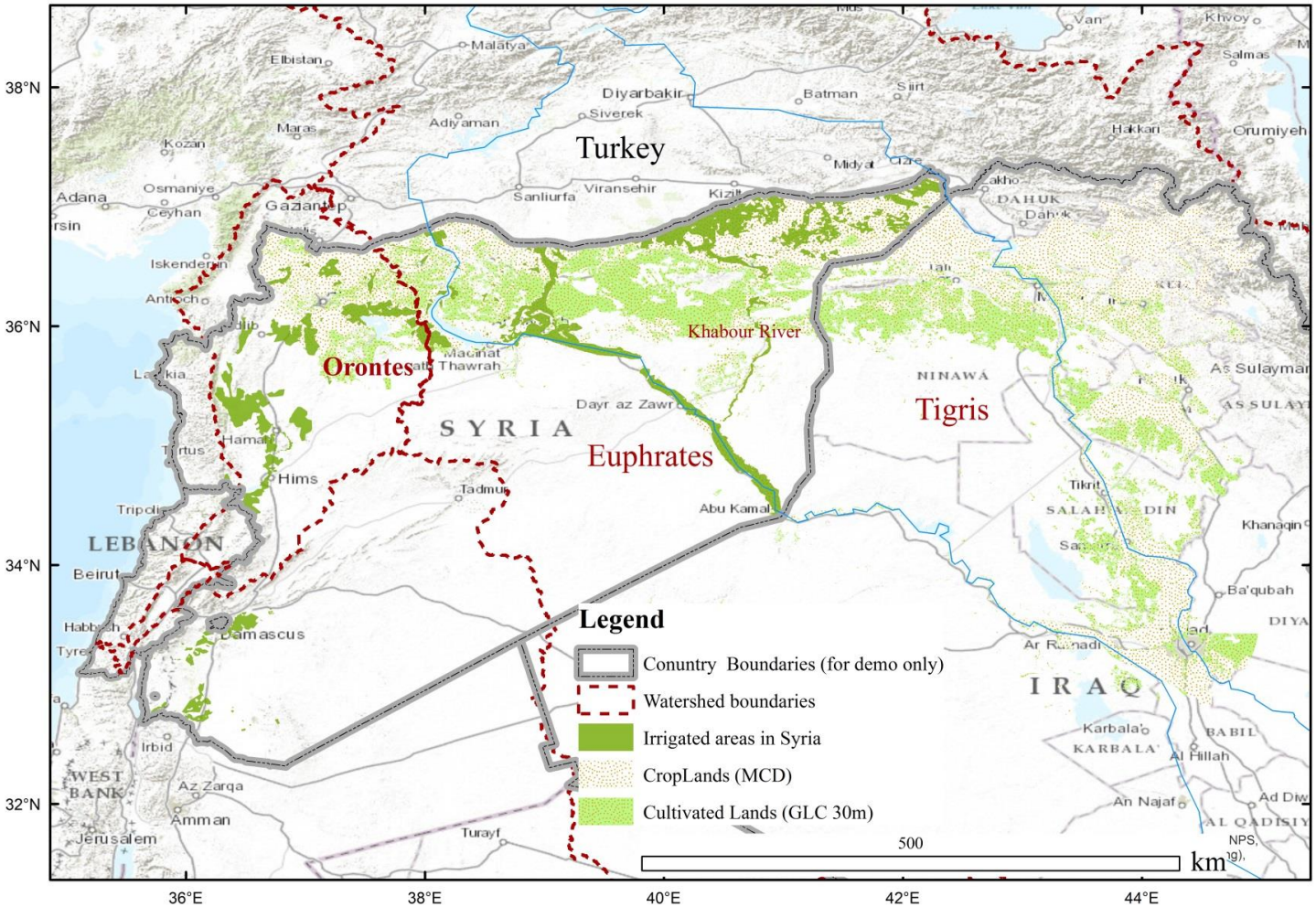
Comparisons with flux tower data



Sun, L. et al. (2016). Monitoring daily evapotranspiration at field-scale over an agricultural landscape on the Eastern Shore of Maryland. *Remote Sens. Environ., in preparation*

Water security in Syria/Iraq

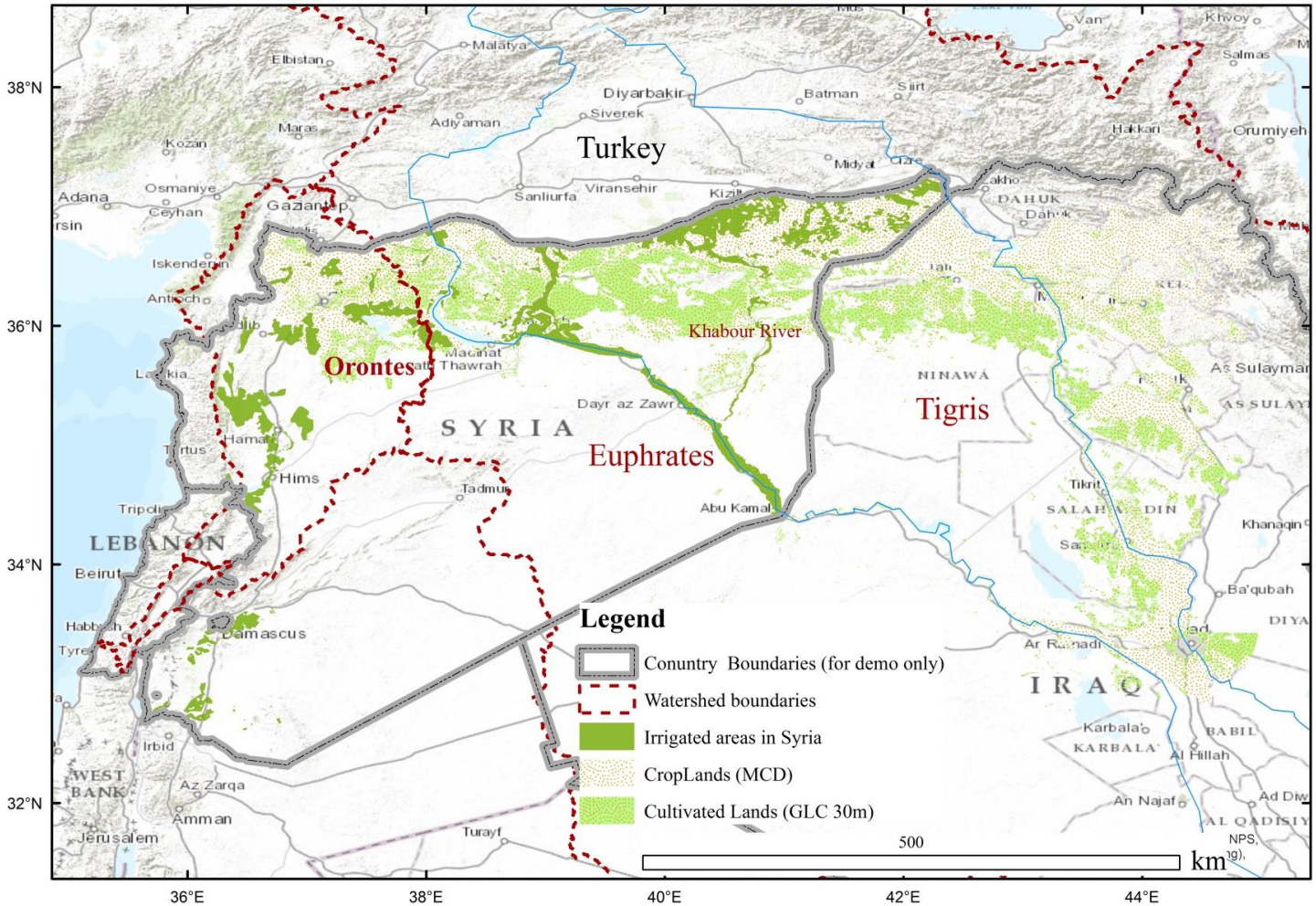
Investigating ag water use changes pre/post conflict



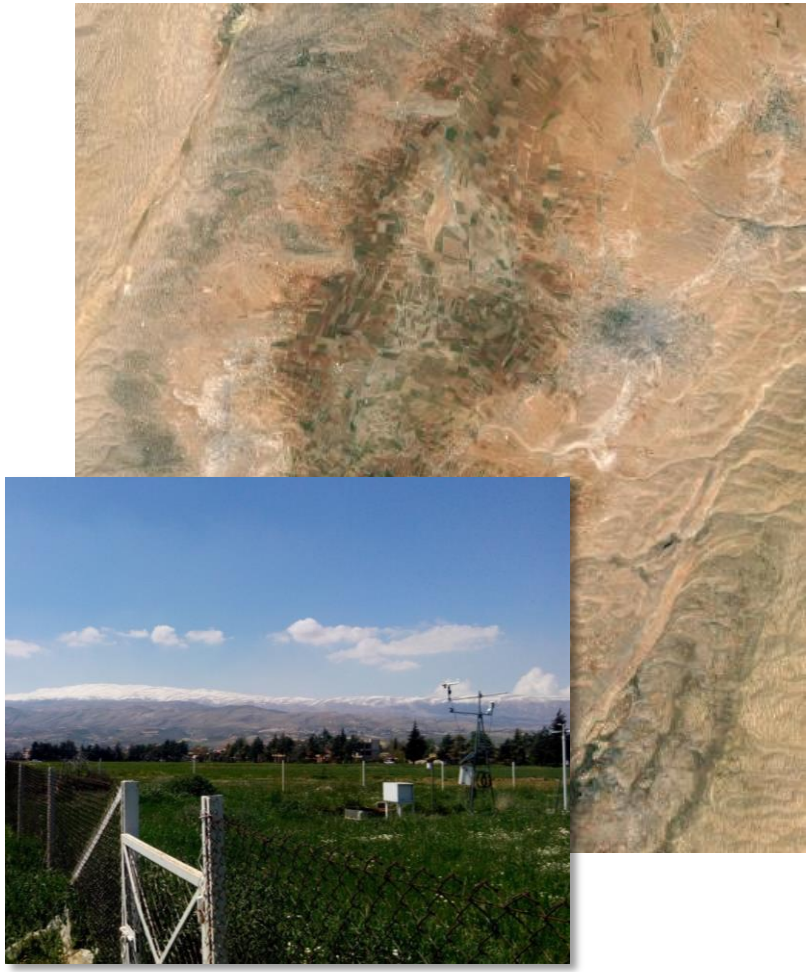
H. Jaafar, American U Beirut, 2016

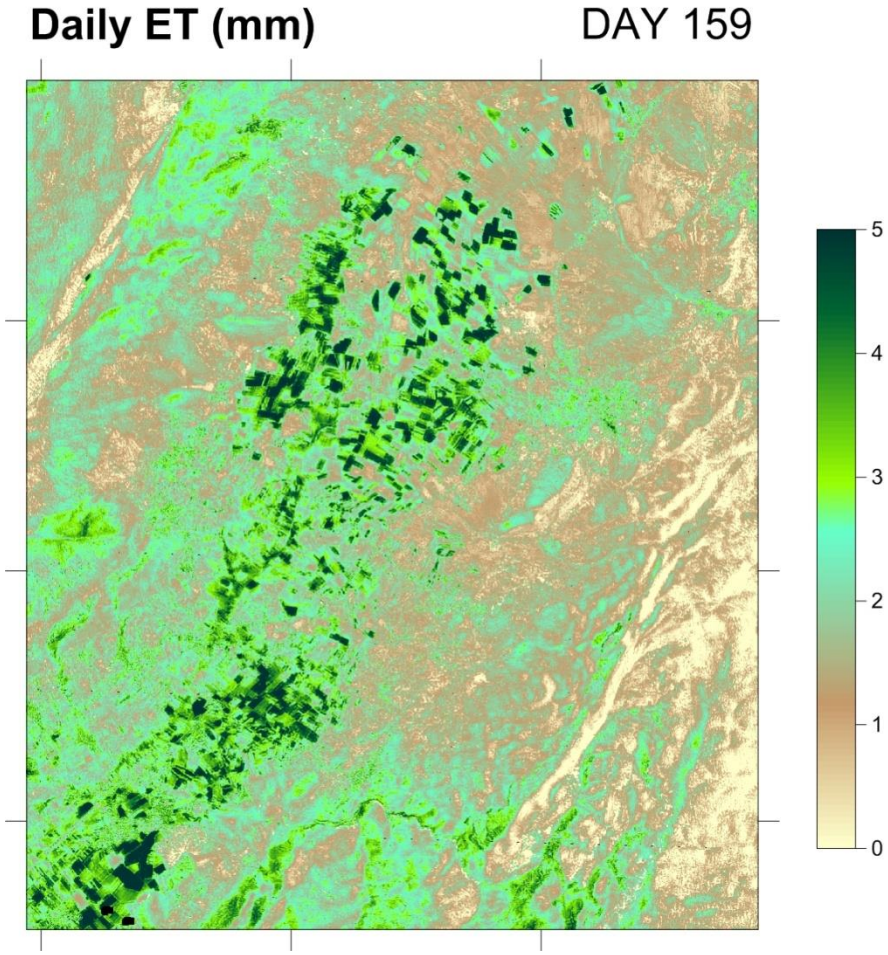
Water security in Syria/Iraq

Historic drought + Ag policies + Conflict (terrorism, refugees) = Change in agricultural systems + Humanitarian crisis



Beqaa Valley, Lebanon

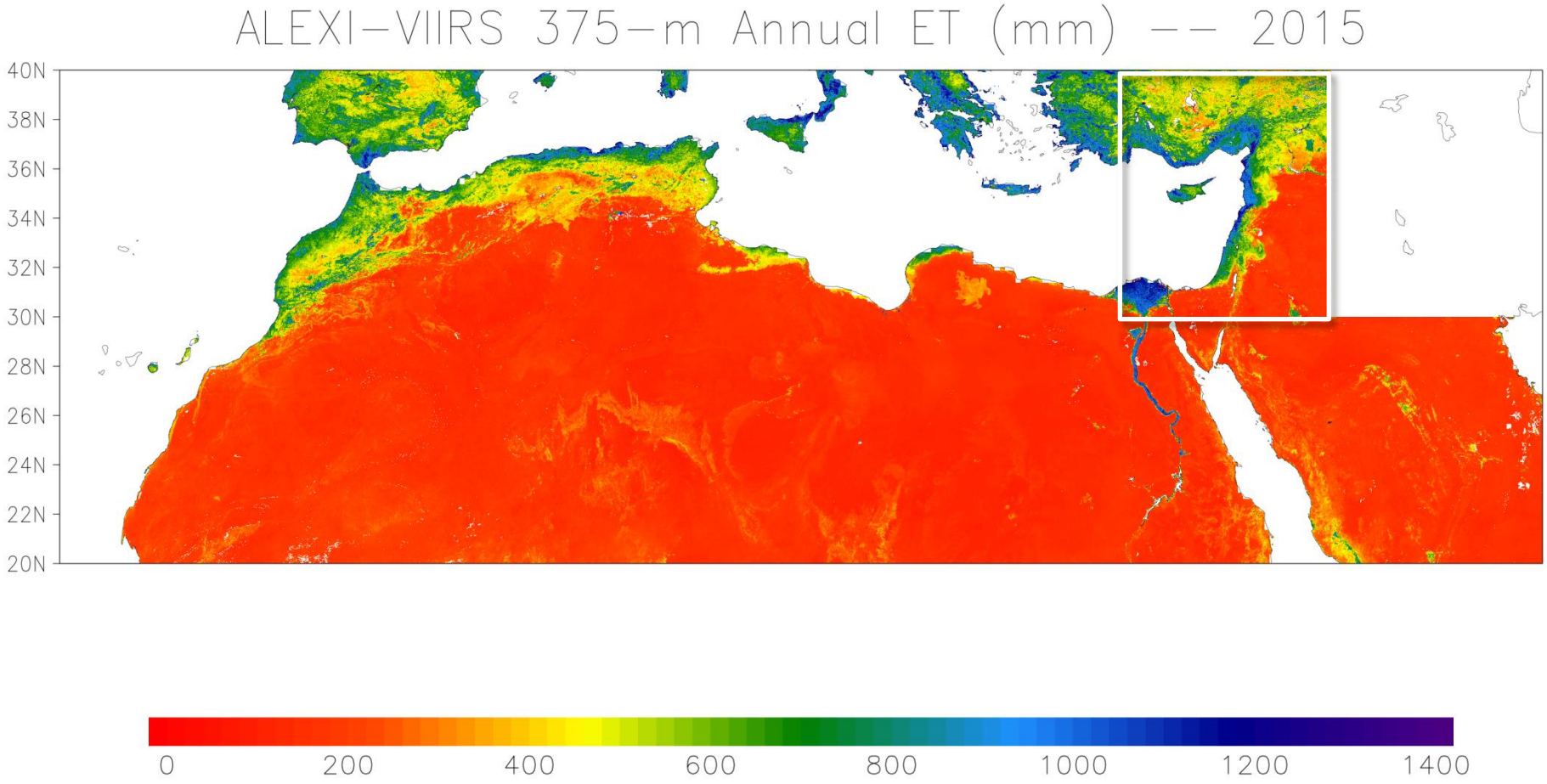


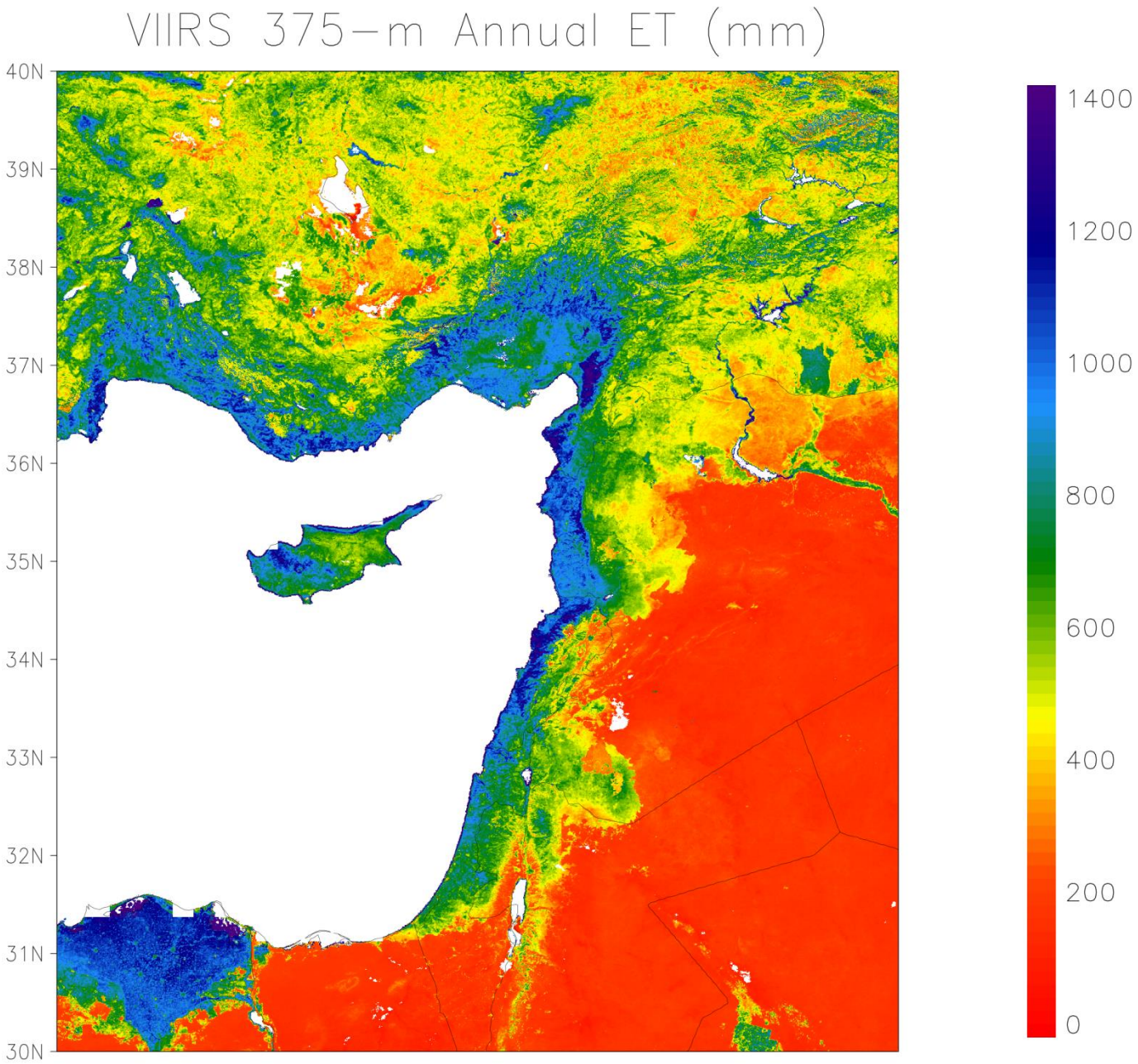


Development of a High-Resolution (375-m) VIIRS ET Product

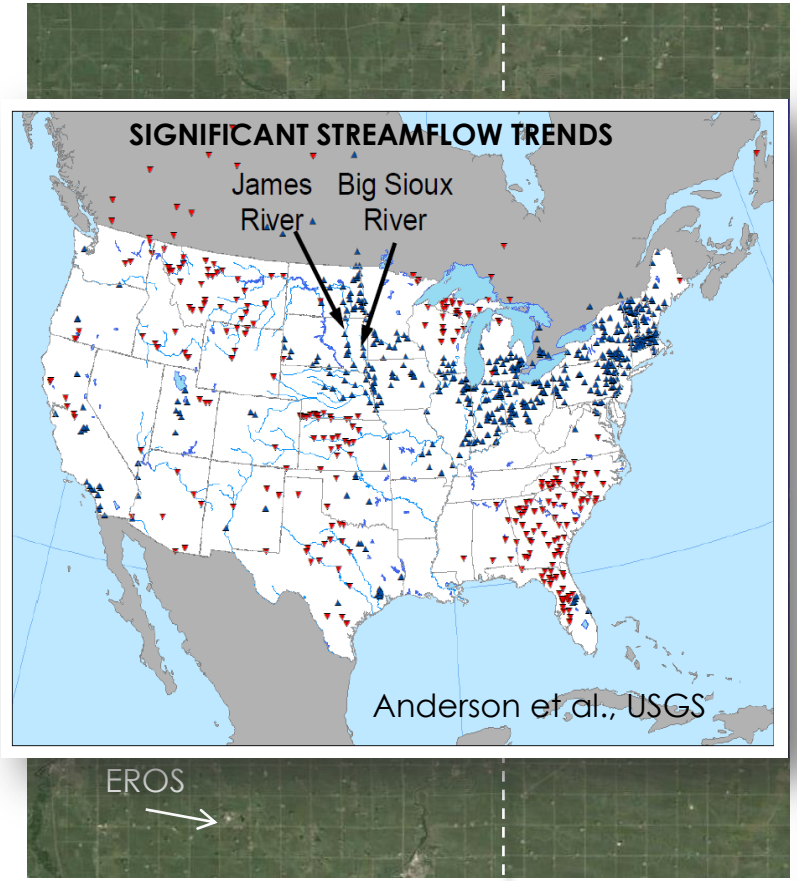
PI: Chris Hain (NOAA-NESDIS)

Collaborators: USDA, USAID, FAO, ICBA, Water for Food Institute (UNE), National Drought Mitigation Center

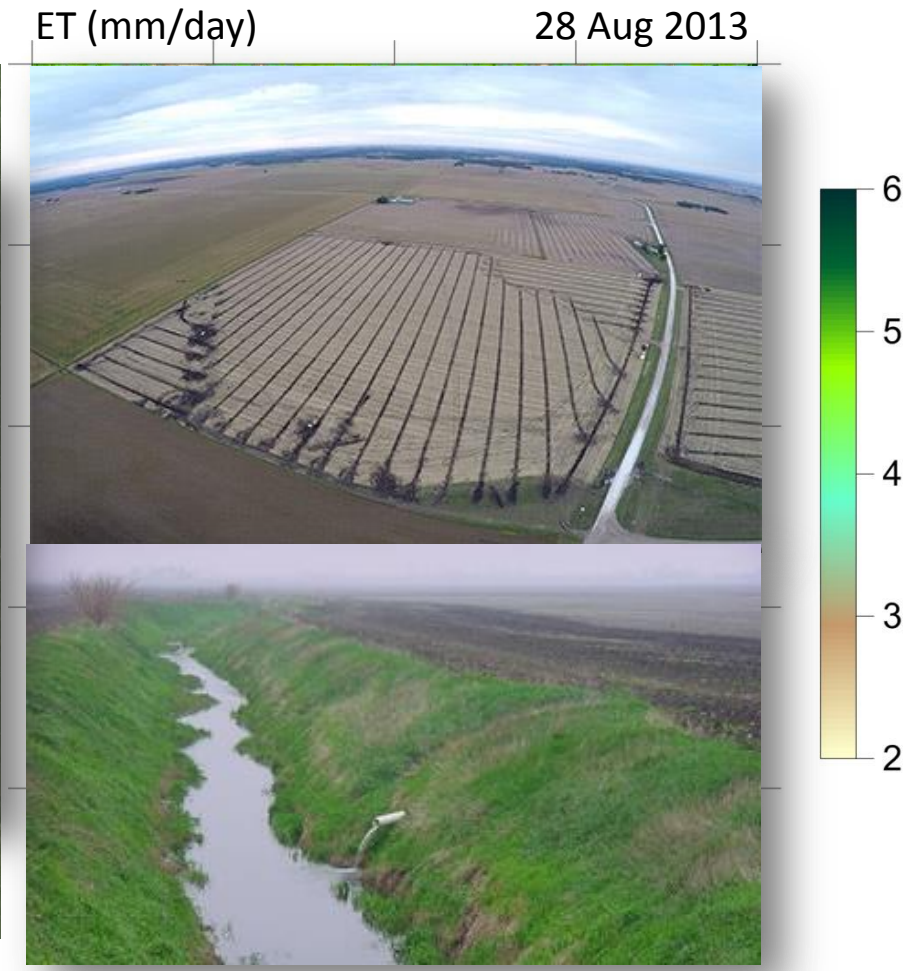



VIIRS 375-m Annual ET (mm)
40N
39N
38N
37N
36N
35N
34N
33N
32N
31N
30N
1400
1200
1000
800
600
400
200
0

Brookings, SD

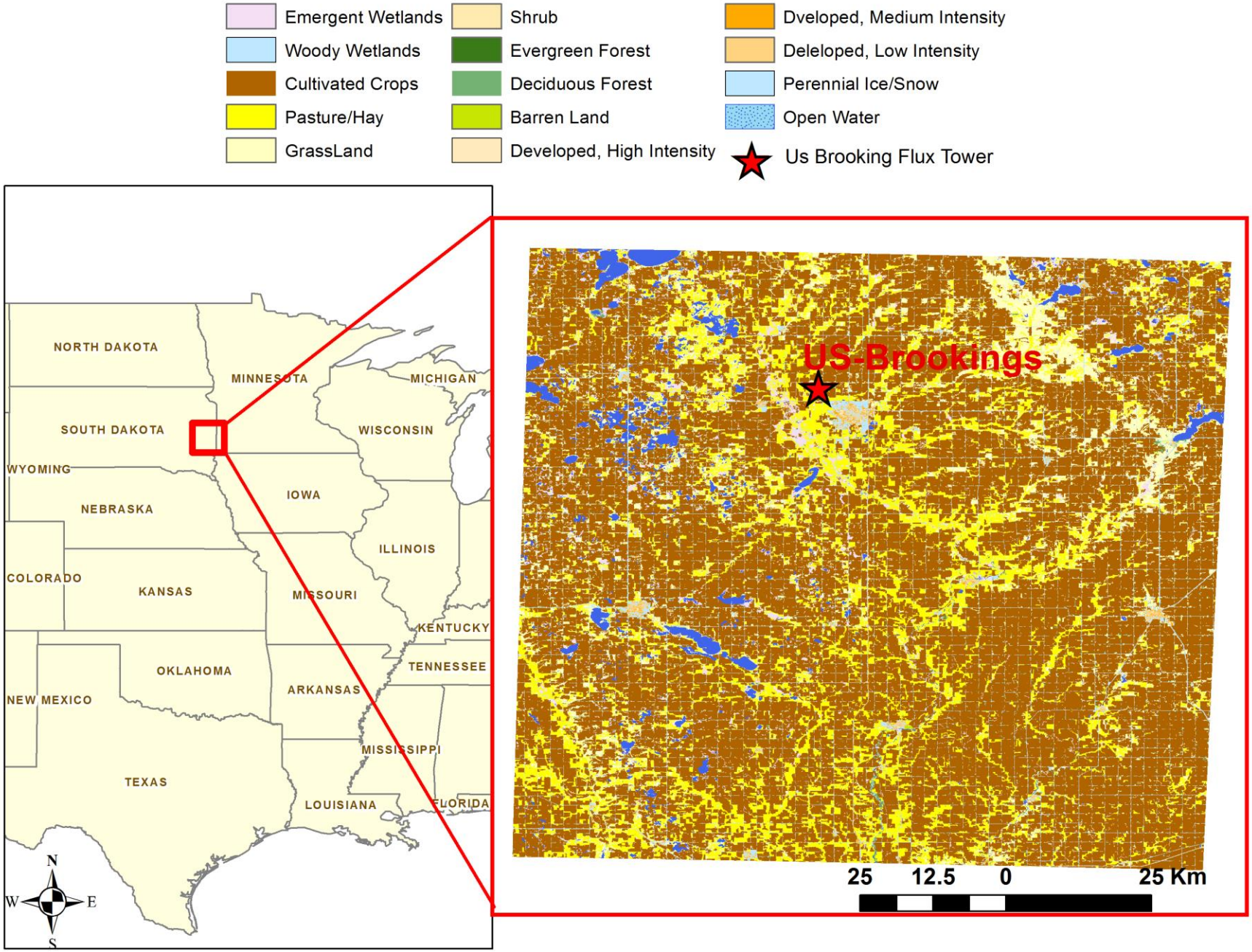


Yun Yang, 2016

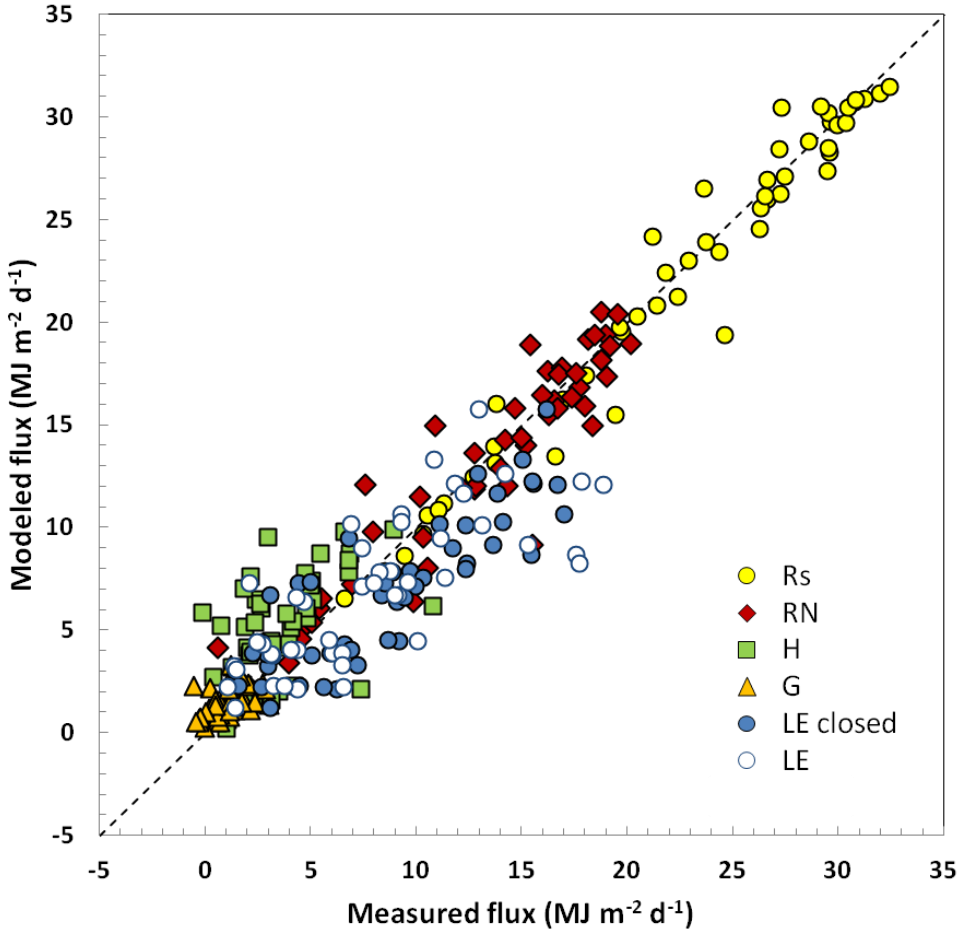


Landsat 8 - 2013

Study Area

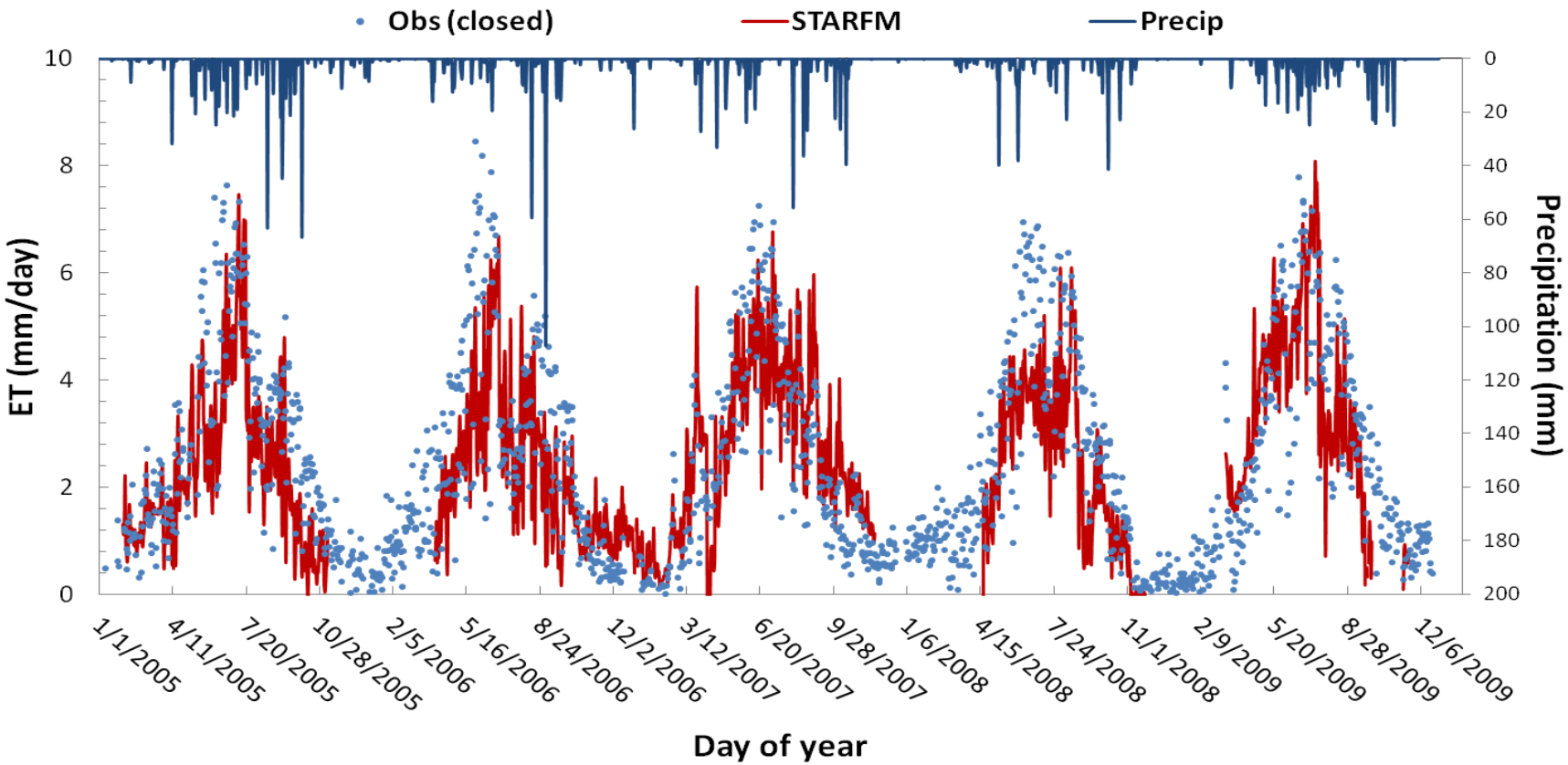

Emergent Wetlands
Woody Wetlands
Cultivated Crops
Pasture/Hay
GrassLand
Shrub
Evergreen Forest
Deciduous Forest
Barren Land
Developed, High Intensity
Dveloped, Medium Intensity
Deleloped, Low Intensity
Perennial Ice/Snow
Open Water
Us Brooking Flux Tower
NORTH DAKOTA
MINNESOTA
MICHIGAN
SOUTH DAKOTA
WISCONSIN
WYOMING
IOWA
NEBRASKA
ILLINOIS
COLORADO
KANSAS
MISSOURI
KENTUCKY
OKLAHOMA
TENNESSEE
ARKANSAS
NEW MEXICO
MISSISSIPPI
TEXAS
LOUISIANA
FLORIDA
N
W
E
S
US-Brookings
25
12.5
0
25 Km

Model Evaluation



Scatterplot of modeled and measured daily surface energy fluxes on Landsat overpass dates for Brookings flux tower site.

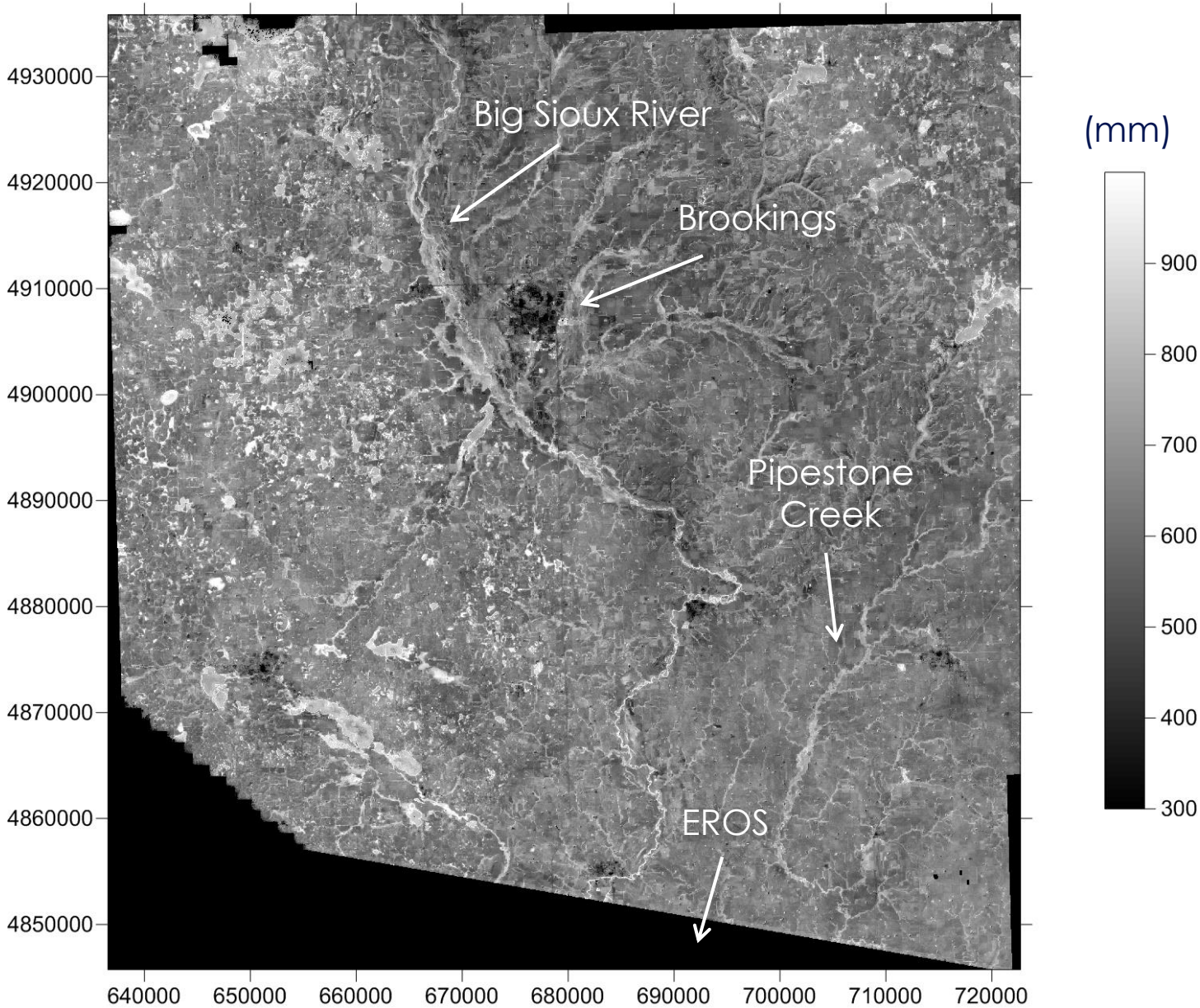
Model Evaluation



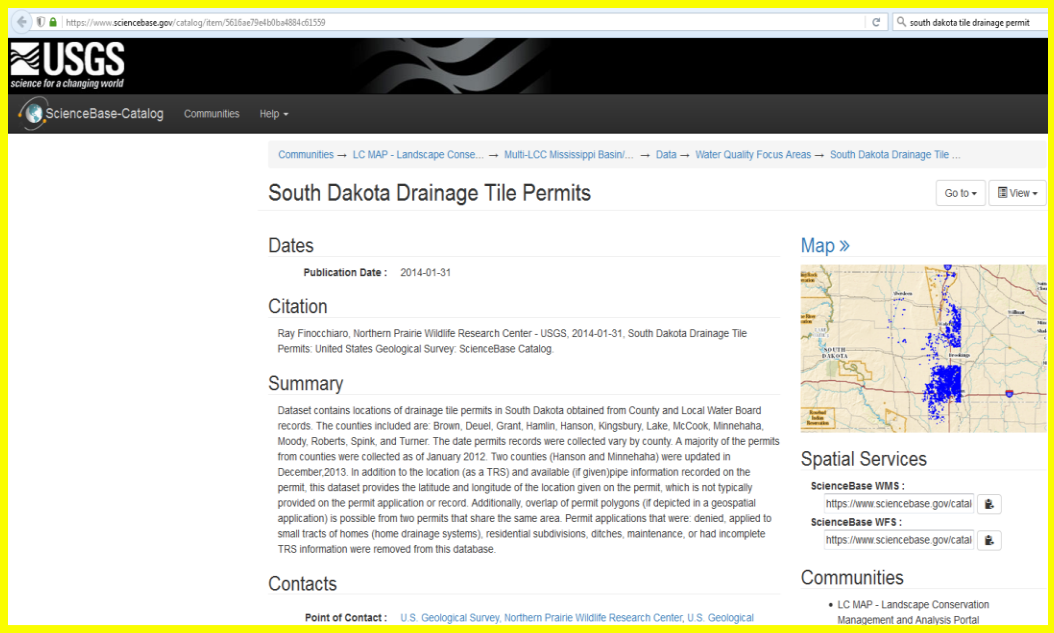
Comparison of time series of observed ET with modeled ET

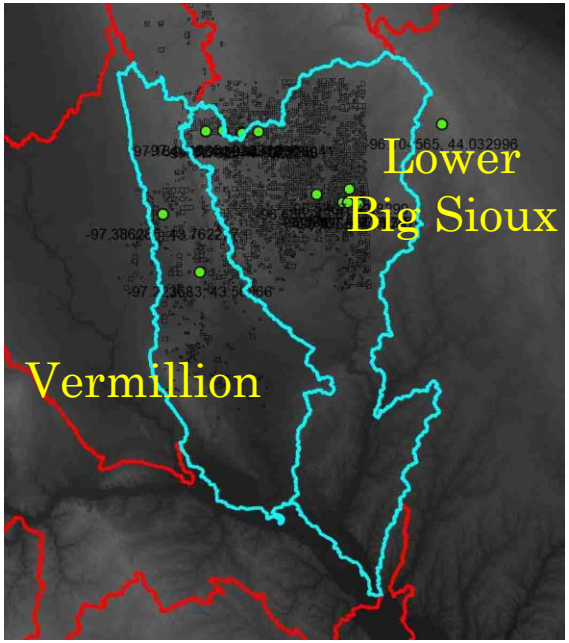
Growing season cumulative ET

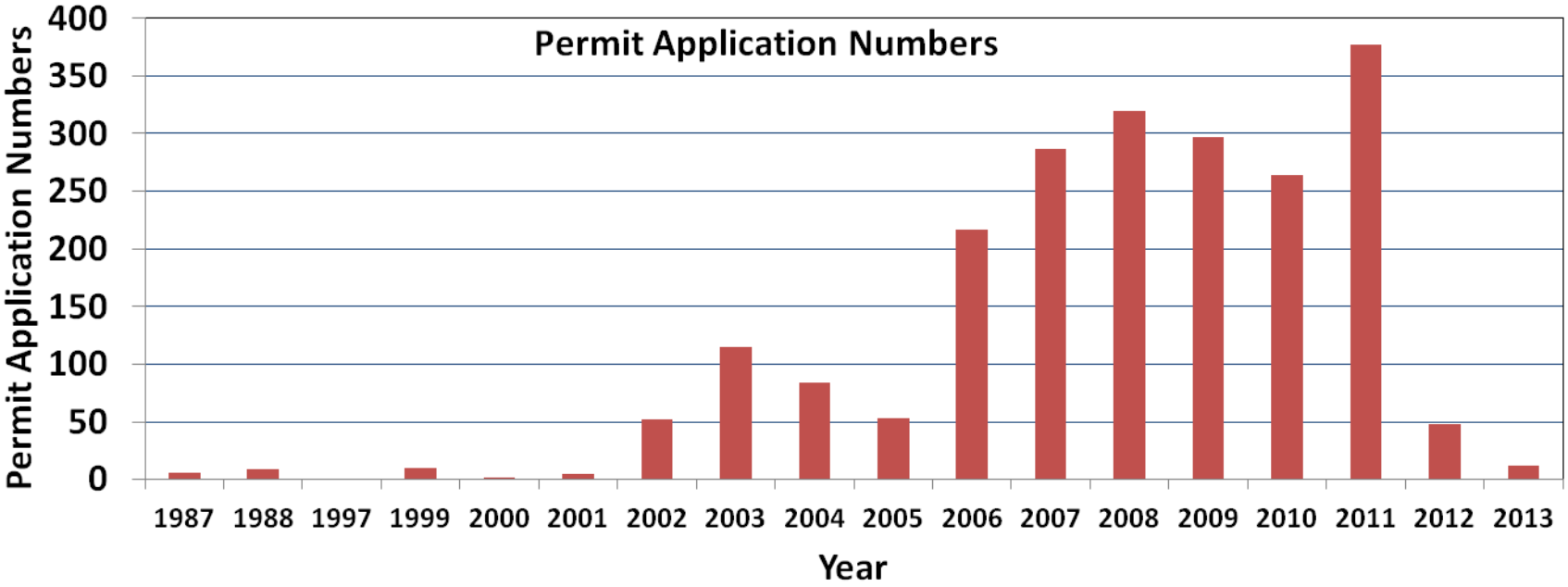
2005-2012 average (DOY 100-310)



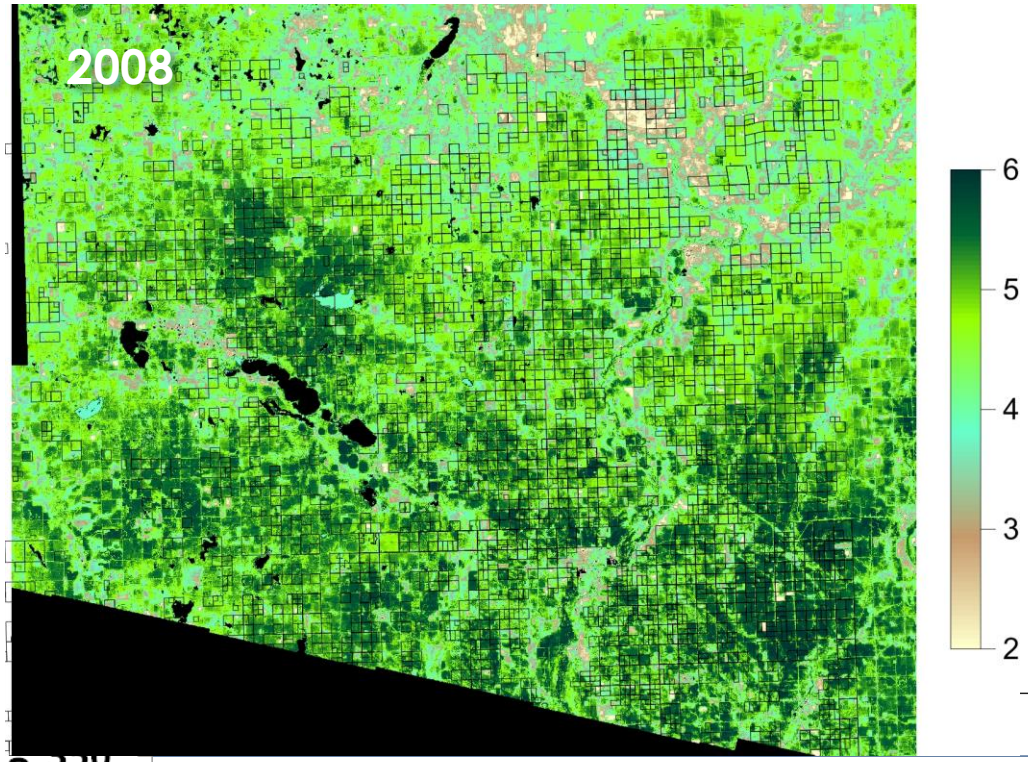
Tile Drainage Permits





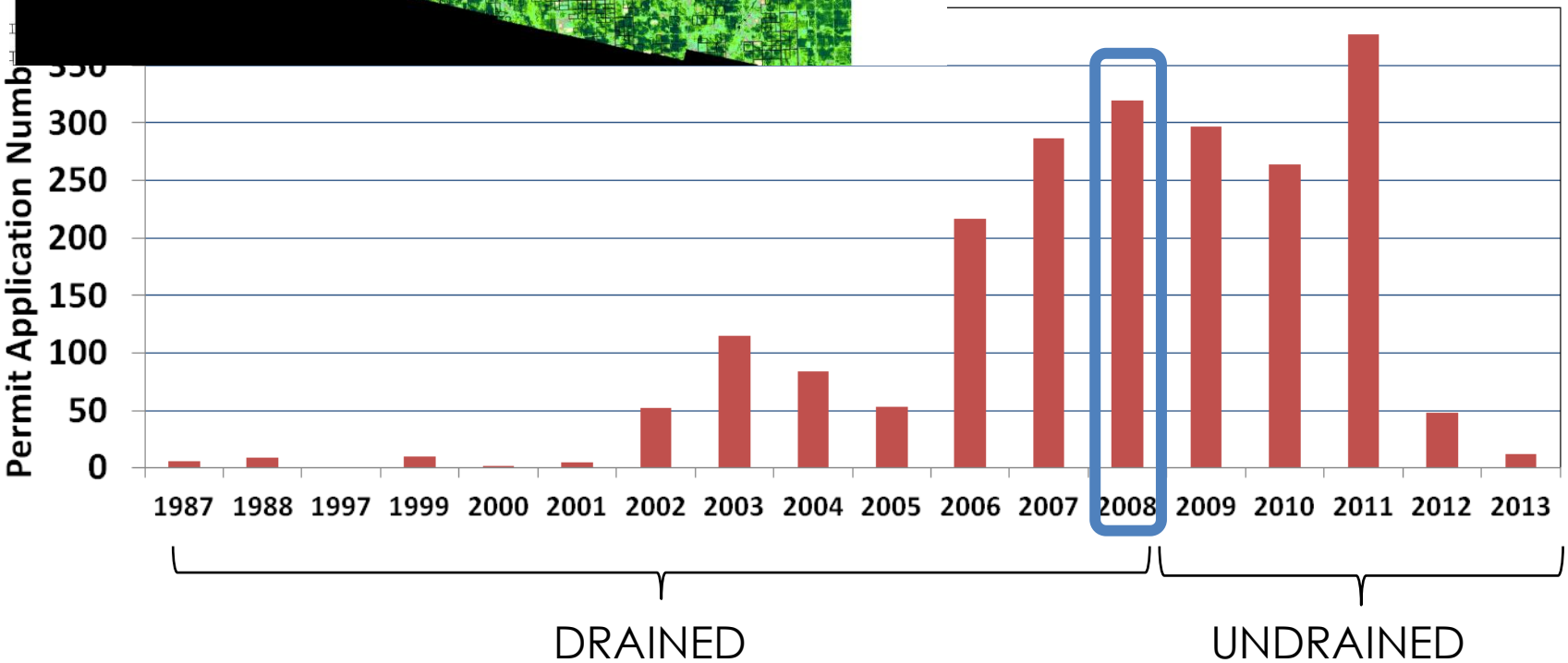


Sampling drained/undrained fields

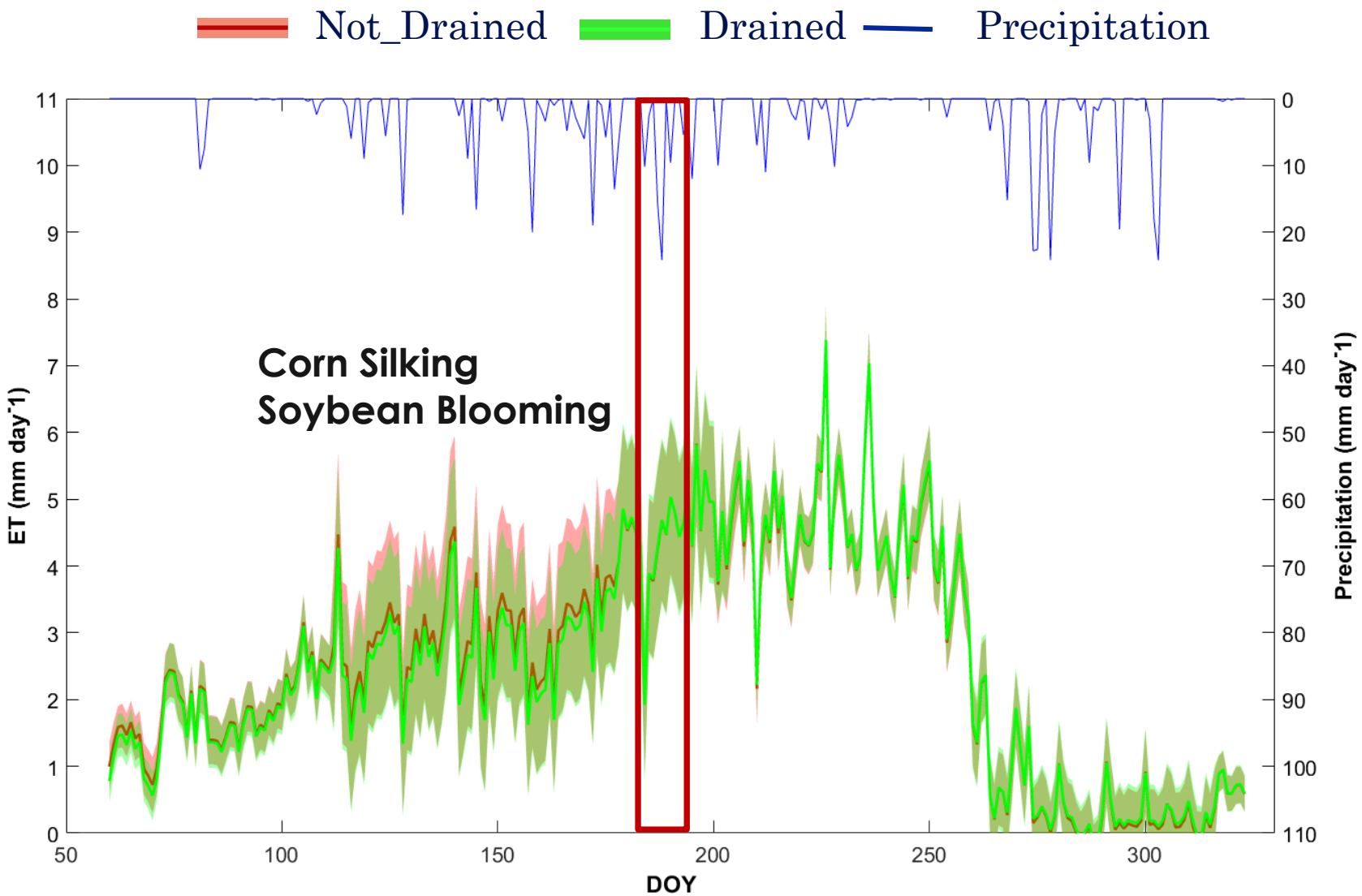


DRAINED: From 2008 ET timeseries, select all pixels with permit applications from 2008 or earlier and average.

UNDRAINED: Average pixels with permit applications from 2009 or later.

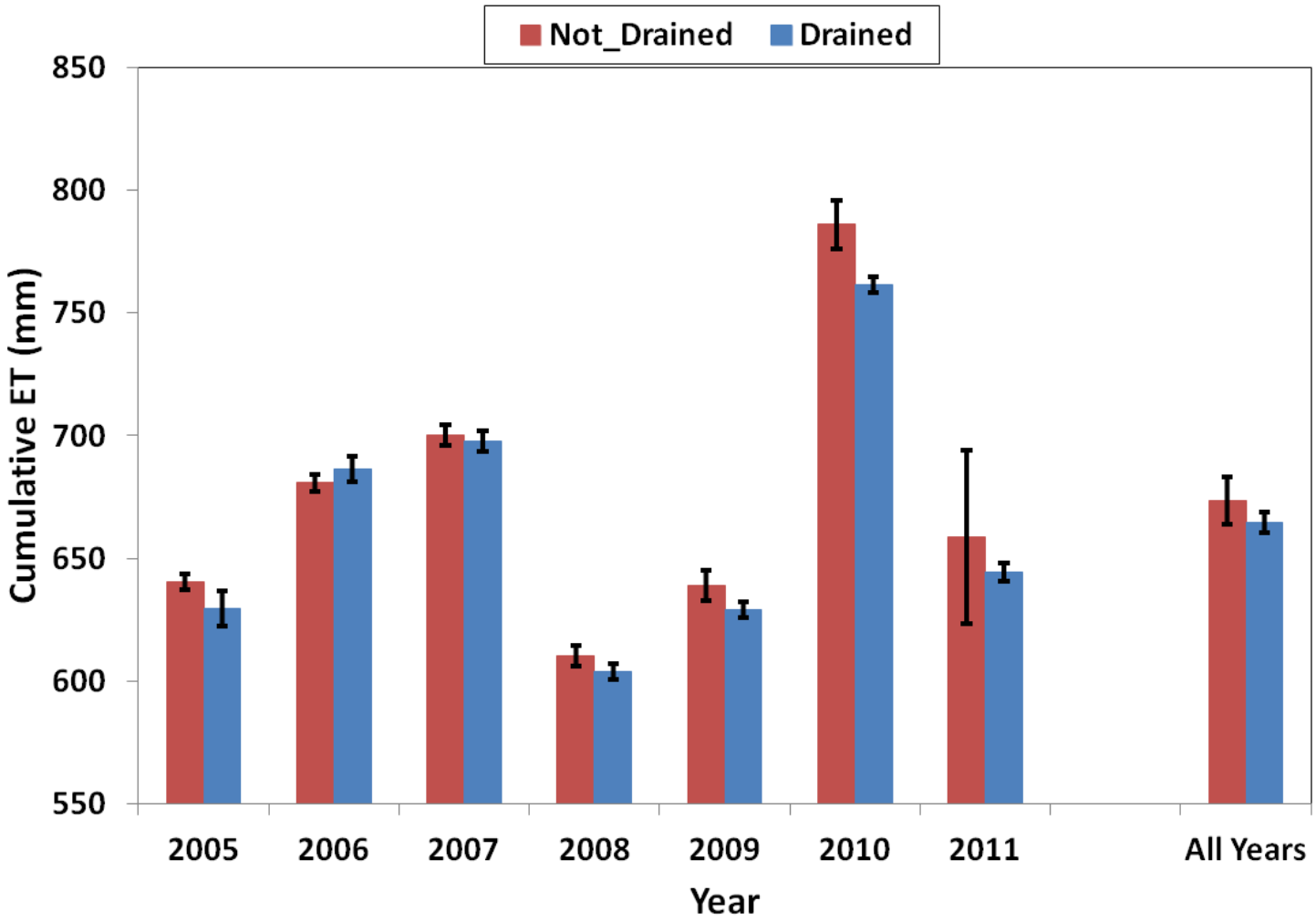


Drainage Impact – Daily ET



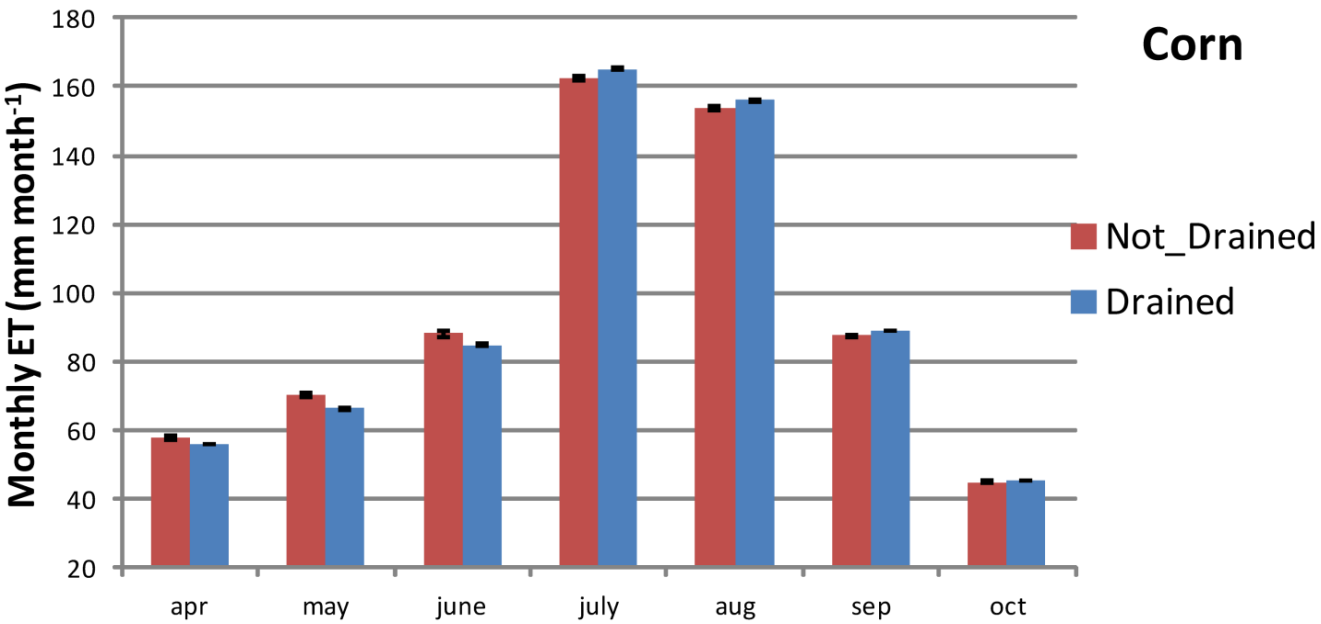
Comparison of time series of daily ET of year 2009 between tile drained area (green line) and not drained area (red line).

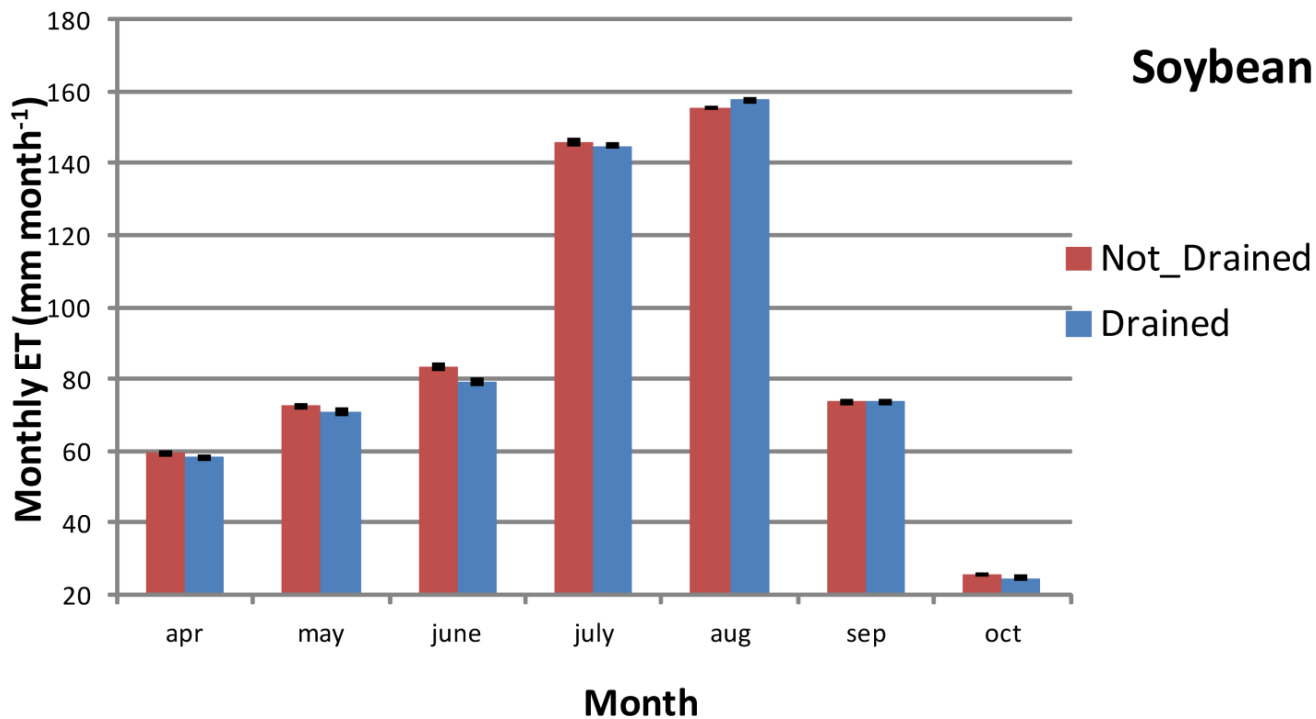
Drainage Impact – Cumulative ET



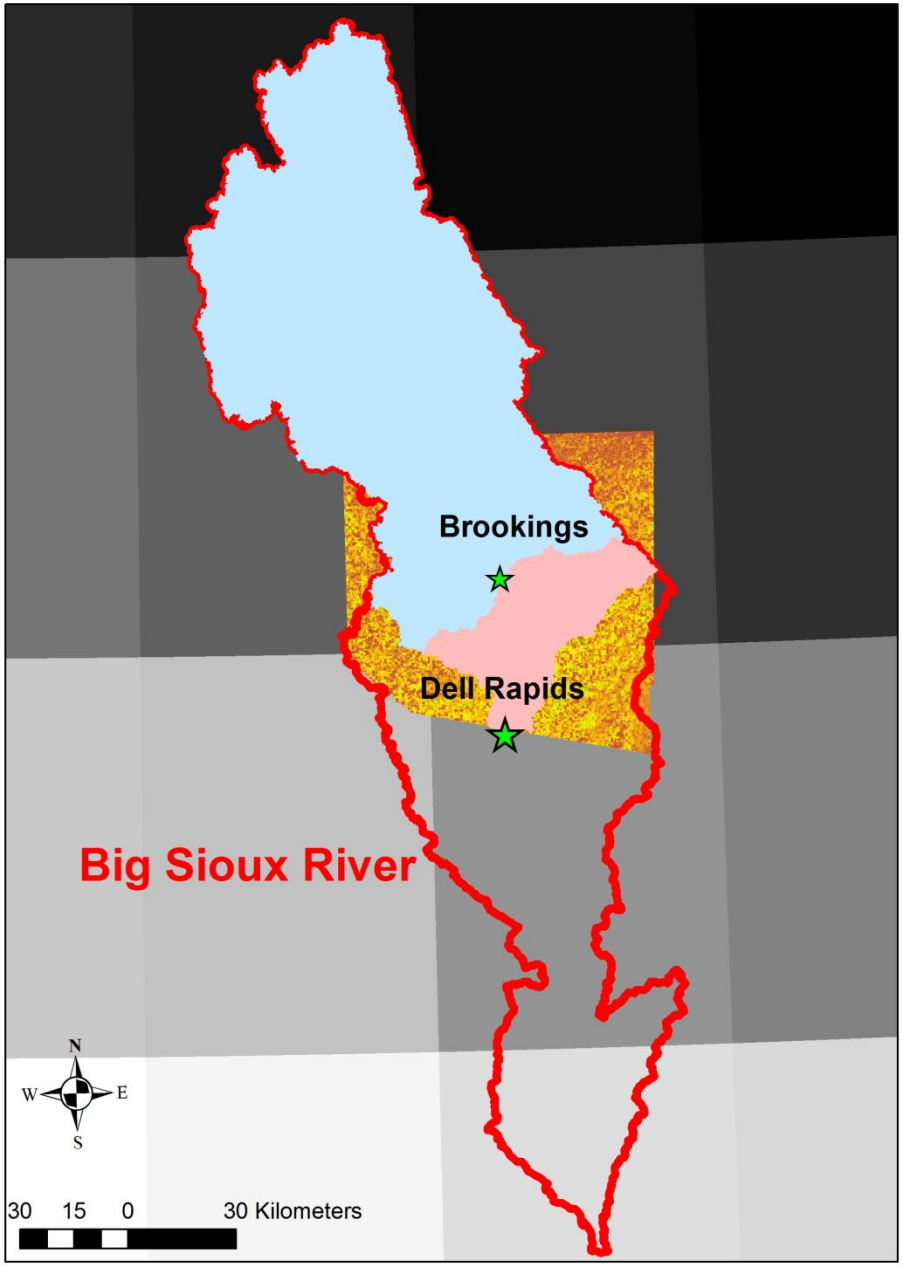
Cumulative ET from DOY 91 to DOY 323 during year from 2005 to 2011

Drainage Impact – Cumulative ET





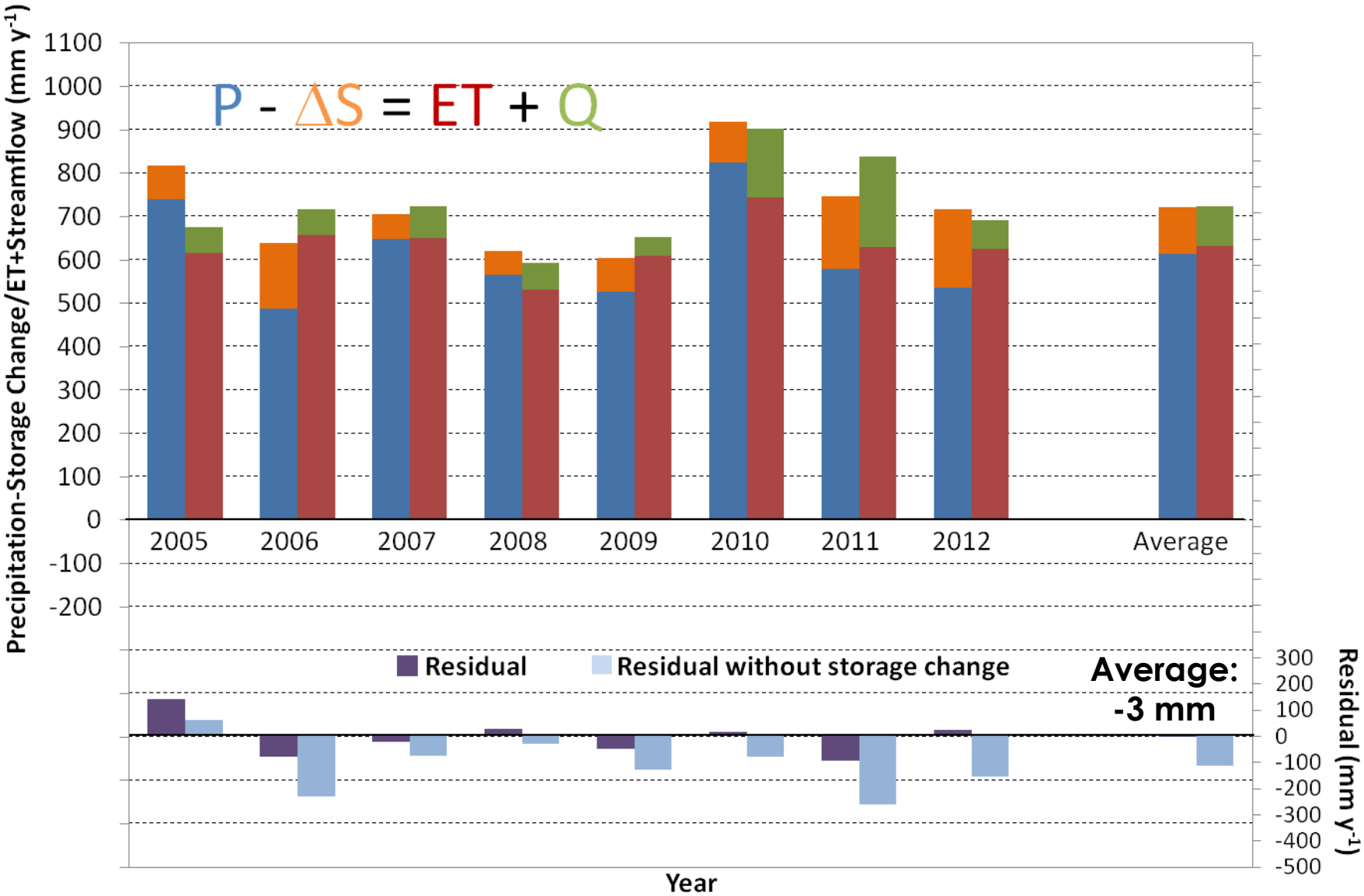
Drainage Impact – Water Balance



- PRISM – Precipitation (P)
- USGS Gauge Stations (Q)
- Simulated ET (ET)
- GRACE Soil Storage Change (ΔS)

$$P - \Delta S = ET + Q$$

Drainage Impact – Water Balance



Conclusions

Tile Drainage impact on ET

- Tile drainage slightly decreases annual cumulative ET.
- The major impact of tile drainage on daily ET is in early growing season.
- PRISM, streamflow, simulated ET and GRACE soil storage change data work together well to get growing season water balance.
- High spatial and temporal resolution ET estimation can provide valuable information for agricultural management.

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