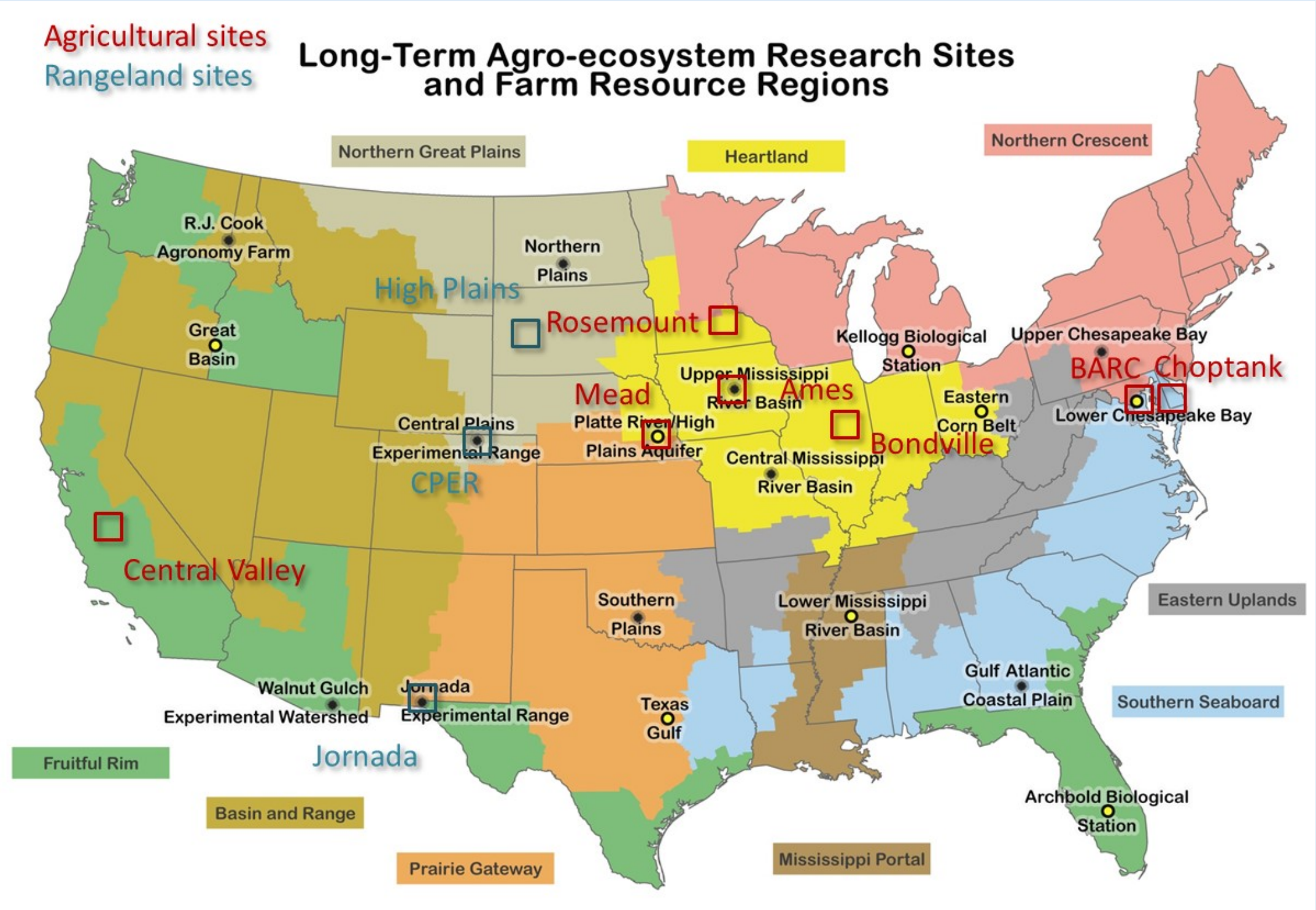


MAPPING WATER USE, PHENOLOGY AND PRODUCTIVITY IN AGRICULTURAL LANDSCAPES BY FUSING MULTI-SENSOR DATA PRODUCTS

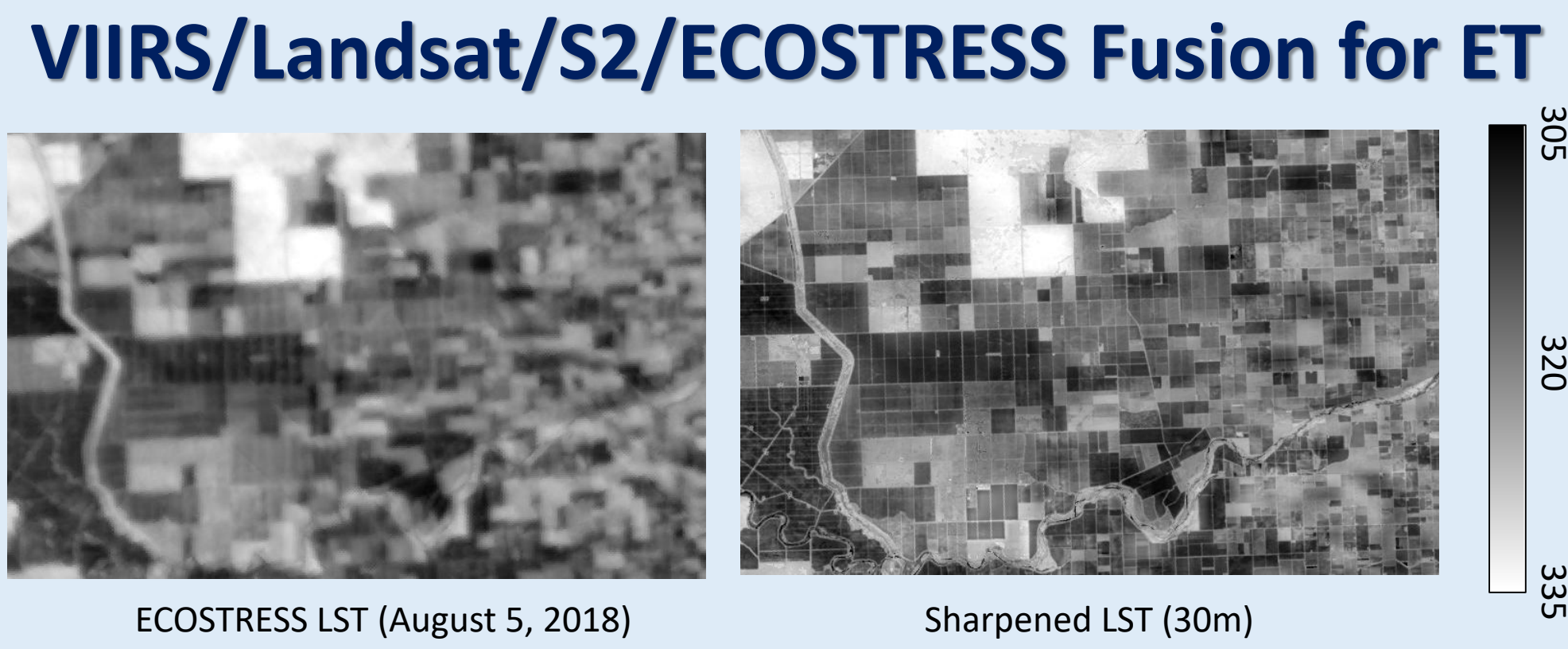
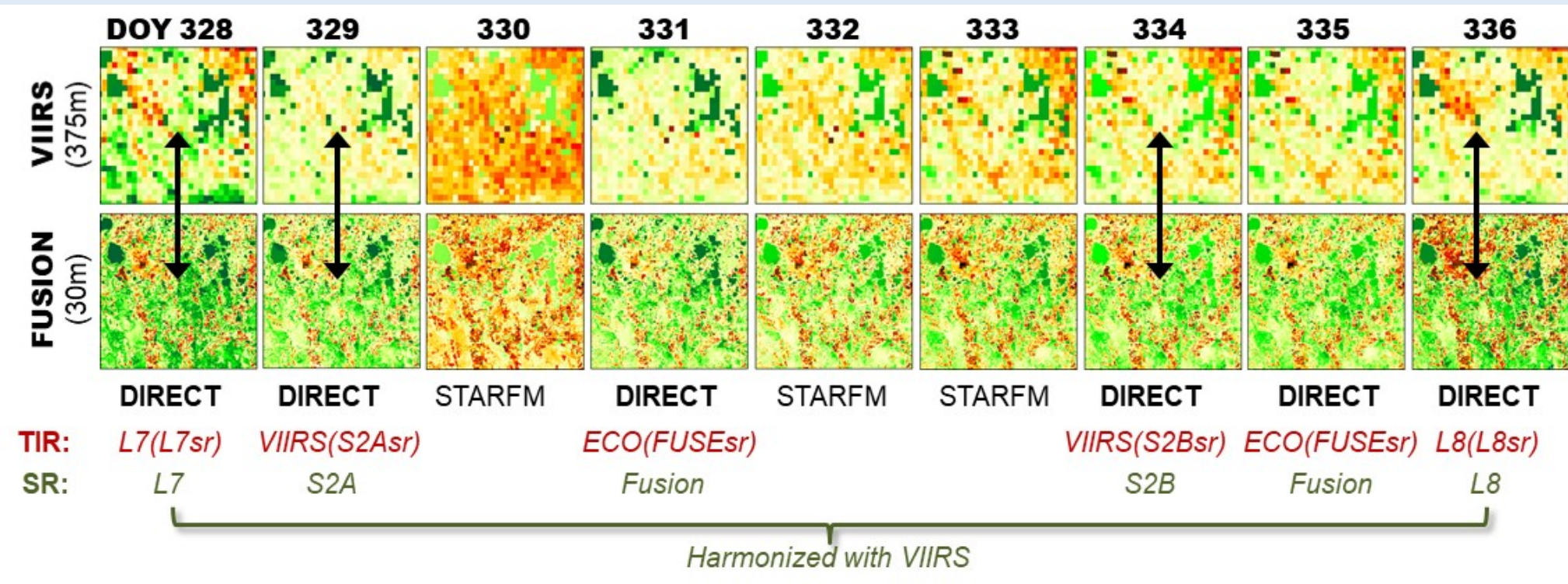
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The project aims to prototype methods for routine production of high spatiotemporal resolution evapotranspiration (ET), vegetation index (VI) and derived phenology and yield products using a multi-sensor data fusion approach. This approach fuses moderate resolution, near-daily retrievals of ET and surface reflectance (SR) from sensors like MODIS and VIIRS with periodic finer scale data from Landsat, Sentinel-2, ECOSTRESS and other Landsat-like sensors to generate multi-year timeseries of gridded products at daily time steps and 30m spatial resolution. ET will be estimated using a well-established surface energy balance algorithm, which uses thermal infrared (TIR) retrievals of land-surface temperature along with vegetation cover and albedo information from the SR bands. Collectively, the high spatiotemporal resolution ET and VI “datacubes” will provide valuable field-scale diagnostics of water use, moisture stress, phenology, and biomass accumulation required for monitoring agricultural production systems and forecasting yield. The accuracy of these products will be evaluated over diverse agricultural landscapes, including crop, pasture and rangelands in the U.S. and internationally. ET retrievals will be compared with flux tower measurements to assess absolute accuracy and ability to capture episodic changes in moisture conditions. VI data and derived phenological metrics will be evaluated at full resolution using in-situ observations, and county and state-level crop progress reports. We will demonstrate utility of combining the 30m daily ET/VI data and derived phenology for operational agricultural assessments.

Study Area



	UMB	PRIPA	Cropland	ICB	CA	CPER	Rangeland	SD	U.S. Puerto Rico	Czech Rep.	AUB
Met data	x	x	x	x	x	x	x	x		x	x
Flux sites	SF, WC, BV, Rosemount	Mead	Choptank, OPEX	GRAPEX	NEON	LTER					
LST	x	x	x	x	x	x	x				
LAI	x	x	x	x	x	x	x				
Yield/biomass	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field	field/mun/state	field/district	field
Phenology	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field/NASS	field	field	field	field
Landcover	Rainfed corn, soybean	Rainfed corn, soy, grassland	Rainfed corn, soy, grassland	irrigated vineyards	Rangeland	Semi-arid rangeland	Agro-pastoral-silviculture	Wheat, Barley, irrigated crops	Canola		



Expected Outcomes

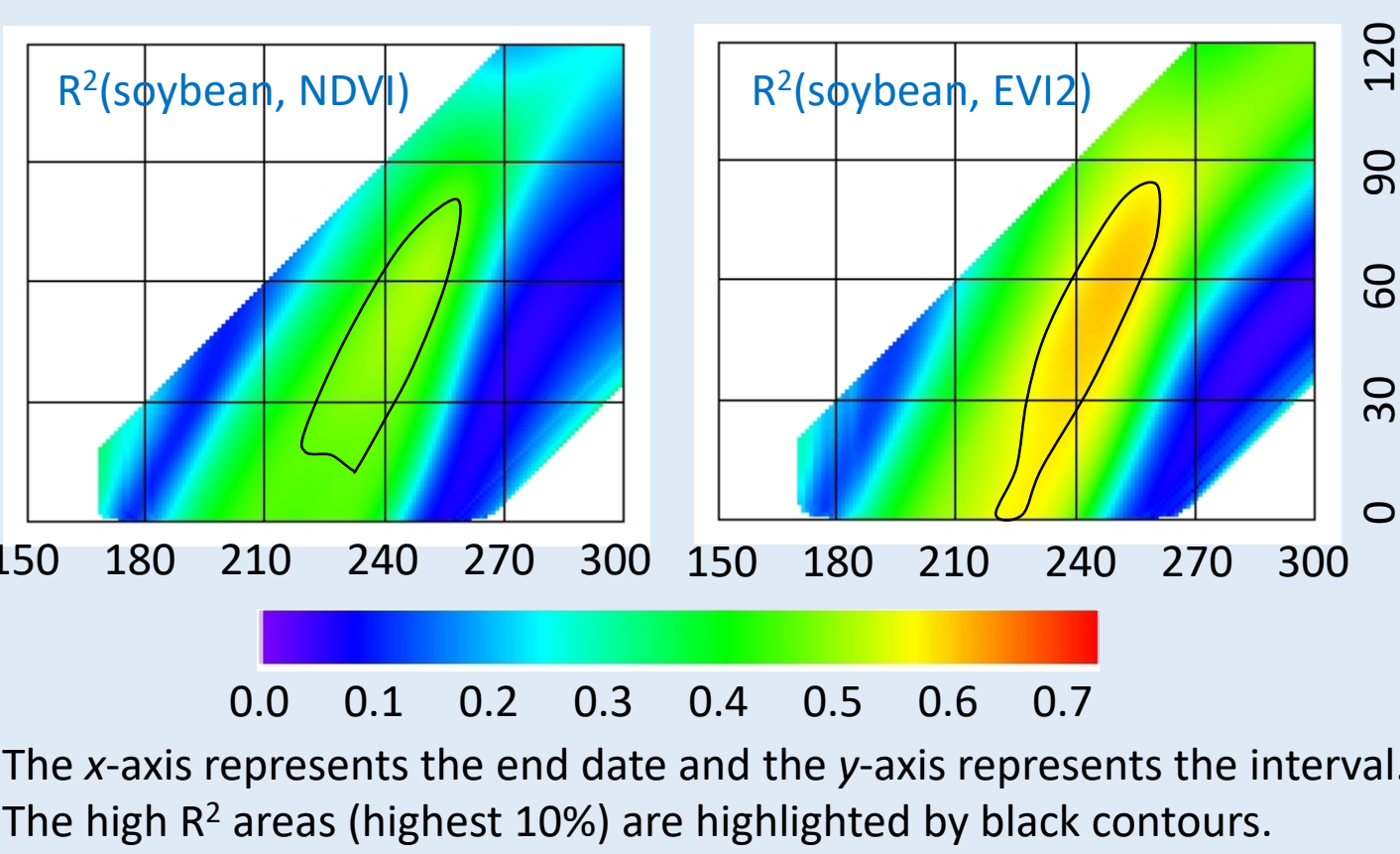
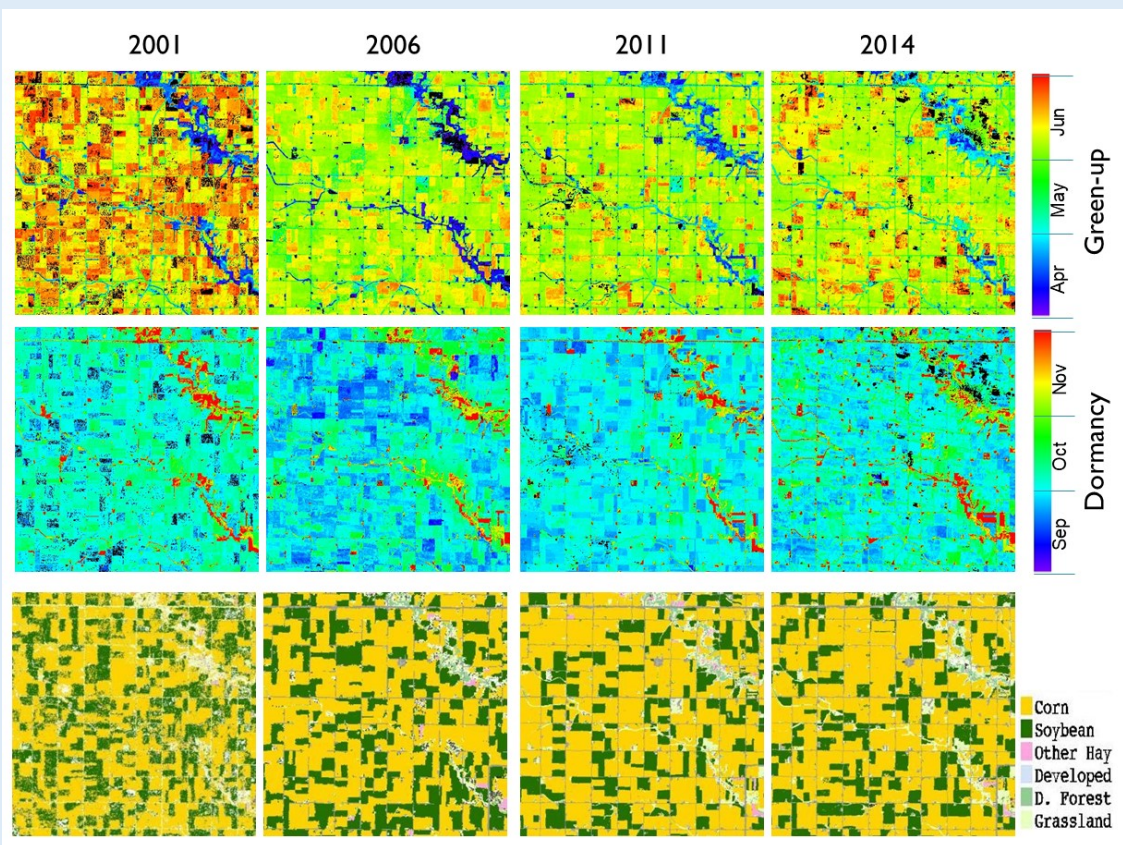
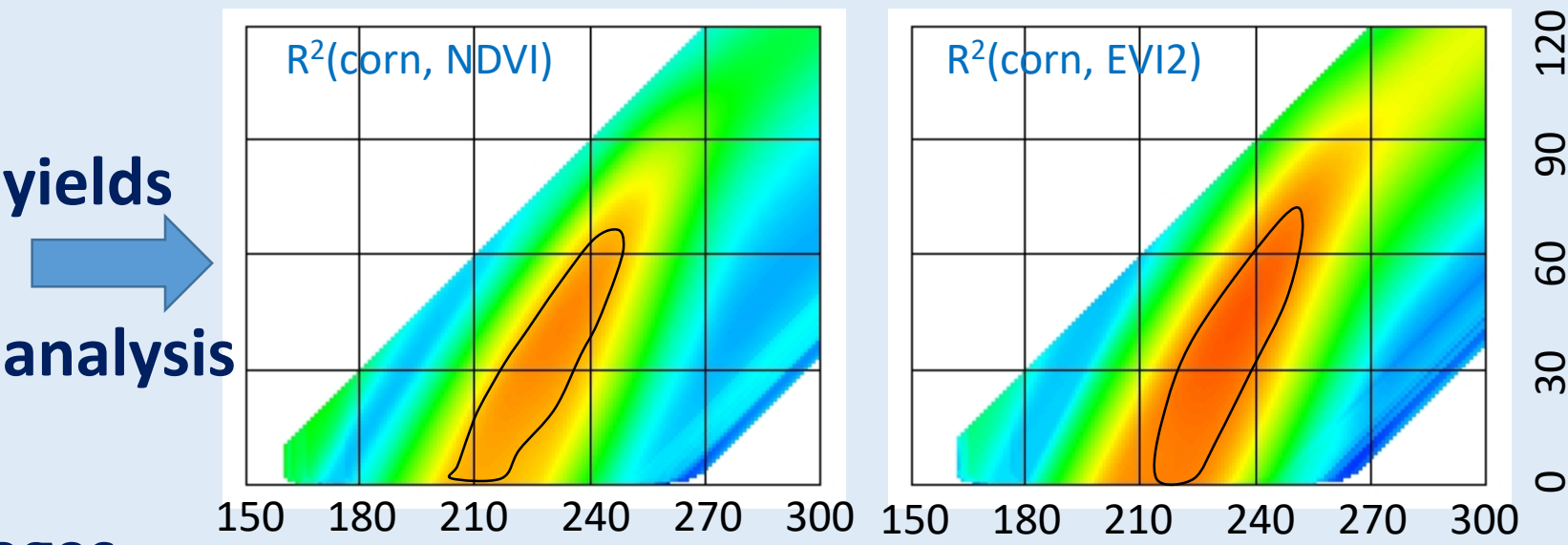
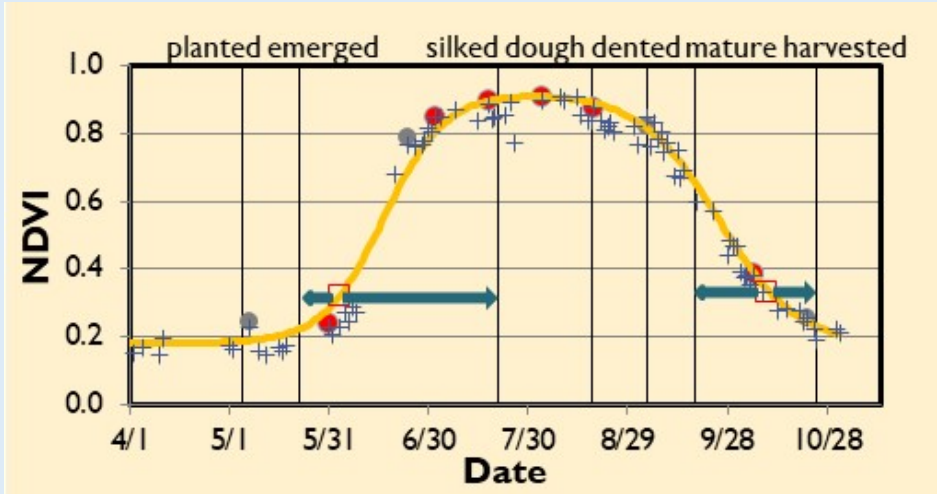
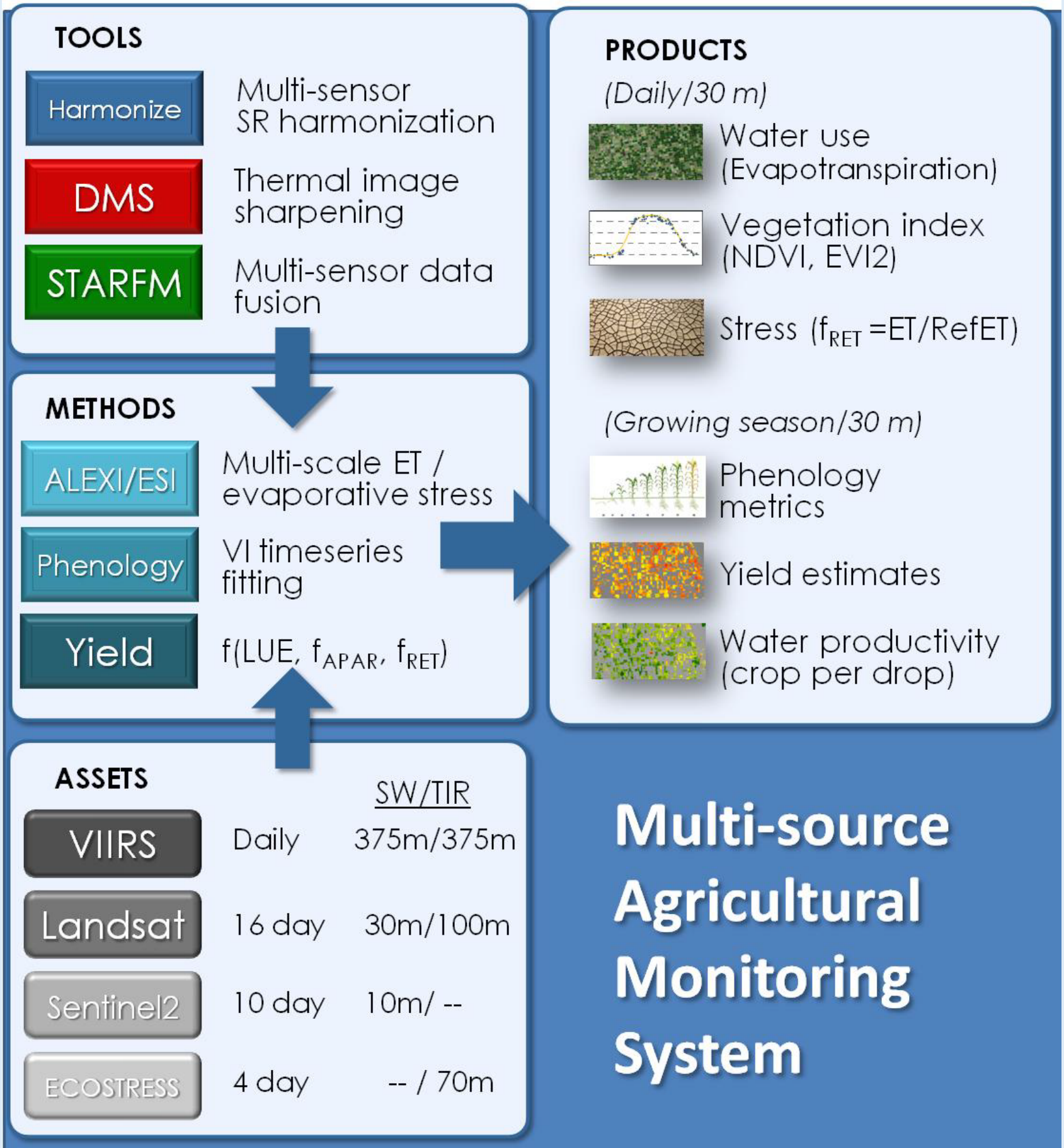
- Daily 30-m SR and VI, combining Landsat, S2 and MODIS/VIIRS SR data
- Phenology extraction tools for crop and rangeland
- A streamlined 30-m, daily ET and water stress mapping algorithm, utilizing sharpened TIR products from Landsat, MODIS/VIIRS and ECOSTRESS
- A prototype field-scale yield mapping tool, combining information from the phenology, VI, ET and water stress datacubes
- Field-scale water productivity maps for evaluating crop water use efficiency and yield gaps over agricultural landscapes

Objectives:

Prototype methods for routine production of high spatiotemporal resolution

- evapotranspiration
- vegetation index
- phenology
- yield products

using a multi-sensor data fusion approach



Yield and Water Productivity

