Mapping Phenology, Water Use and Drought at Field Scales

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Project overview

TOOLS

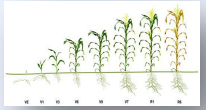
STARFM	Multi-sensor data fusion
DMS	Thermal image sharpening
ALEXI	Multi-scale ET modeling

ASSETS

		SW/TIR
GEO	Hourly	5km/5km
MODIS	Daily	250m/1km
Landsat	16 day	30m/100m
Lsat-like		~20-60m/ --

APPLICATIONS

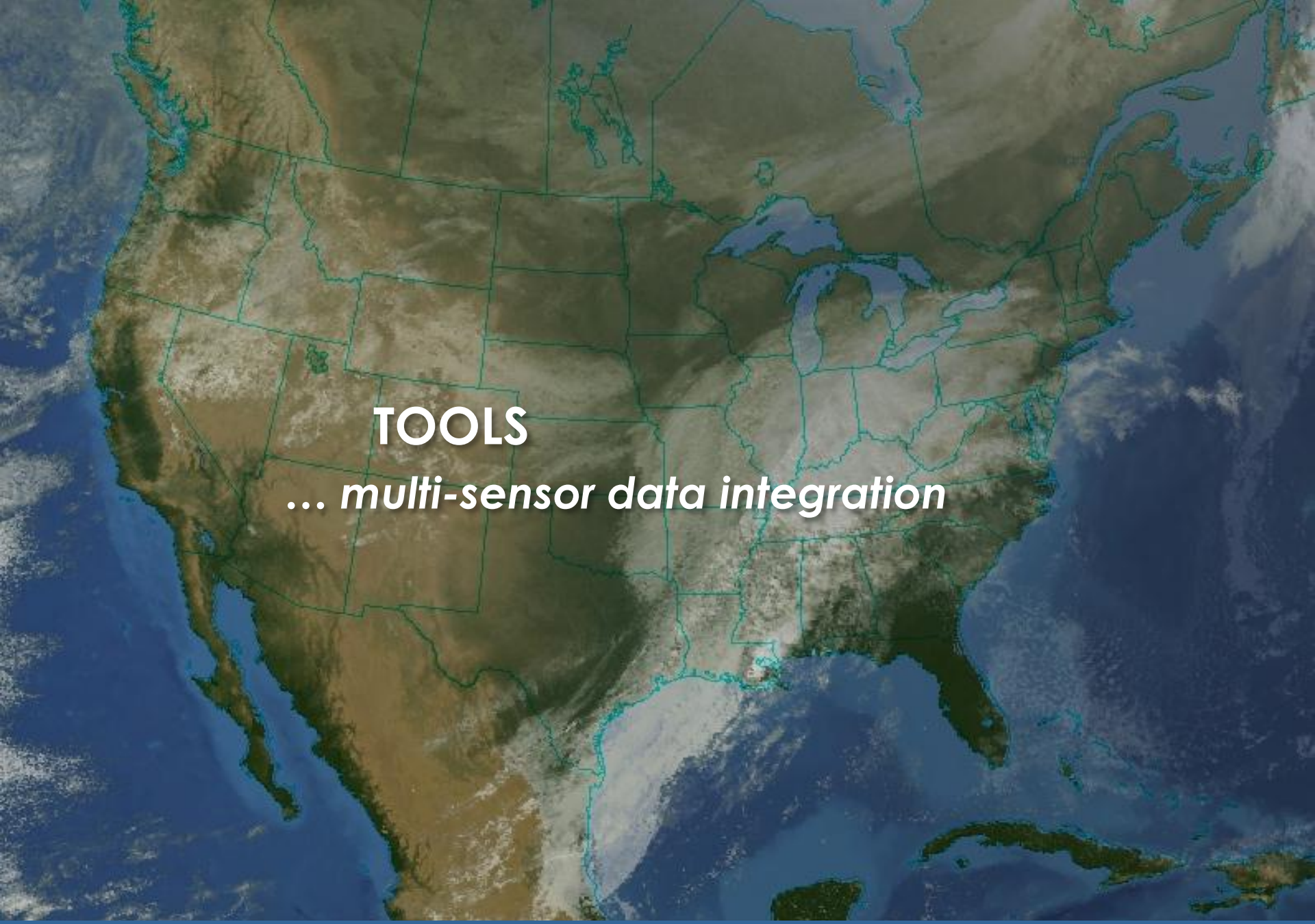
(daily/30 m)



Crop phenology metrics

Crop water use (Evapotranspiration)

Crop stress (drought early warning)

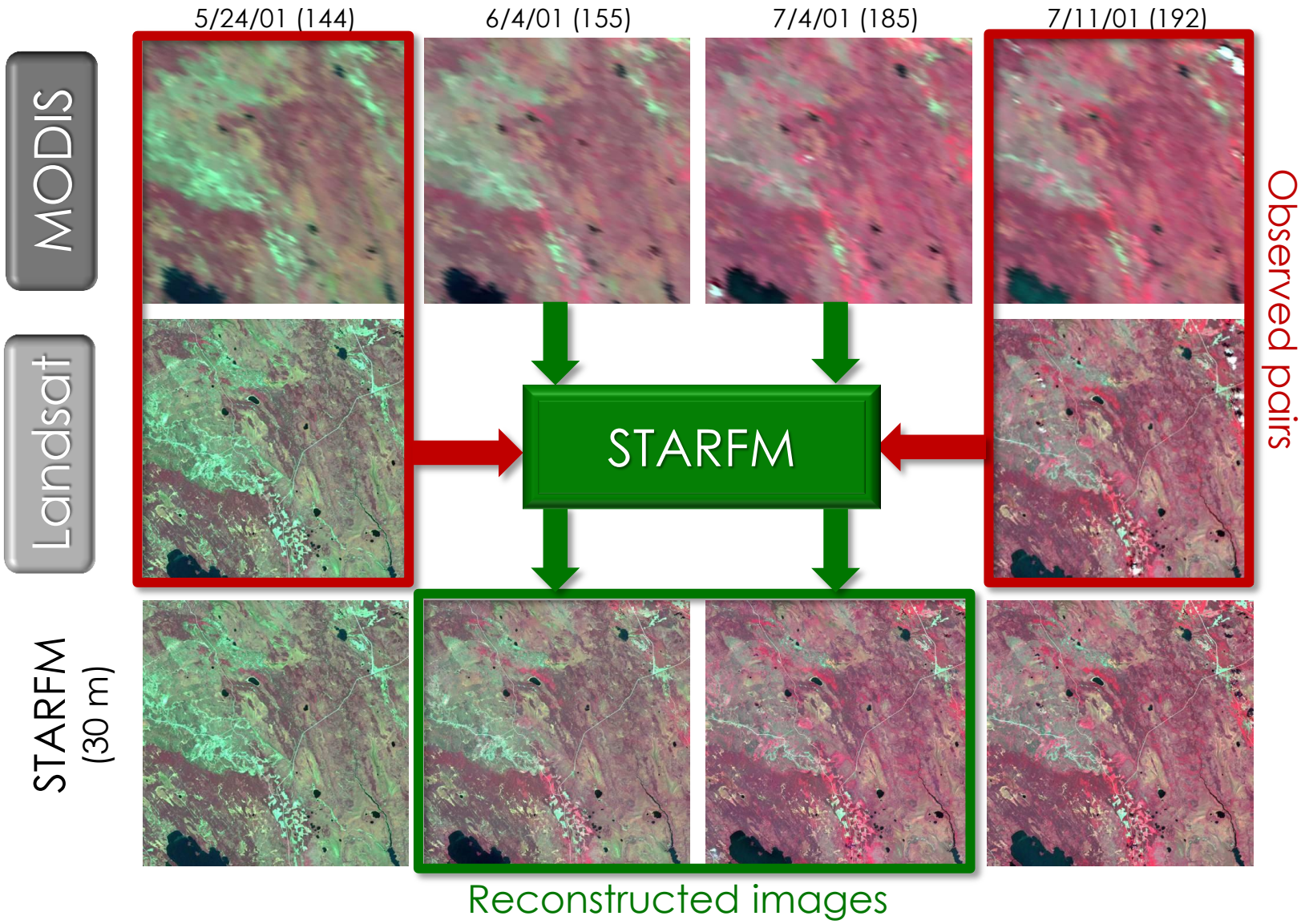


TOOLS

… multi-sensor data integration

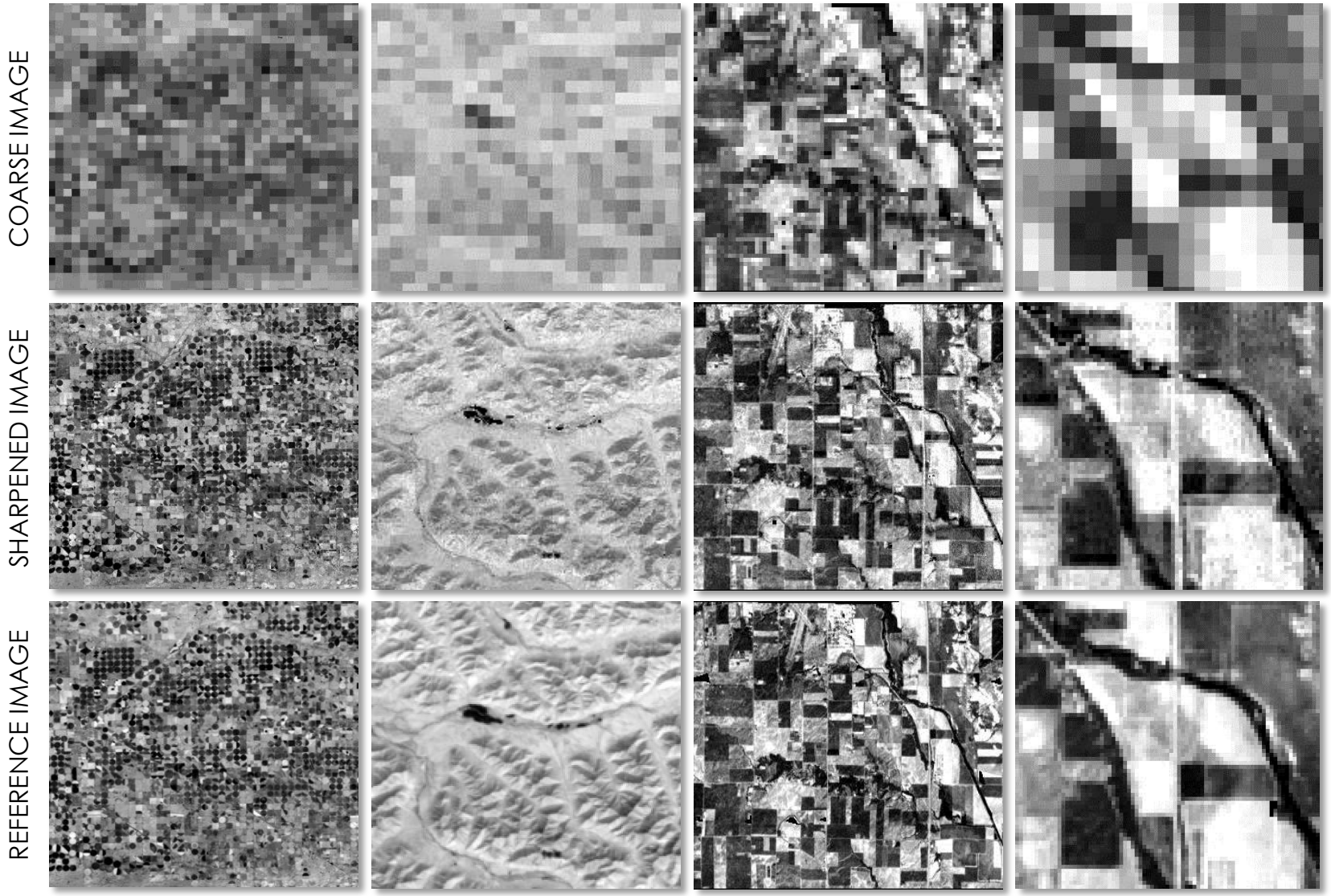
STARFM: Multi-sensor data fusion

Spatial and Temporal Adaptive Reflectance Fusion Model



DMS: Thermal image sharpening

Data Mining Sharpener



TEXAS (960 to 60 m) **ALASKA** (960 to 60 m) **IOWA** (120 to 30 m)

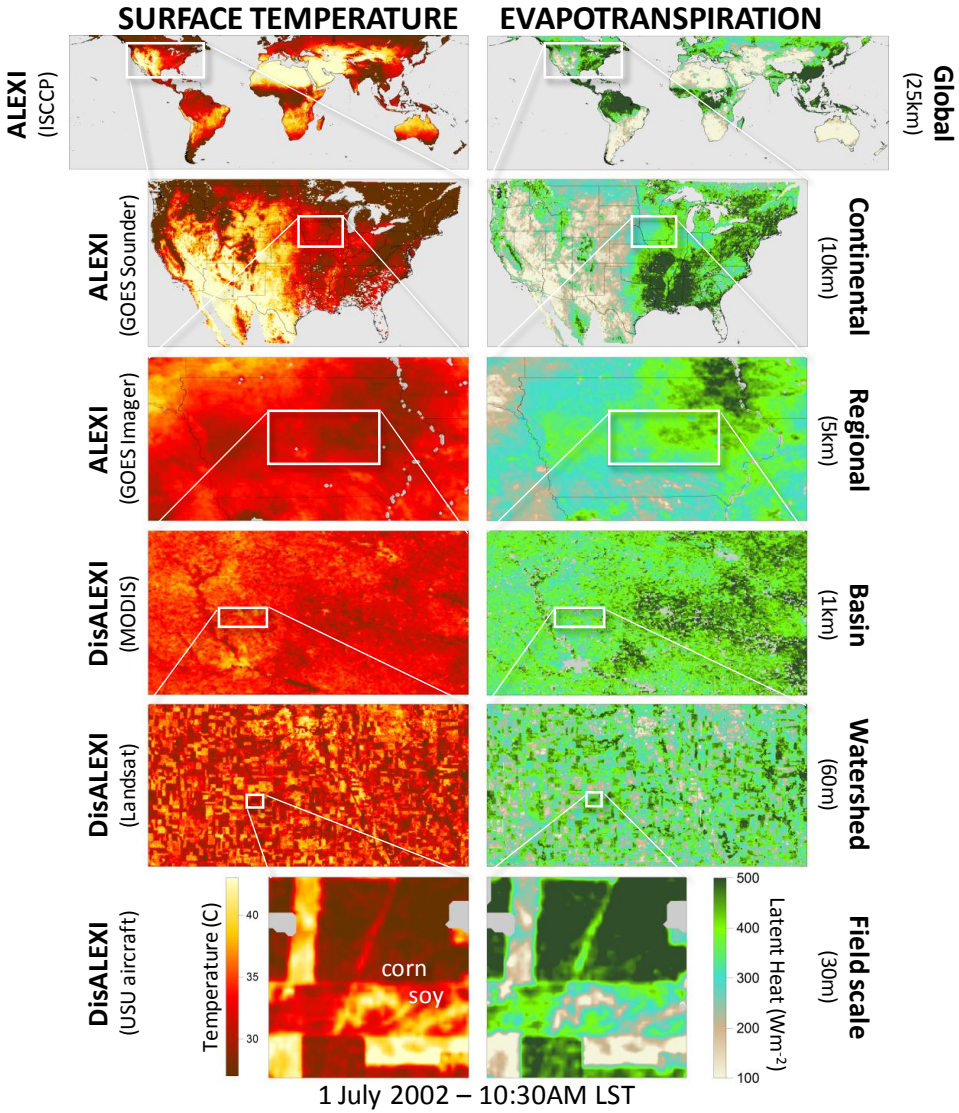
Atmosphere Land Exchange Inverse Model

ALEXI: Multi-scale ET modeling

GEO

MODIS

Landsat



Hourly

Daily

Bi-weekly

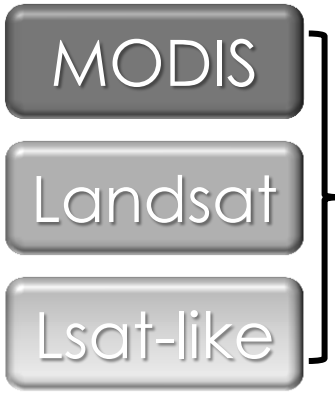
APPLICATIONS

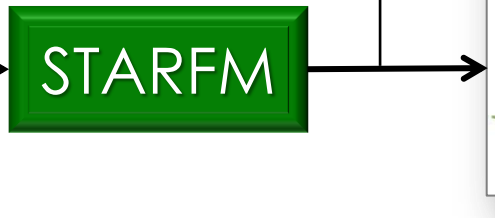
… daily monitoring at 30 m

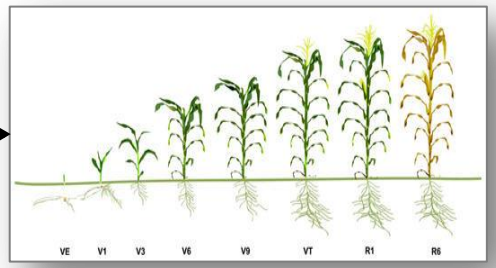
FIELD-SCALE PHENOLOGIC METRICS

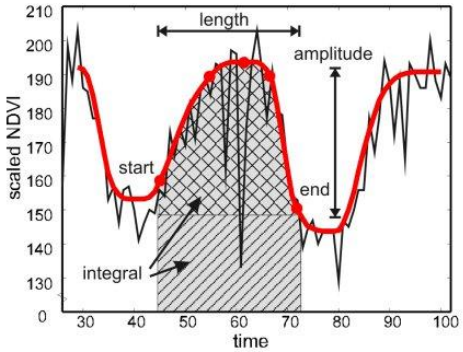
SW reflectances

Daily EVI timeseries







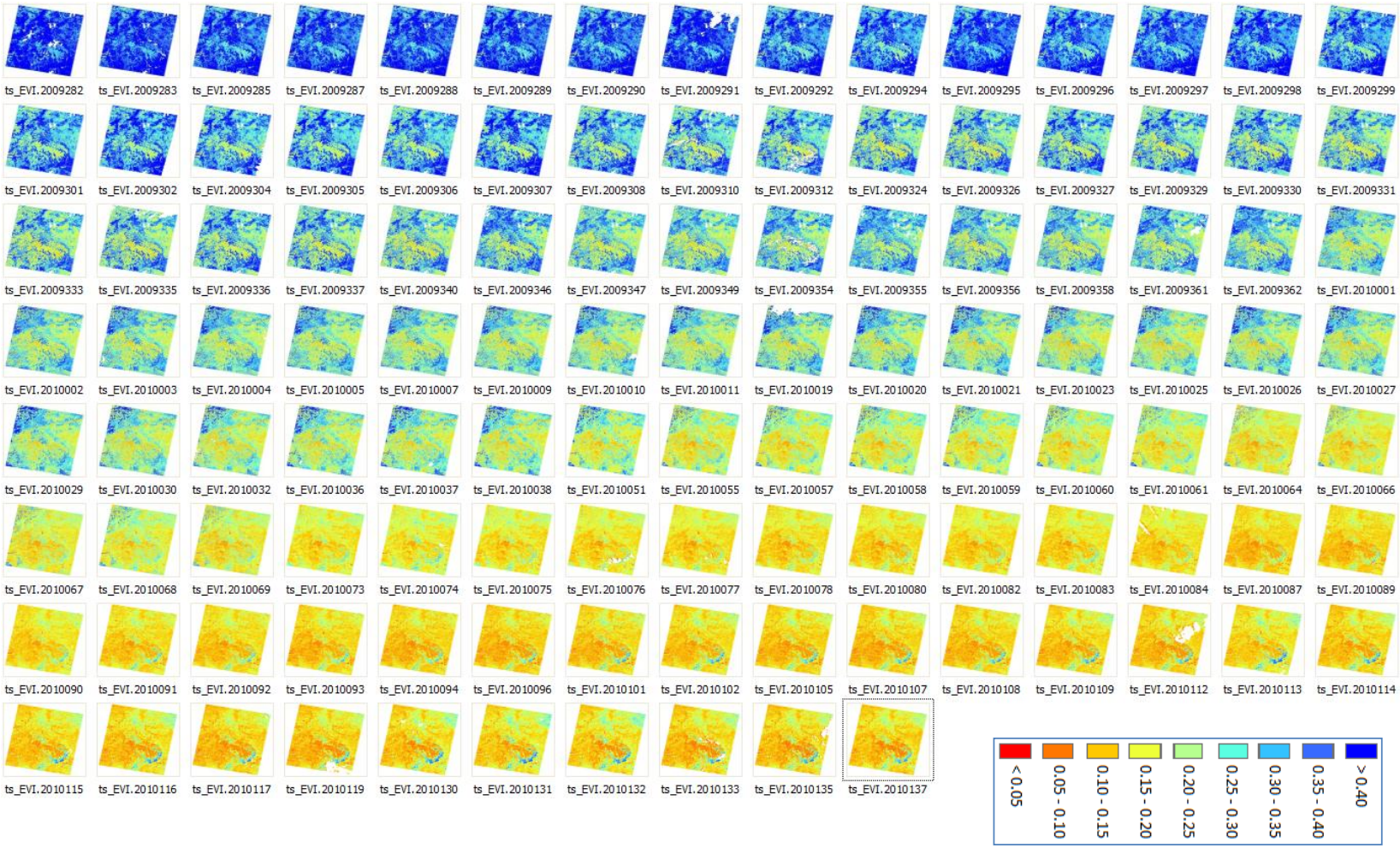


TimeSat:

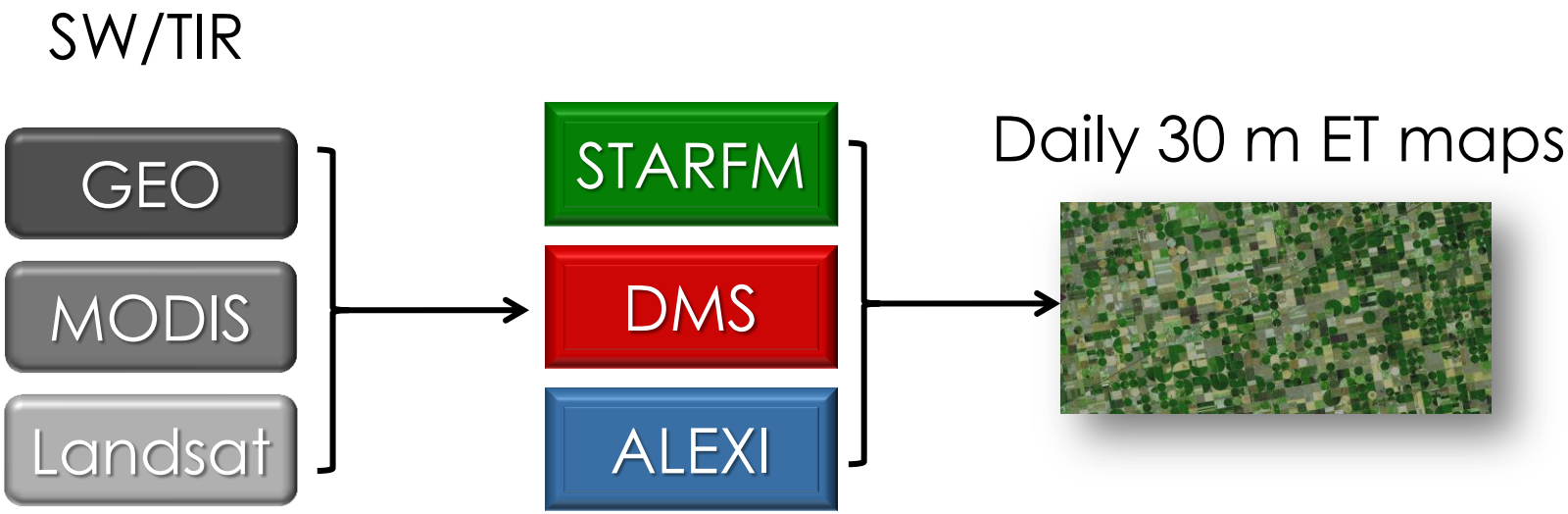
- start of season
- end of season
- peak greenness
- start of senescence

Simulated Landsat Time Series EVI

from 2009274 (Oct. 1, 2009) to 2010151 (May 31, 2010)

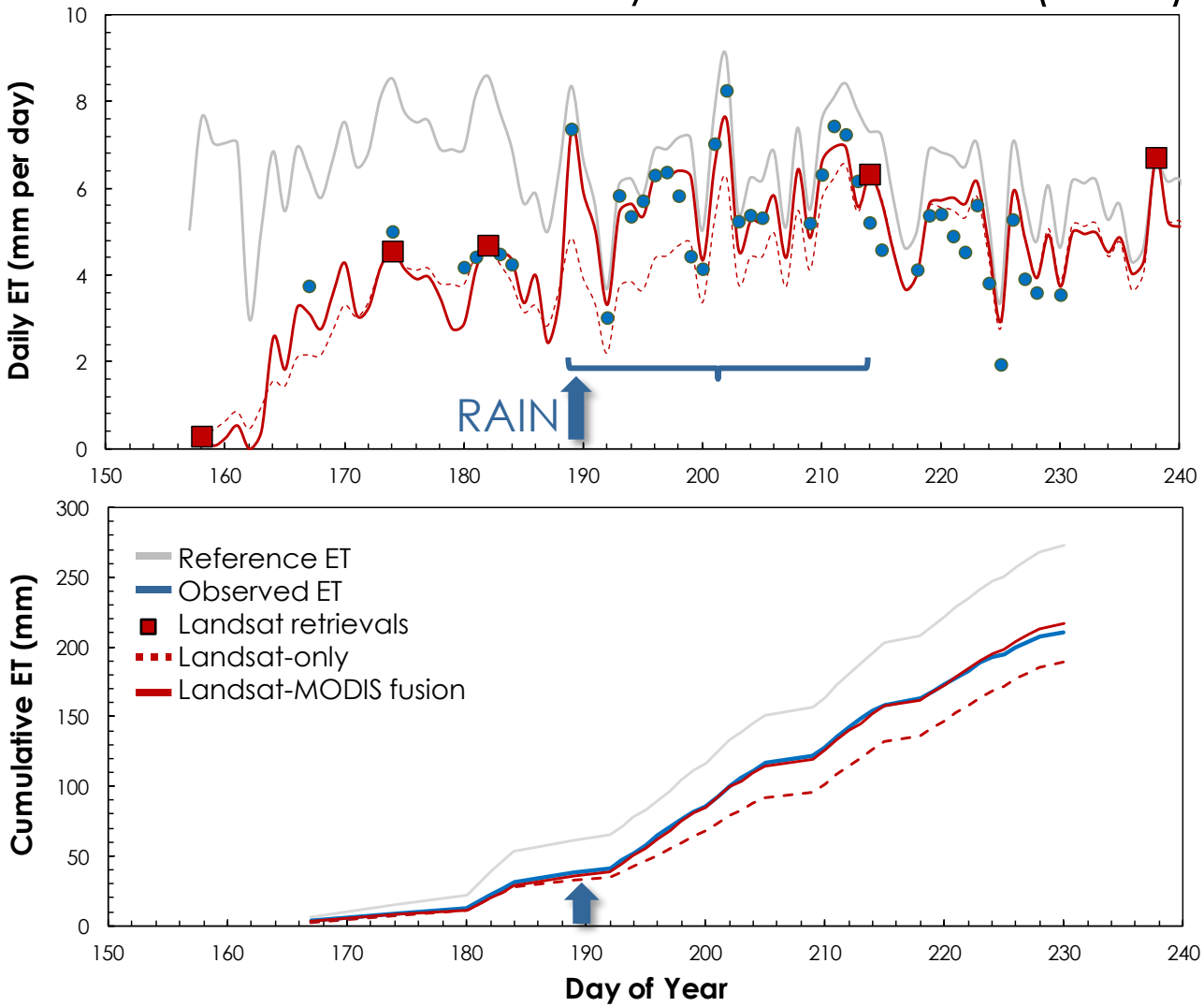


FIELD-SCALE DAILY EVAPOTRANSPIRATION

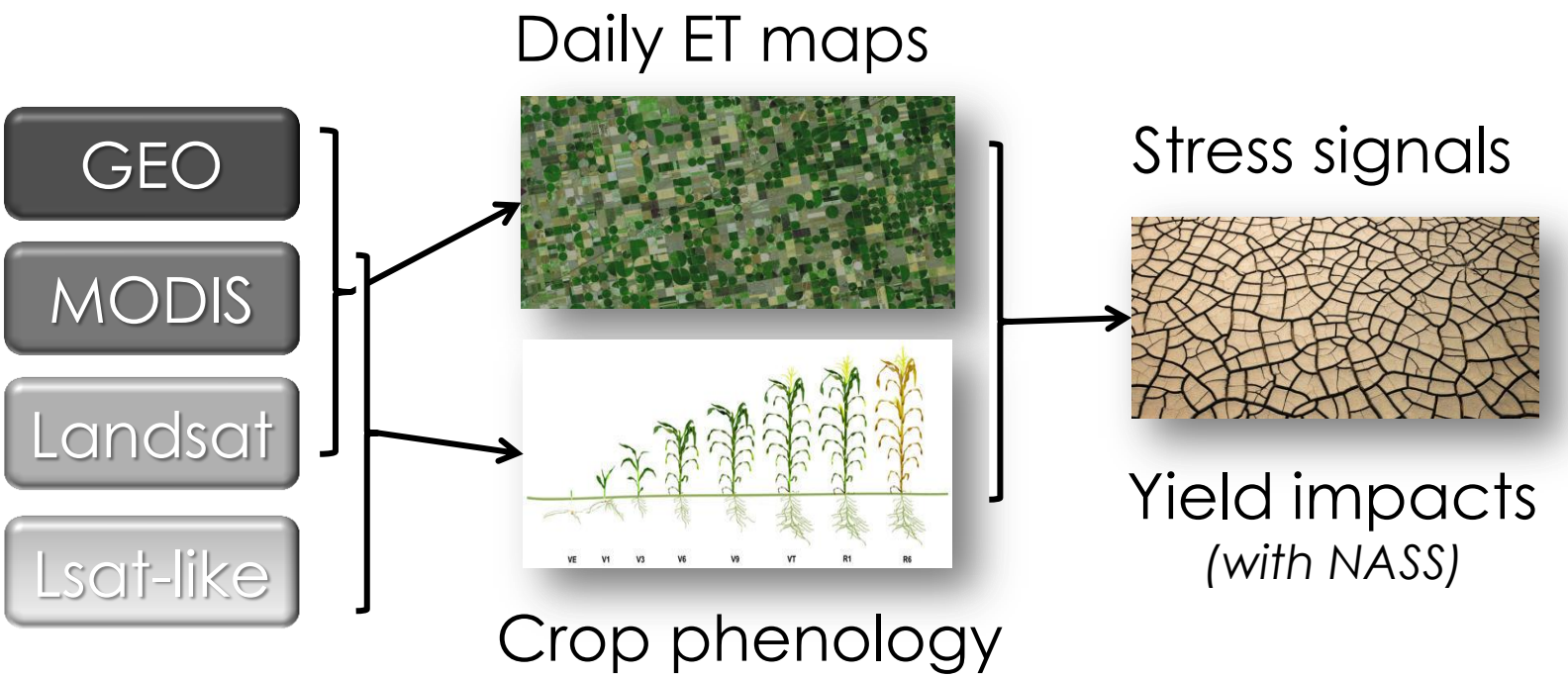


Improvement over Landsat-only

Rainfed soybean – SMEX02 (Iowa)



FIELD-SCALE DROUGHT IMPACTS

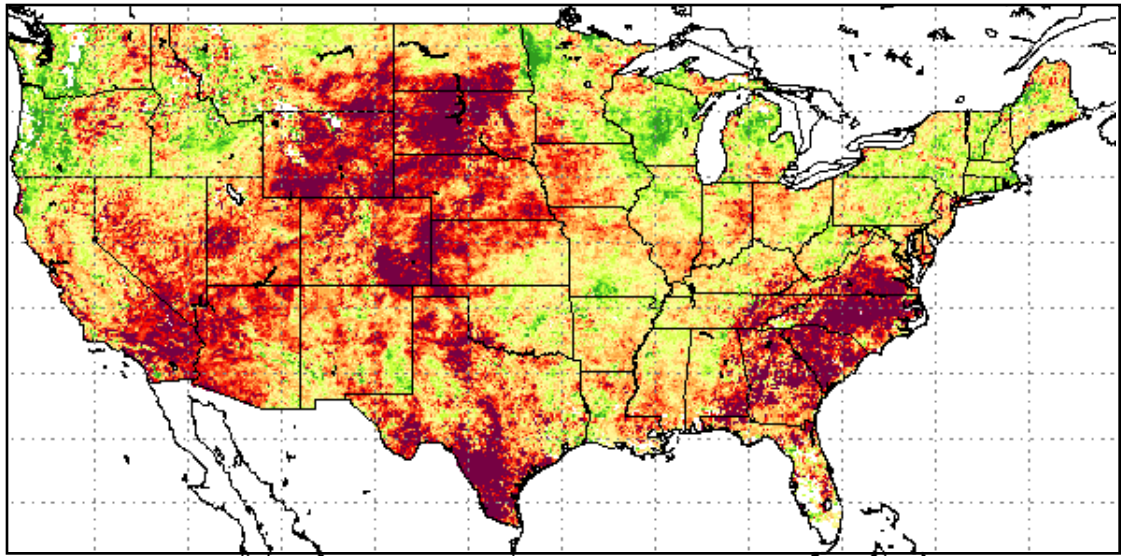


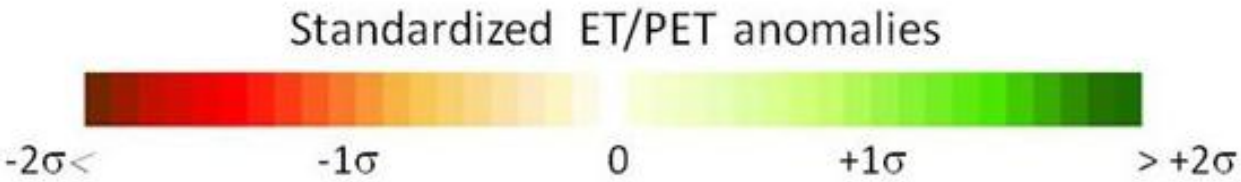
TASK 3: Drought/Crop Stress

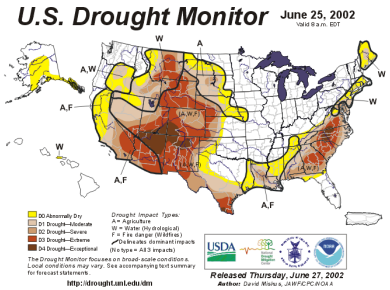
hrsl.arsusda.gov/drought

GOES Evaporative Stress Index

JUNE 2002







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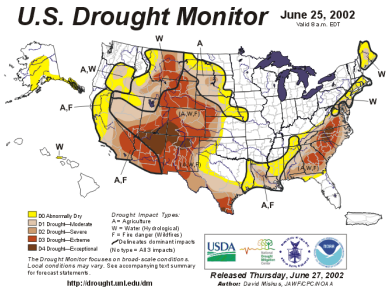
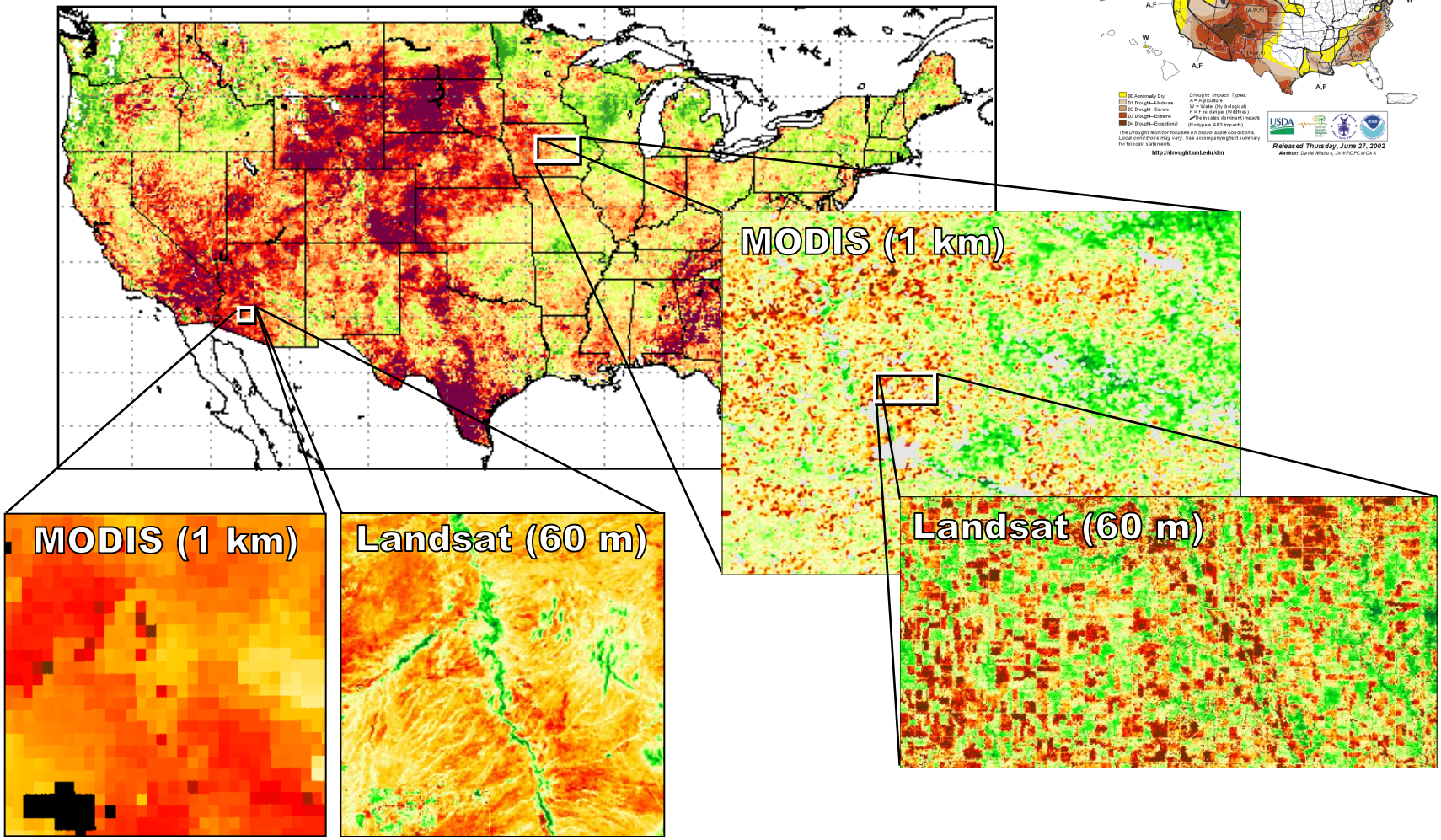
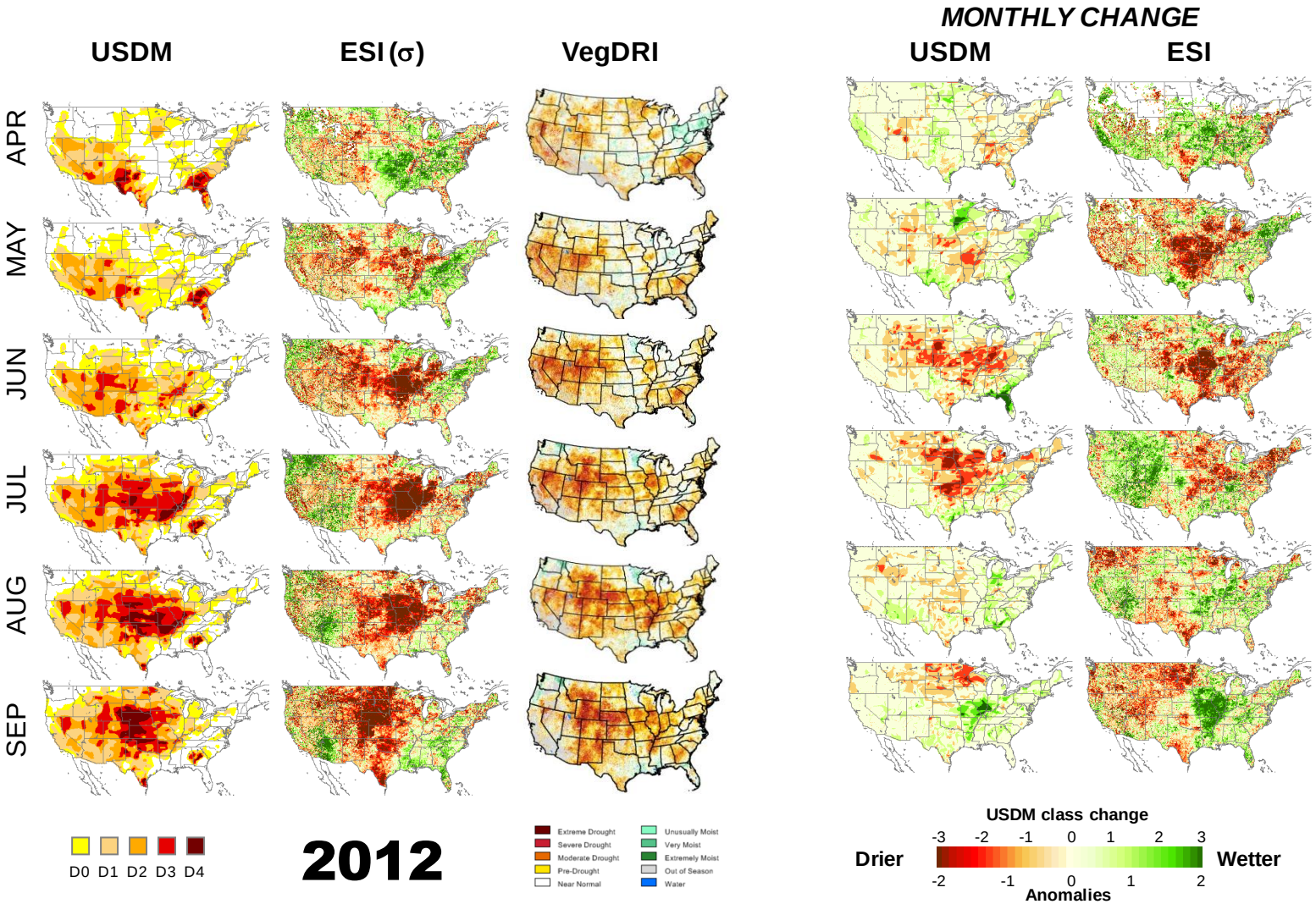




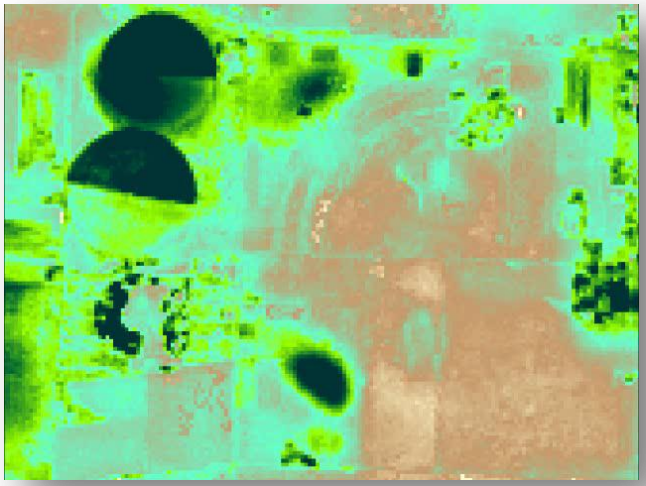
Drought early warning

2012 FLASH DROUGHT



Summary

Daily ET at 30m, Bushland TX 2008



TOOLS

- STARFM data fusion
- DMS TIR image sharpener
- ALEXI/DisALEXI ET modeling

FIELD-SCALE APPLICATIONS

- Crop phenology
- Daily ET
- Crop stress / drought early warning

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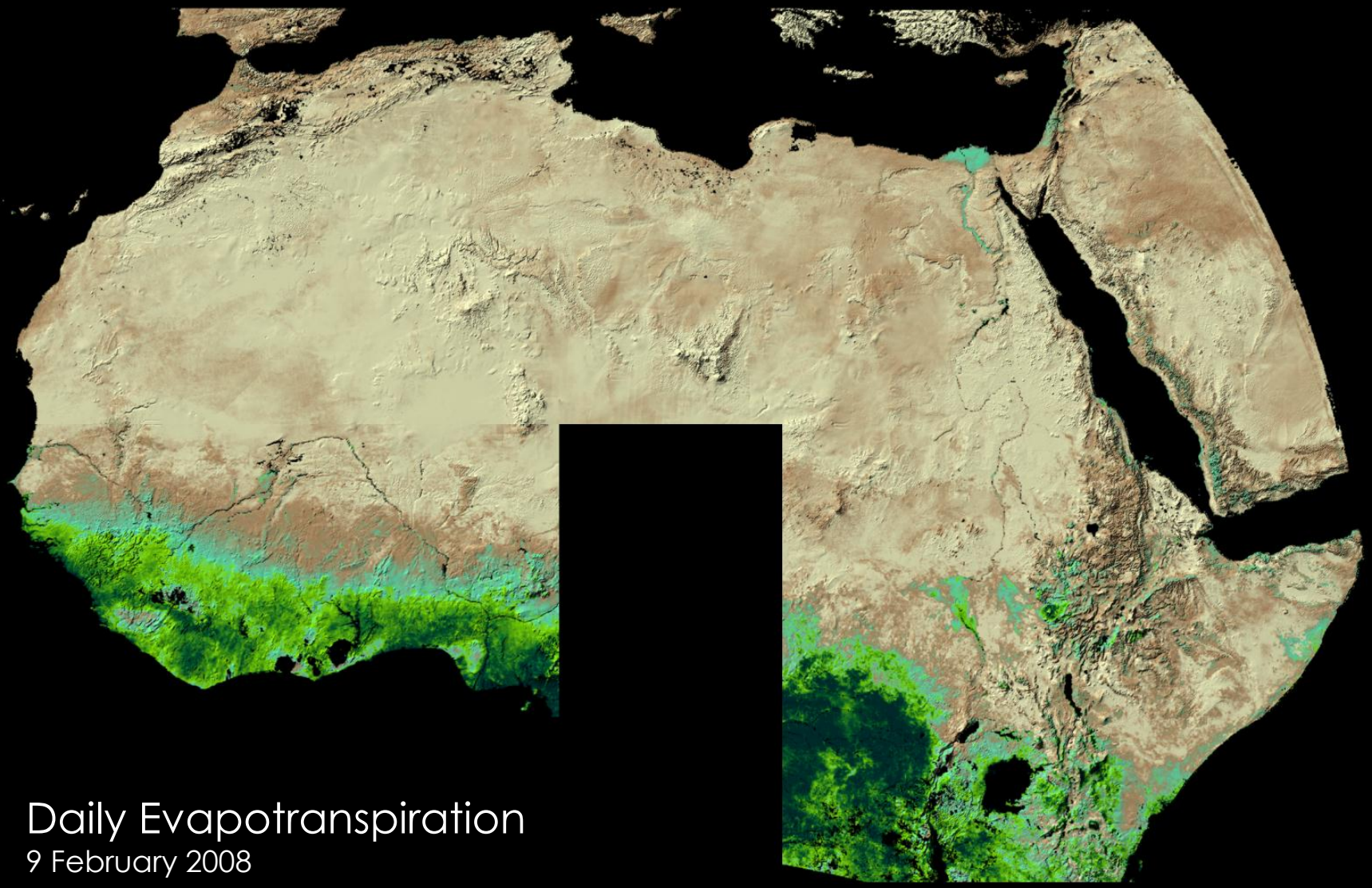
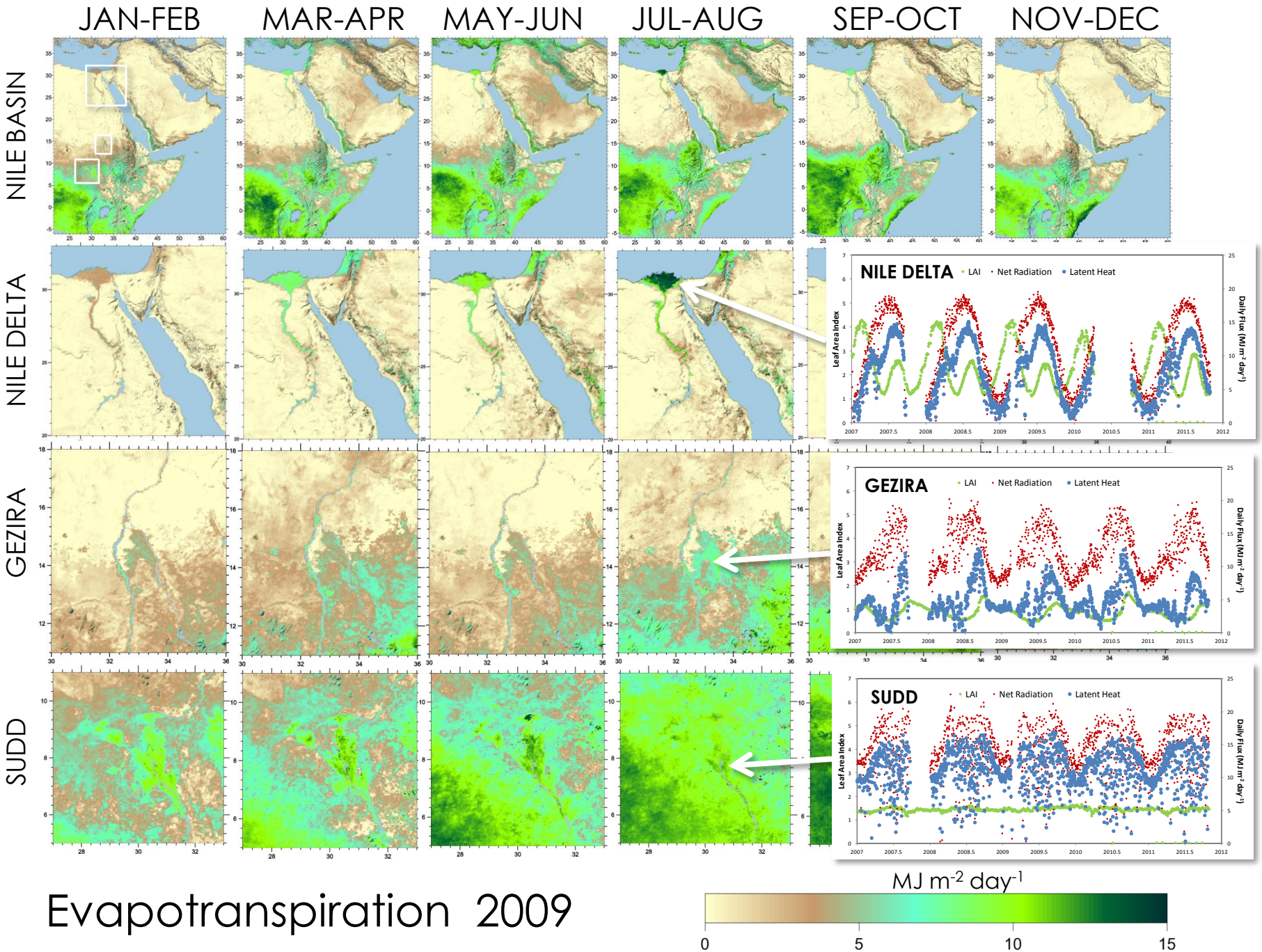
APPLICATIONS FOR SATELLITE ET

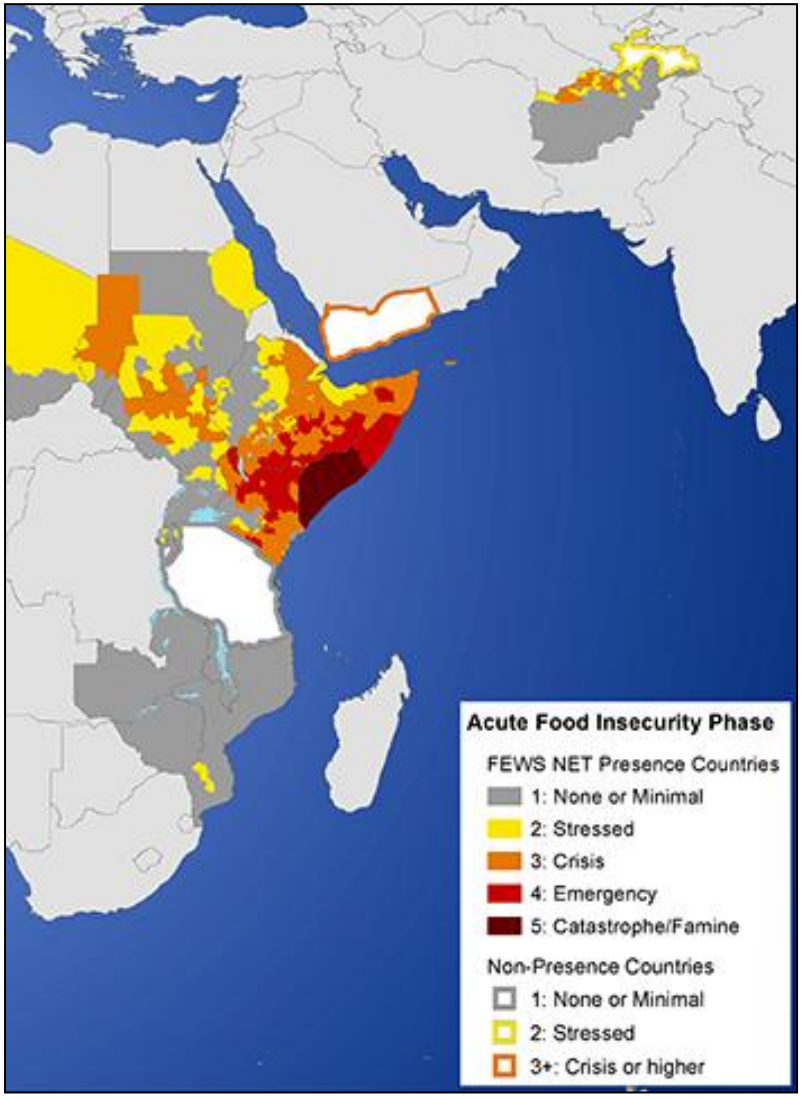
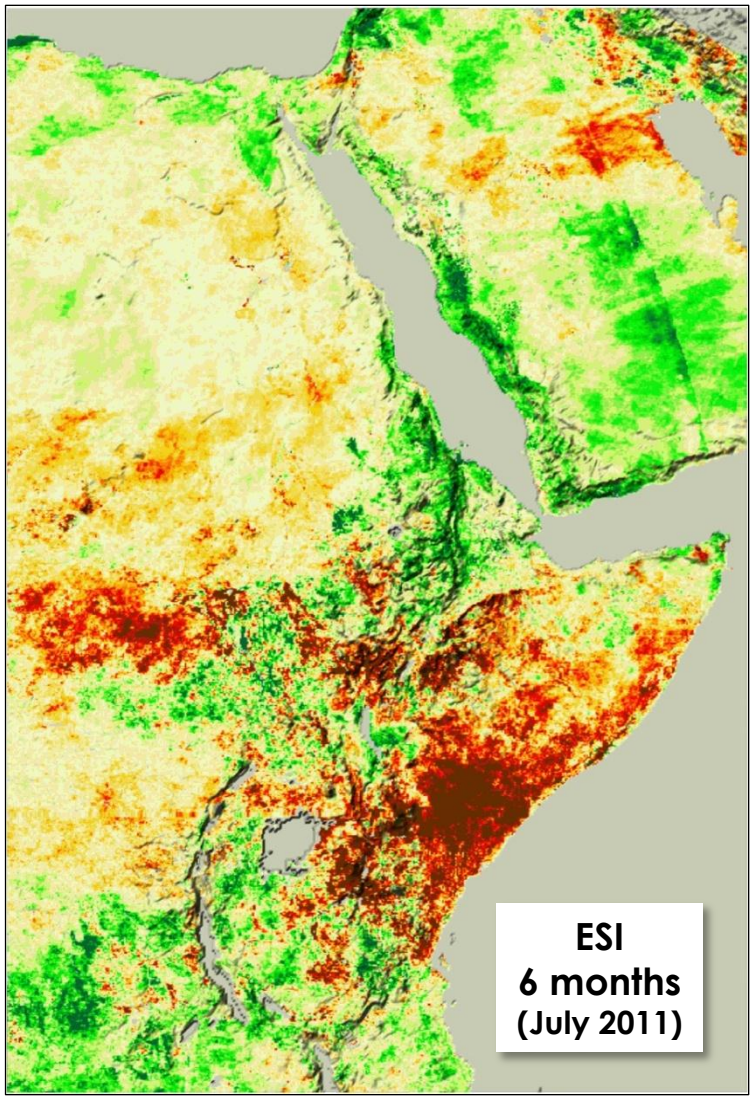
… Food and Water Security

Water use in North Africa



Daily Evapotranspiration
9 February 2008



Evapotranspiration 2009

2011 Famine in Somalia