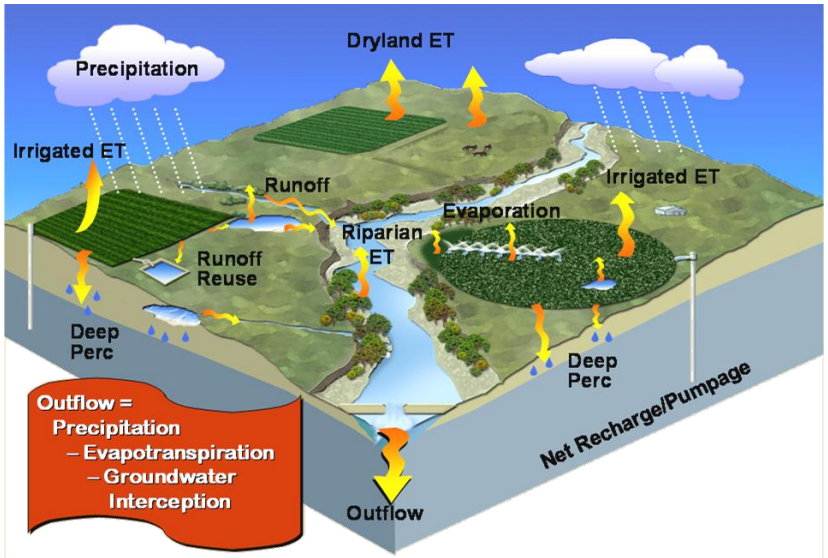
School of Natural Resources

Civil Engineering

Developing and enhancing Landsat derived Evapotranspiration and surface energy products

Part II

Ayse Kilic



University of Nebraska–Lincoln

CALMIT
University of Nebraska - Lincoln
Center for Advanced Land Management Information Technologies

University of Nebraska Lincoln

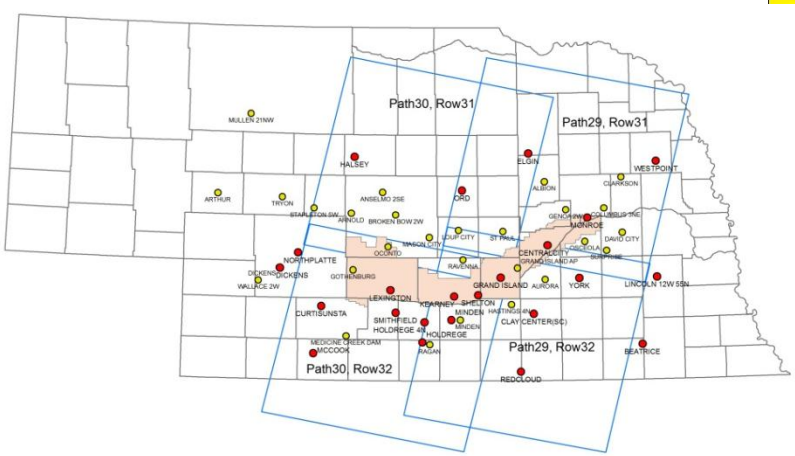
Primary goals

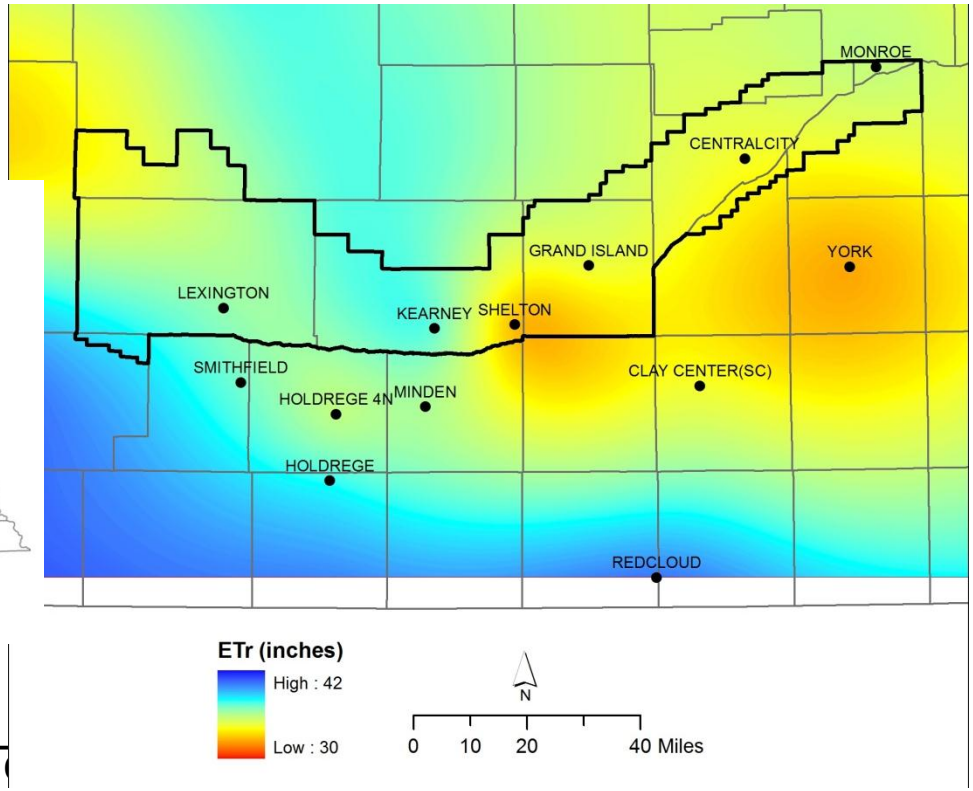
- Advance, produce and demonstrate operational production of evapotranspiration based on Landsat TM, ETM+ and LDCM data
- **Apply and leverage thermal data of Landsat for expanded use in water and land resources management.**
- Demonstrate the Importance of thermal imaging on future Landsat Missions

Specific focus areas

- Advance the ability to utilize gridded National Land Data Assimilation System (NLDAS) and similar weather data systems (i.e.NARR, NEXRAD, PRISM) to support time-integration with Landsat derived ET

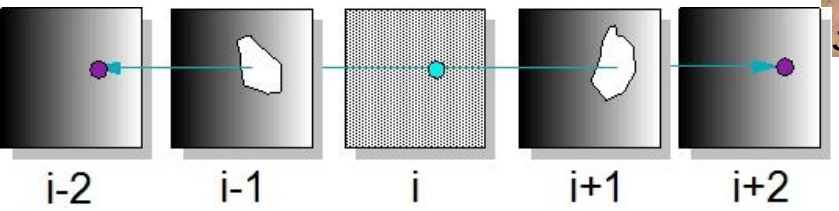
- Automated calibration of METRIC





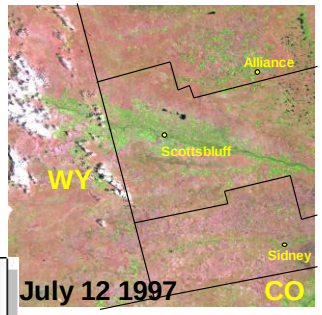
Specific focus areas

- Implement automated methods for cloud gap filling into operational ET retrievals
- Adapt fusion techniques to ingest imagery from an array of satellites to improve accuracy of time integrated ET from Landsat

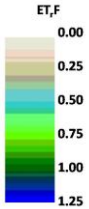


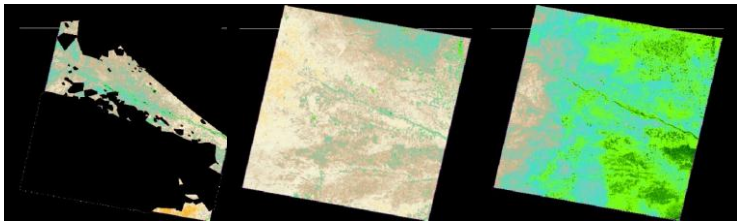
Dec. 12, 2012

Landsat

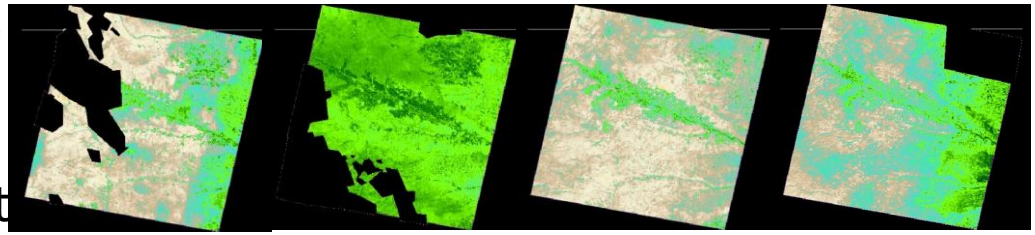


1997 image date ETrF estimates



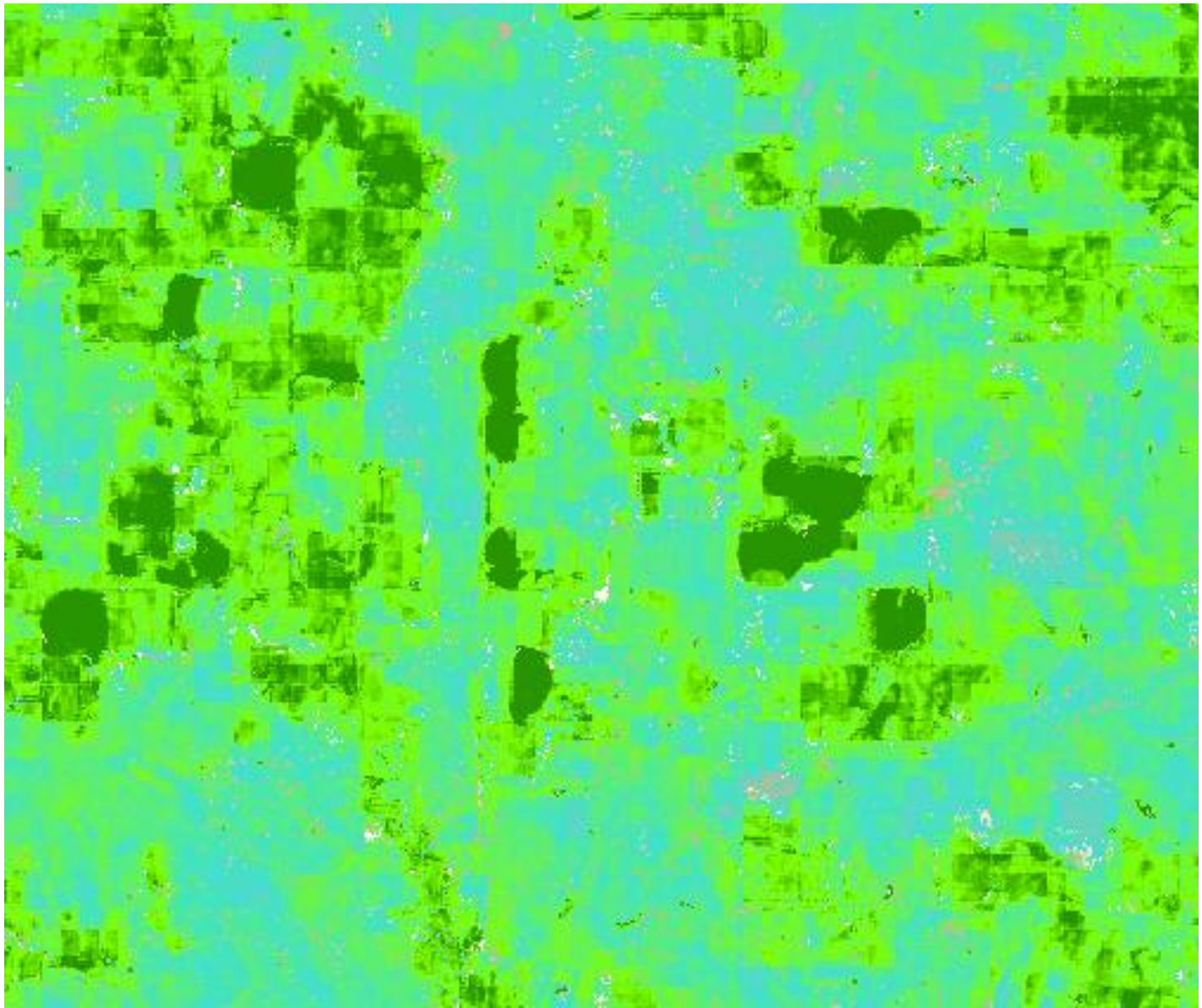


April 23 May 9 June 26



July 12 August 13 September 30 October 16

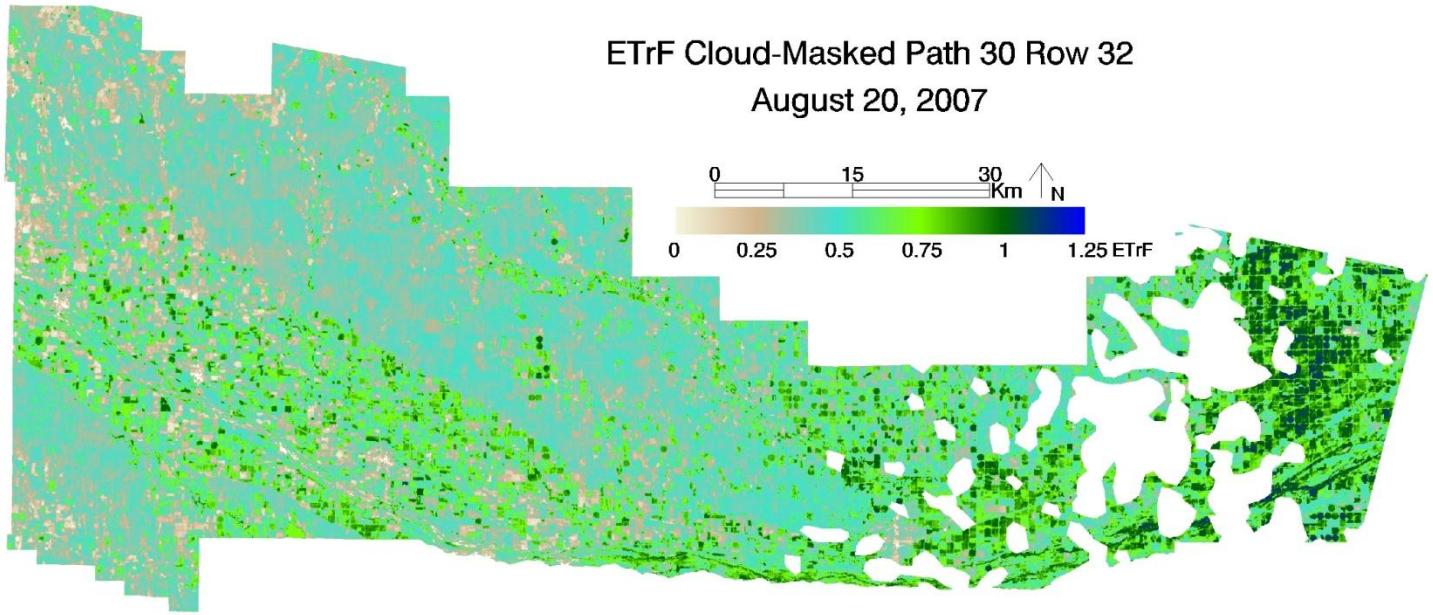
ET – 07/12/2007 – from MODIS fusion with Landsat energy balance

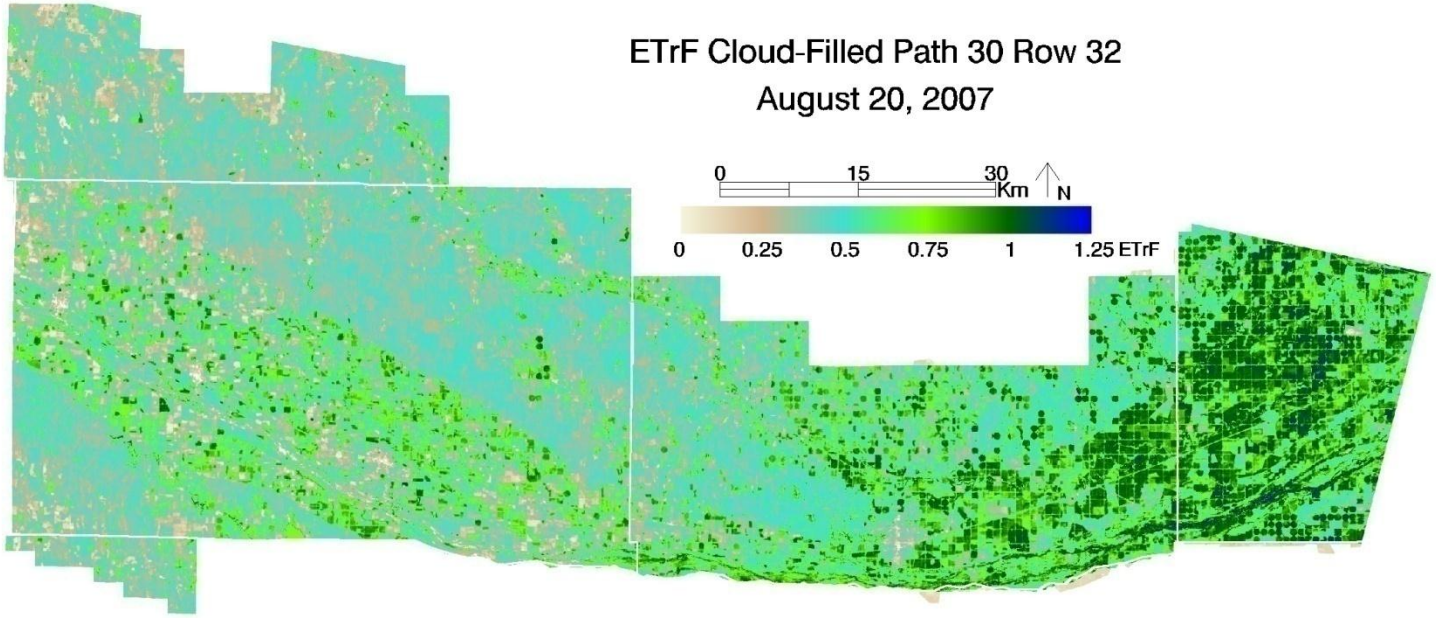


Central Platte, NE

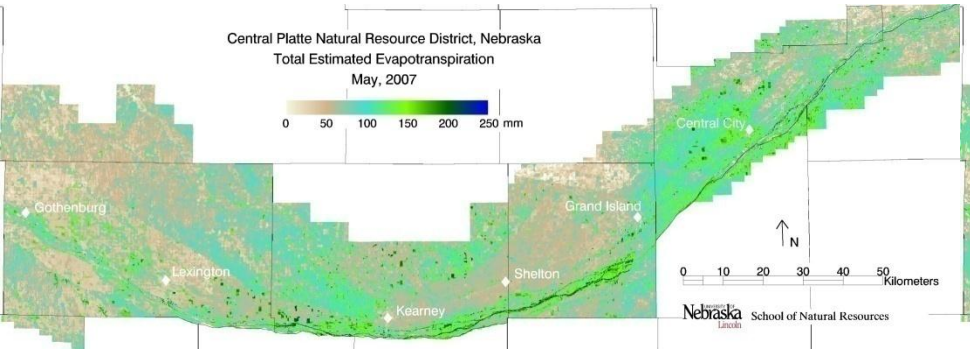
CHALLENGES for producing ET from Landsat

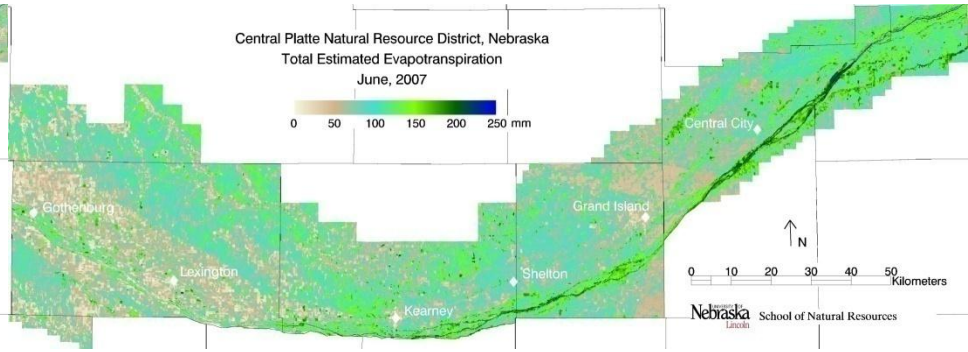
- Dealing with clouded periods
- Dealing with wetting events (irrigation/precipitation) between images – we will incorporate more data fusion w/MODIS, VIIRS and moderately high resolution reflectance data
- Getting more frequent return time

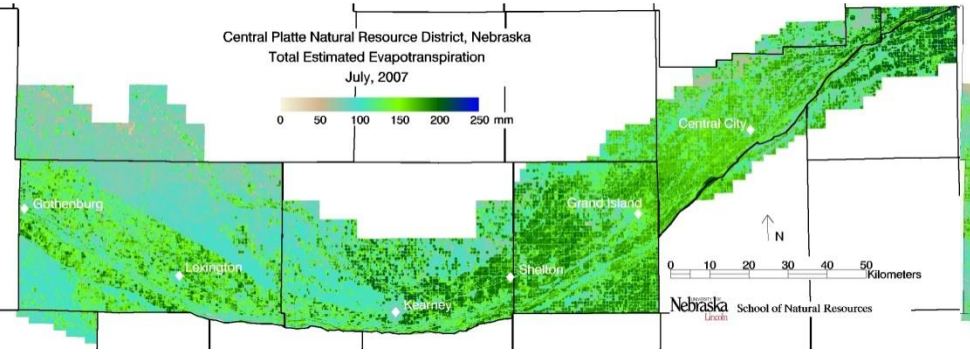

ETrF Cloud-Masked Path 30 Row 32
August 20, 2007
0
15
30
Km
N
0
0.25
0.5
0.75
1
1.25 ETrF

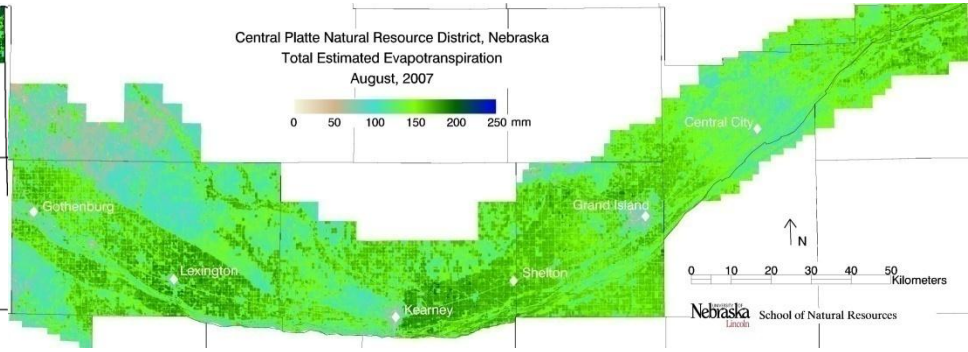

ETrF Cloud-Filled Path 30 Row 32
August 20, 2007
0
15
30
Km
N
0
0.25
0.5
0.75
1
1.25 ETrF

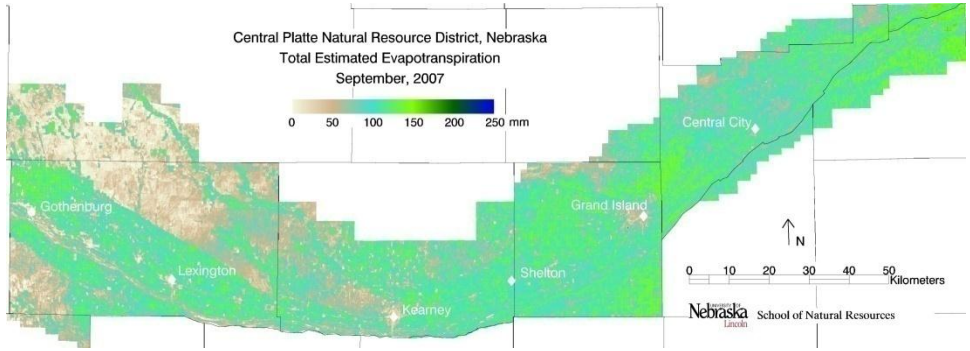
Monthly ET





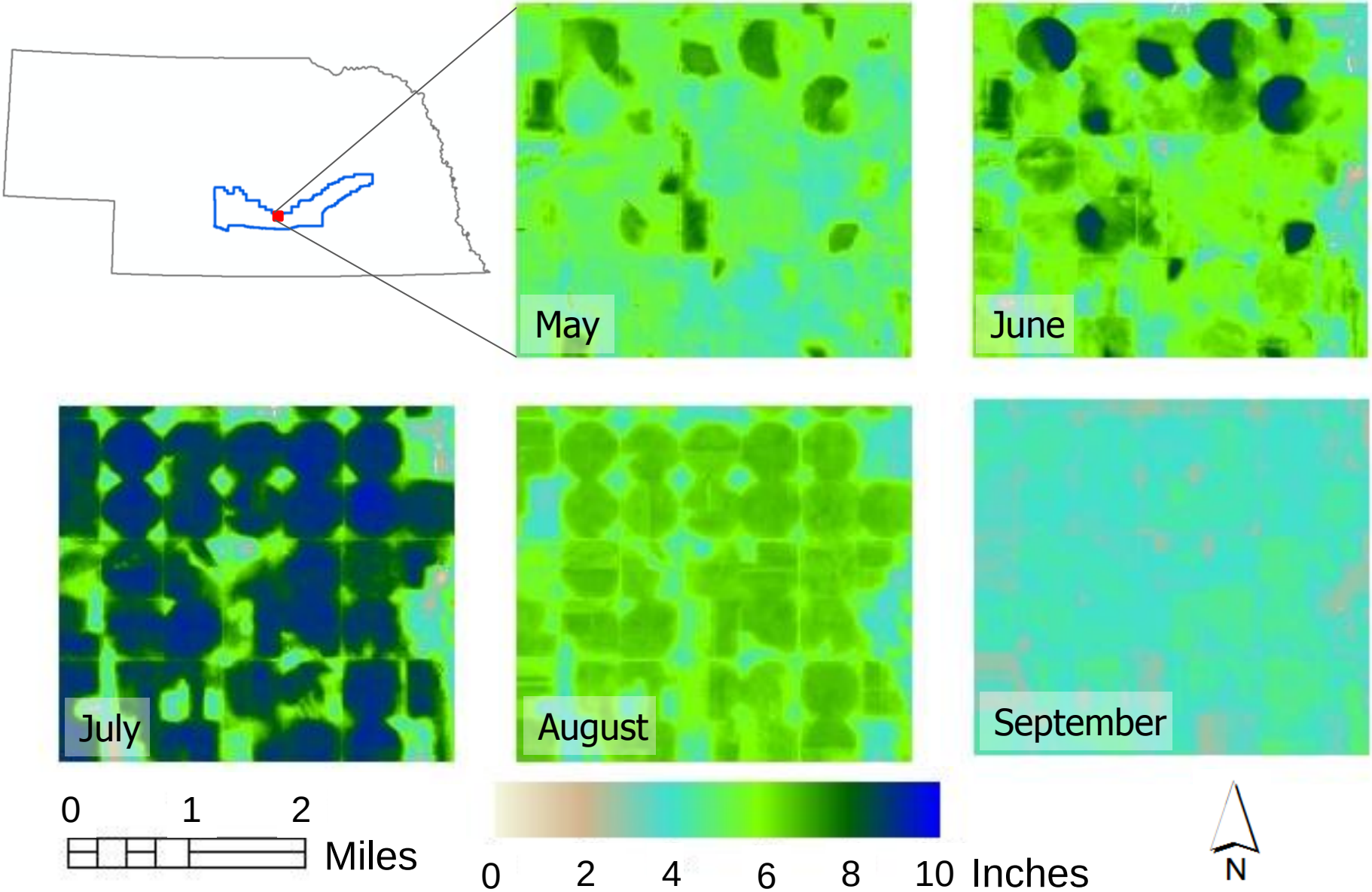




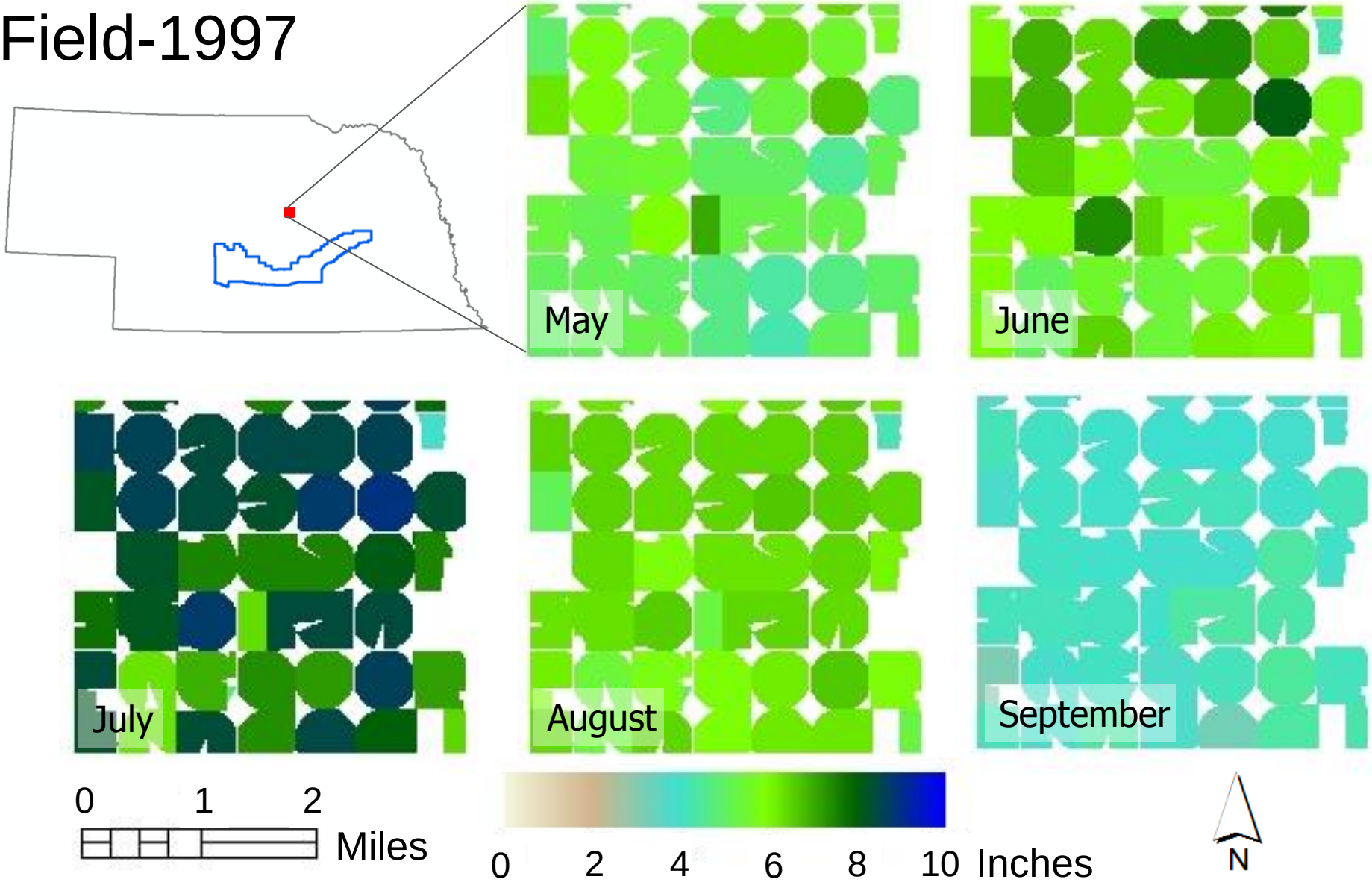


Provide the spatial information to water managers on where water is consumed within the NRD
Show the timing of ET and periods of **maximum pumping**

Estimated ET by Month - 1997

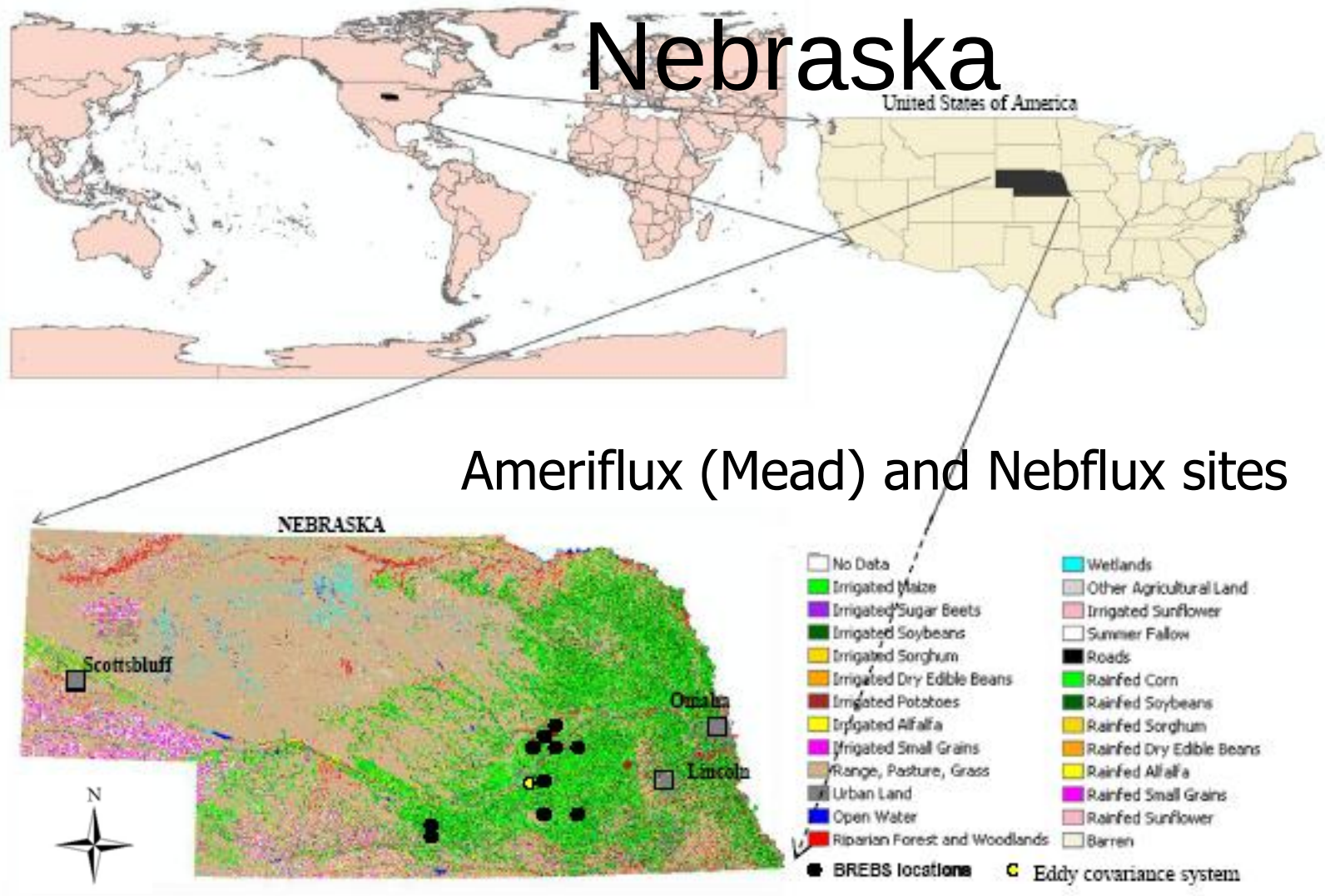


Average ET by Field-1997

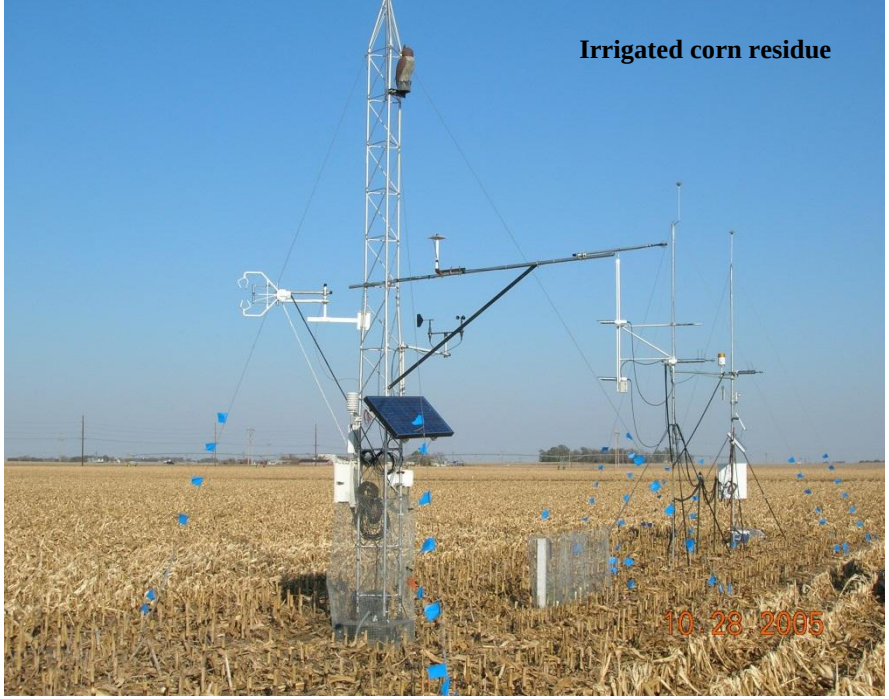


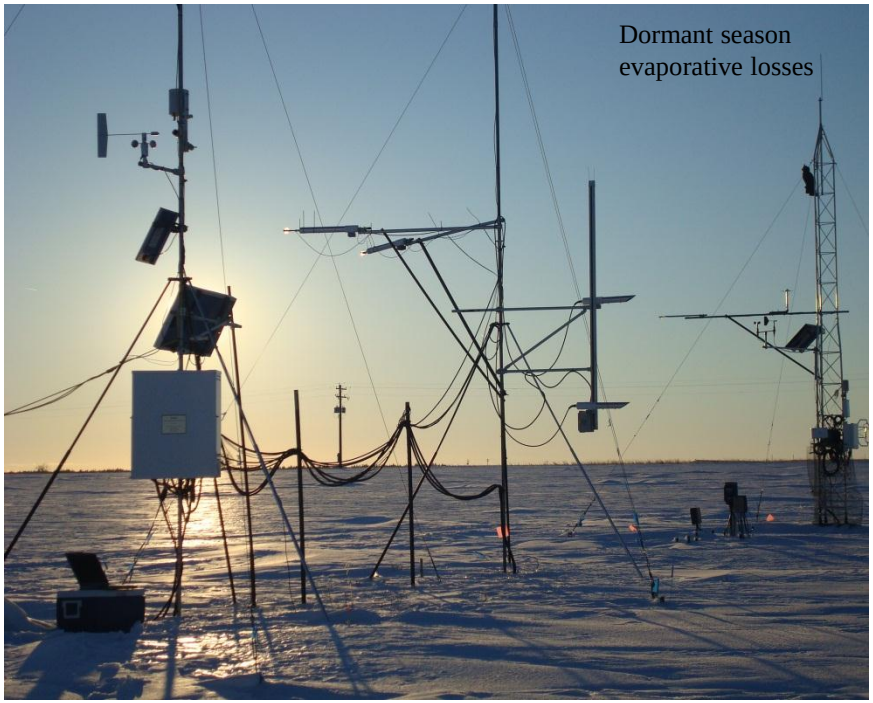
Certify acreage and amount of consumption!

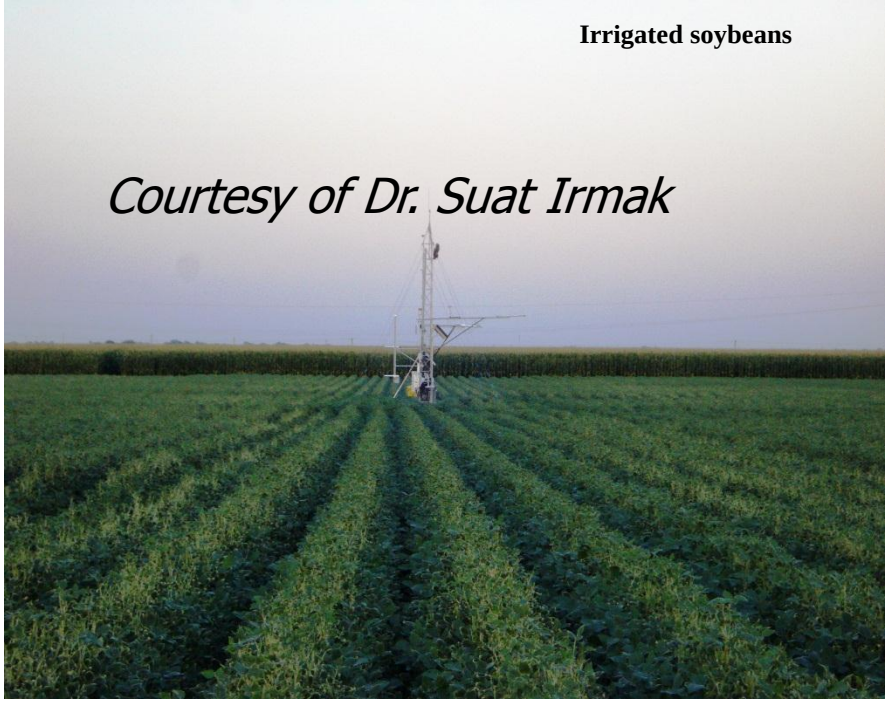
ET Measurement sites in Nebraska



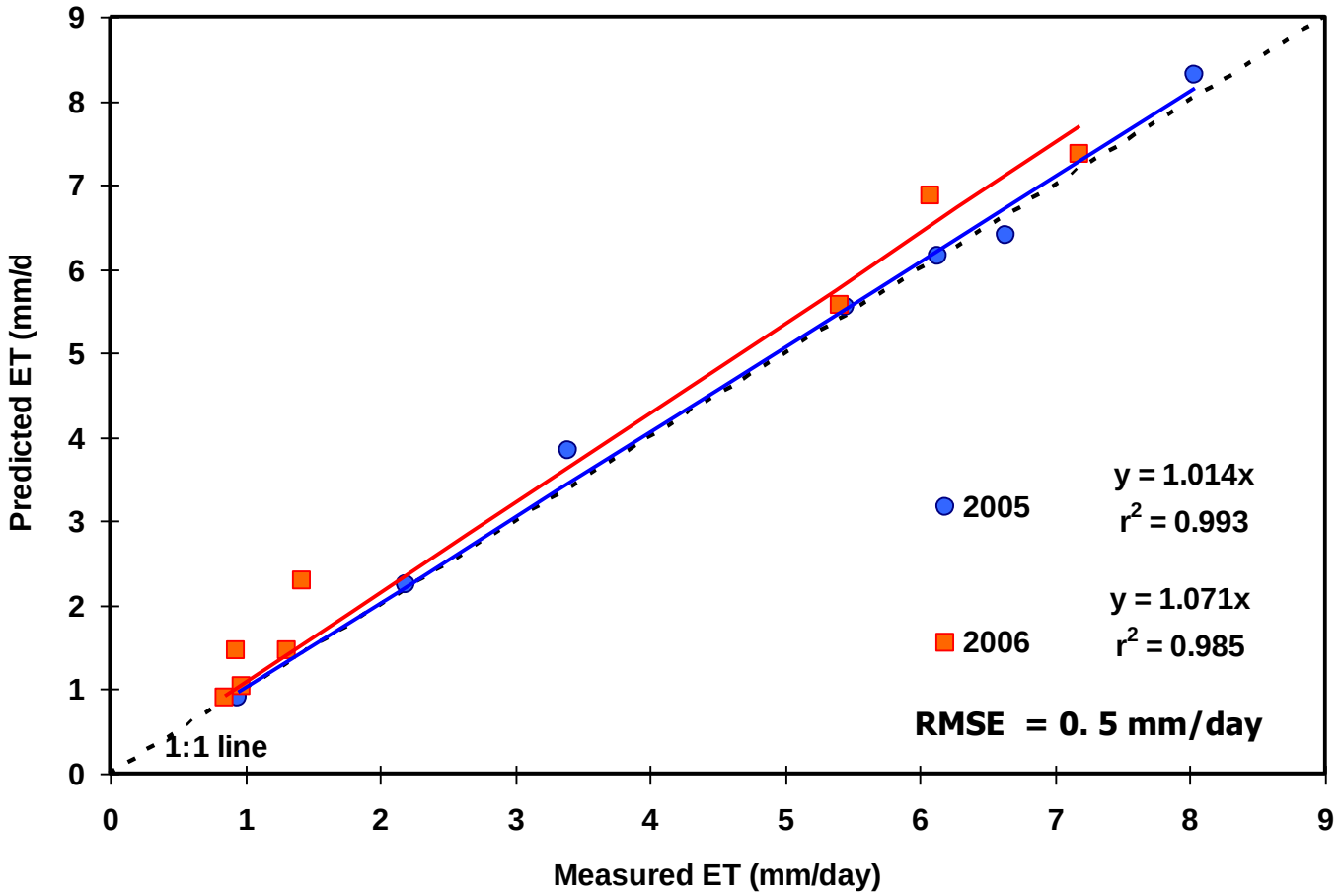
Irrigated corn

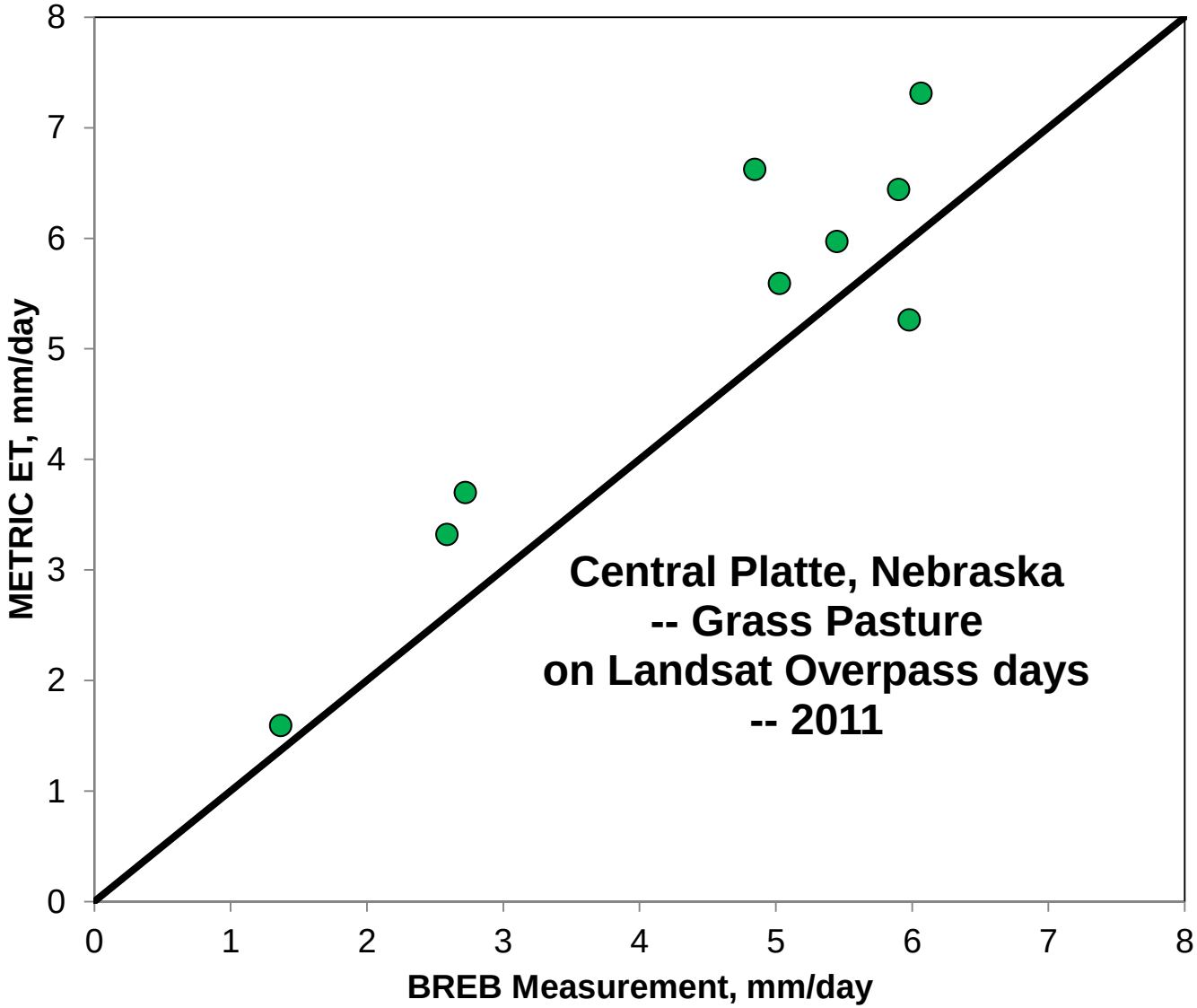

Irrigated corn residue
10 28 2005

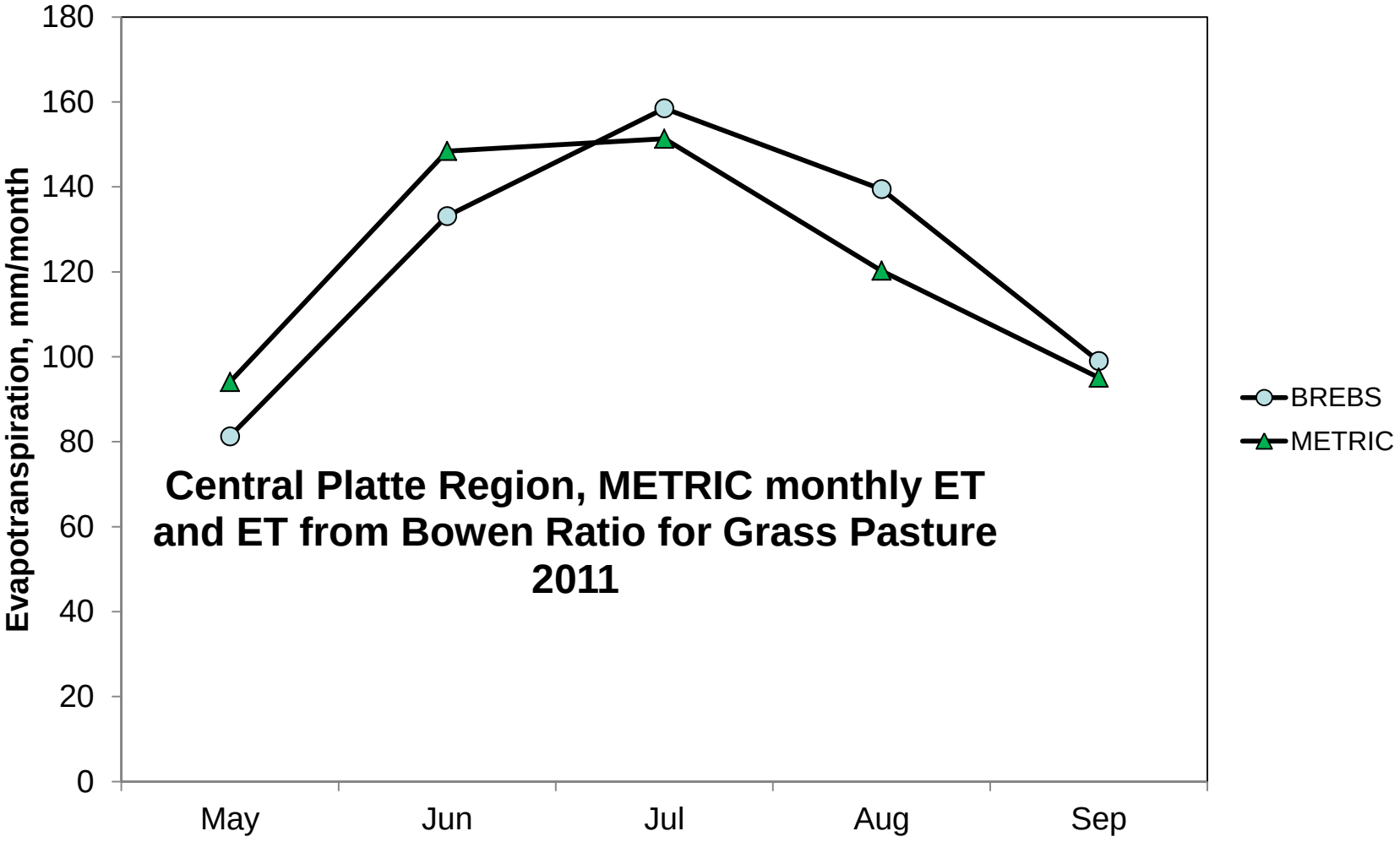

Dormant season
evaporative losses


Irrigated soybeans
Courtesy of Dr. Suat Irmak

Evaluation of METRIC using Bowen Ratio Energy Balance Measurements for Corn




Central Platte, Nebraska
-- Grass Pasture
on Landsat Overpass days
-- 2011
METRIC ET, mm/day
BREB Measurement, mm/day
0
1
2
3
4
5
6
7
8


Central Platte Region, METRIC monthly ET and ET from Bowen Ratio for Grass Pasture 2011
Evapotranspiration, mm/month
180
160
140
120
100
80
60
40
20
0
May
Jun
Jul
Aug
Sep
BREBS
METRIC