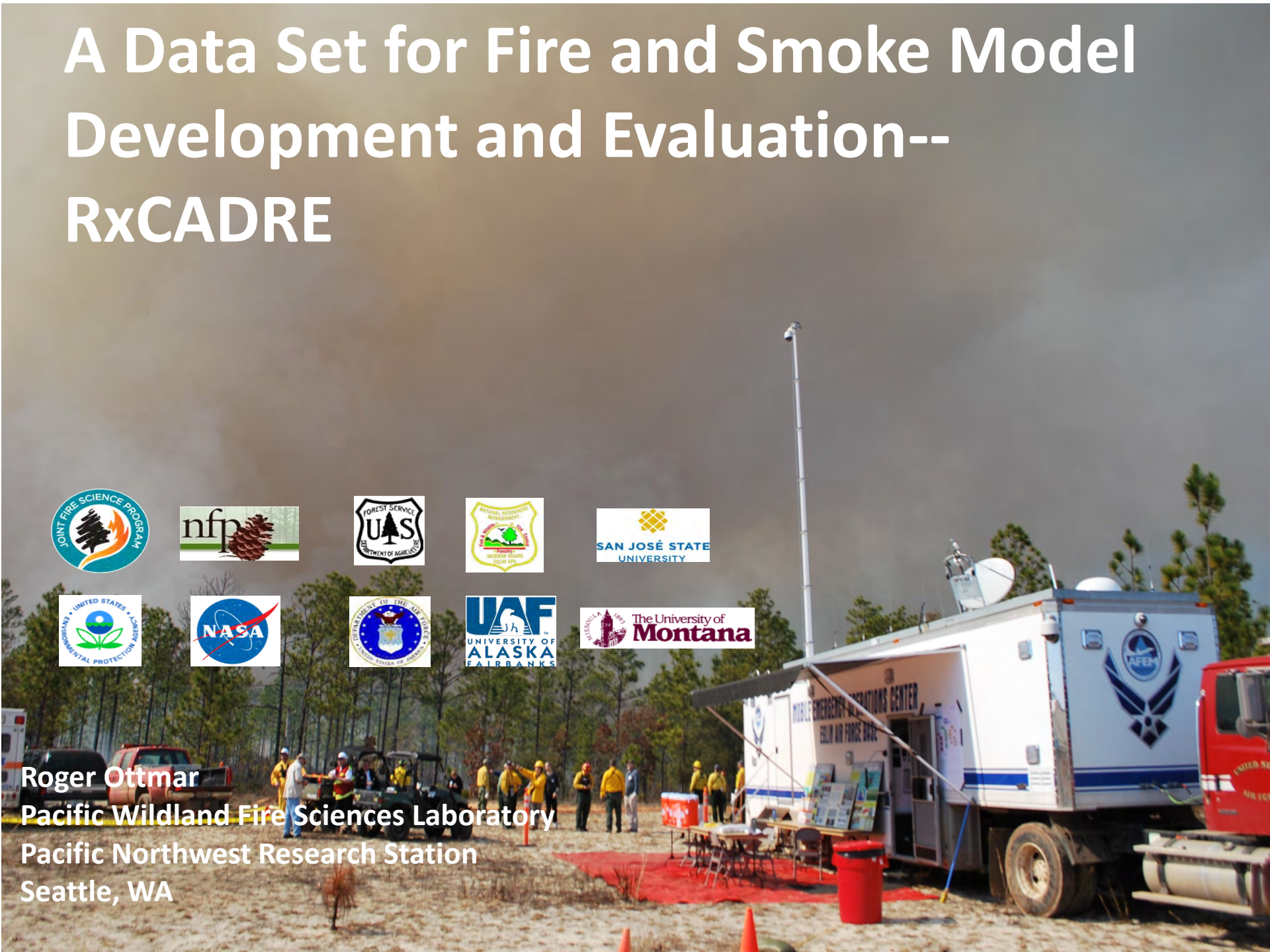
A Data Set for Fire and Smoke Model Development and Evaluation-- RxCADRE



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RxCADRE History

- 2007--Core Fire Science ad hoc group identified the need for an integrated, quality-assured fuels, fire, and atmospheric field data set for development and evaluation of fire models
- 2008-- Tested capacity to collaboratively measure fire, Eglin AFB (FL) and Joseph Jones Ecological Research Center (GA)
- 2011 -- Larger effort--Eglin AFB
- 2012—Funded by JFSP for 2012 field campaign/reduce and analyze data 2008, 2011, 2012

Target Audience for Data Acquisition

- Fire Scientists
- Fire & Smoke Modelers

With secondary emphasis:

- Fire & Fuel Planners
- Fire-use Practitioners
- Fire Ecologists
- Firefighters
- Smoke regulators

RxCADRE Project Objectives--2012

- Provide a quality integrated fine scale and operational-scale data set for testing and evaluation of fire behavior and other fire models using data collected from 2008, 2011 & 2012 field research campaigns

- Provide testing grounds for innovative methodologies and instrumentation

Milestones--2012

- Selected a noted scientist to represent each of 6 disciplines
- 90 scientists and technicians, 20 Agencies, Universities, and Contractors
- One of the largest collaborative fire research efforts
- Asked key fire behavior modelers: What needs to be collected and how?
- Field campaign completed November 2012
- Developed a data management plan and repository for data exchange and distribution for 2008, 2011, and 2012 campaigns

2012 RxCADRE Field Campaign Location

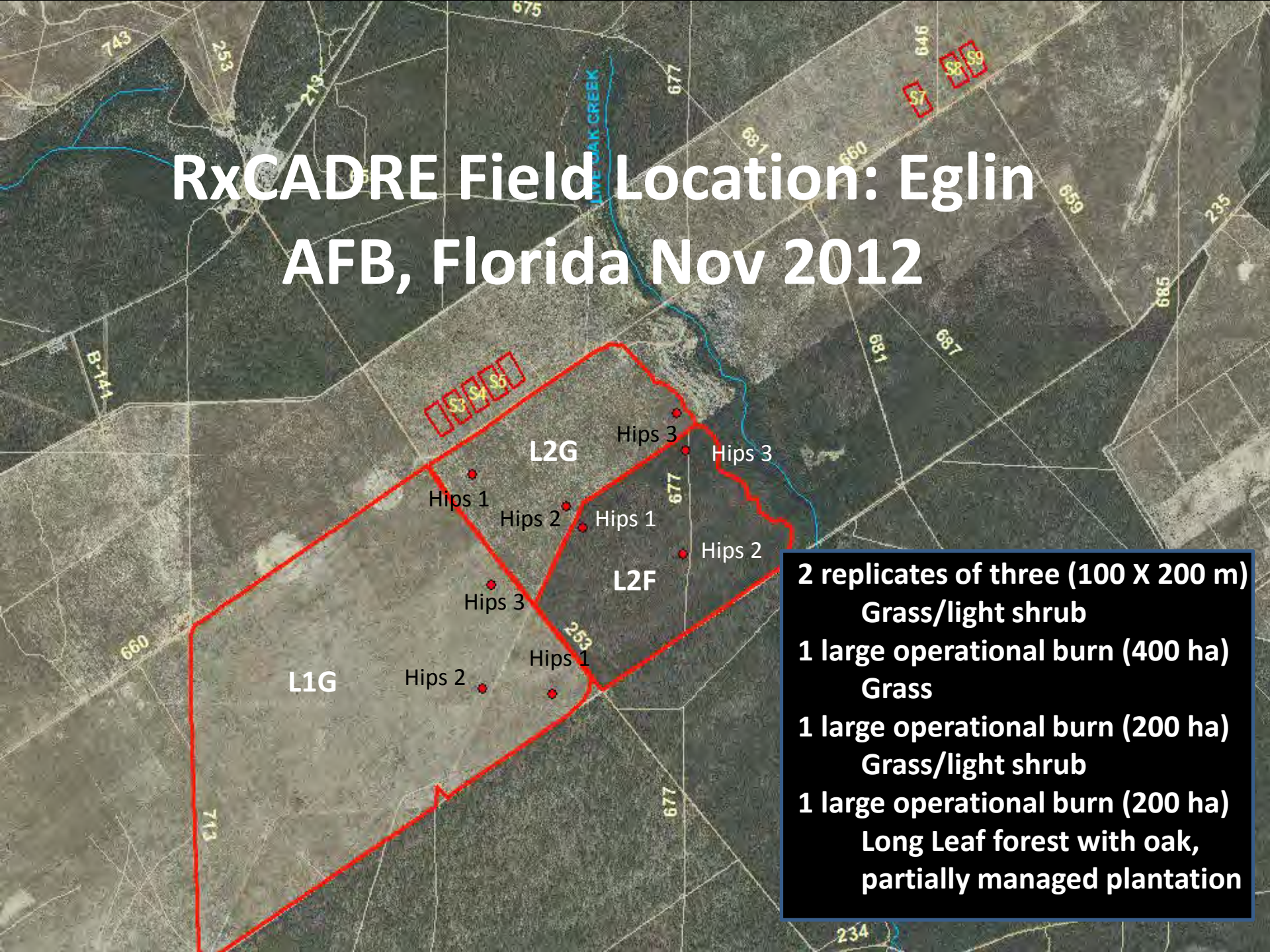
Jackson Guard, Eglin Air Force Base, Florida

- New Center for Excellence
- Receptive to research
- Cooperation
- Coordination
- Logistical support
- Burn 114,000 acres per year
- Burn year around
- Burn shortly after rain

Logistics and Ignition

- 90 scientists and technicians represented
- 15 Agencies, Universities & and Contractors
- 3 briefings each morning
- Different objectives and requirements
- Ignition times
- Hot and cold missions
- Weather
- Equipment
- Discovery Channel--Canada

RxCADRE Field Location: Eglin AFB, Florida Nov 2012



2 replicates of three (100 X 200 m)
- **Grass/light shrub**

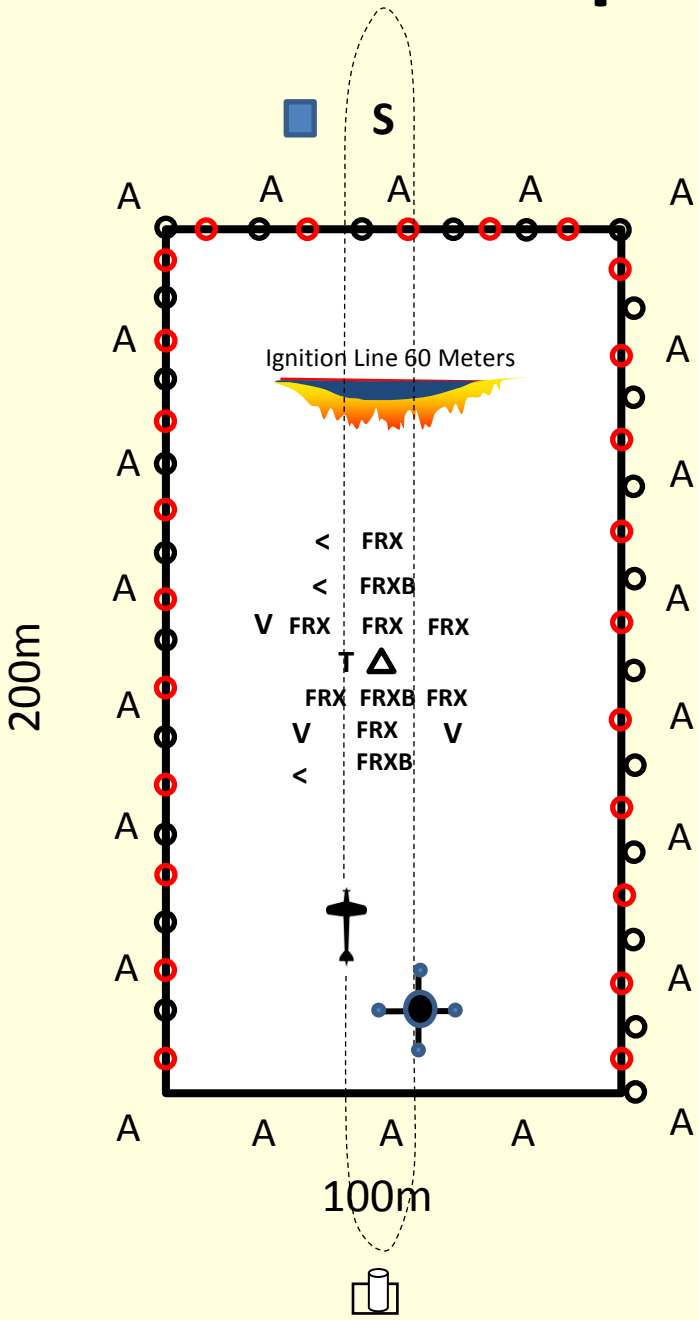
1 large operational burn (400 ha)
- **Grass**

1 large operational burn (200 ha)
- **Grass/light shrub**

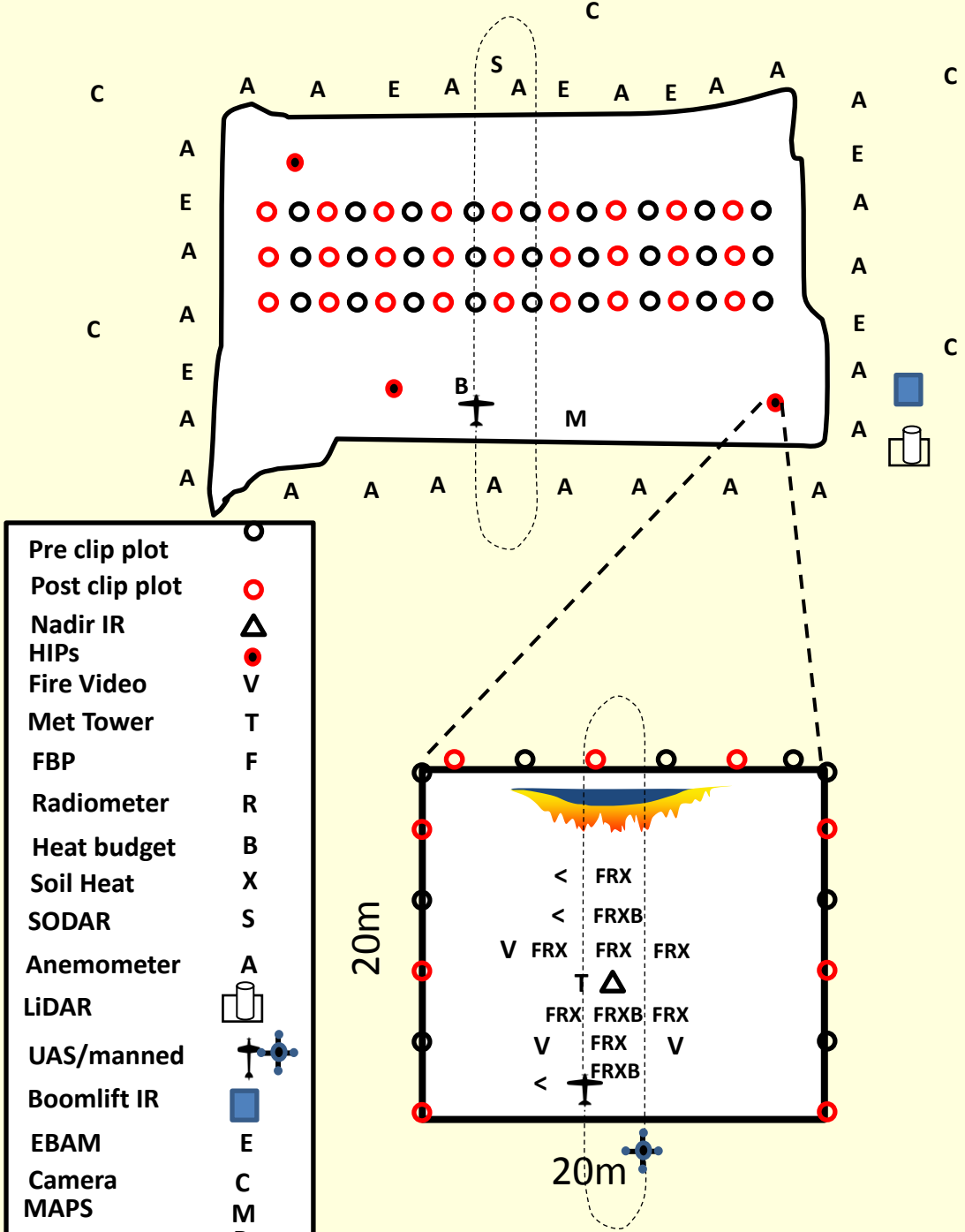
1 large operational burn (200 ha)
- **Long Leaf forest with oak, partially managed plantation**

Small Block Replicates

Pre clip plot	O
Post clip plot	O
Nadir IR	△
Fire Video	V
Met Tower	T
FBP	F
Radiometer	R
Heat budget	B
Soil Heat	X
SODAR	S
Anemometer	A
LiDAR	
UAS	
Boomlift IR	
MAPS	M

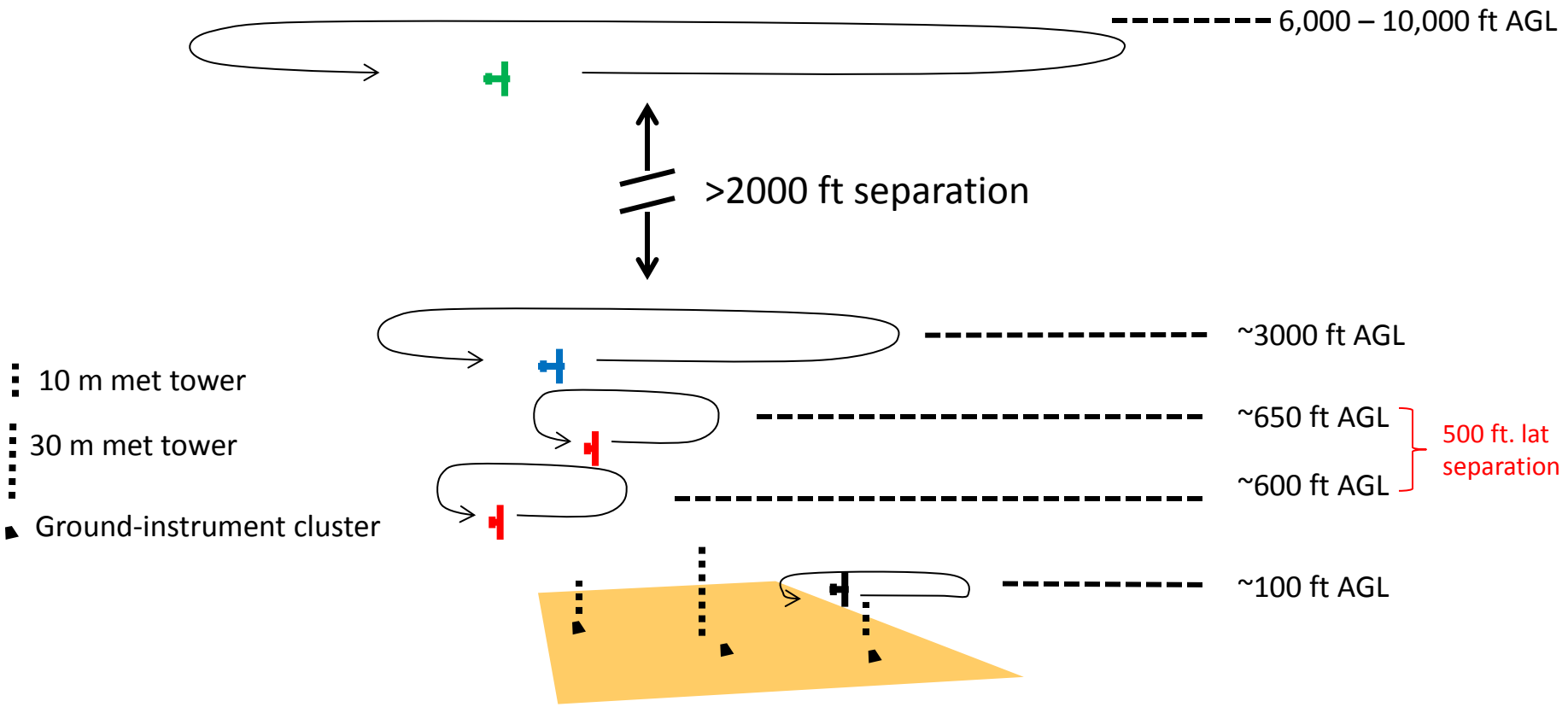


Large Operational Block and HIPs



Rx-CADRE Active Fire Measurements – Large Units (500-1000 acres)

Active fire measurements



Manned — Piper Navajo – WASP sensor (LWIR/MWIR/SWIR and visible fire mapping at zenith)

UAS
- UAF Scout – LWIR, Flight 1 HIP-3, Flight 2 as directed
- EAFB Test Wing G2R1, G2R2 – LWIR smoke sensor, wind, T, and RH sampler, F1 HIP-1, HIP-2; F2 MAPPS
- U. Alaska ScanEagle – LWIR synoptic view

NOTE: Piper smoke sampling aircraft is downwind following plume ~1000 - 8000 ft AGL

Fuels (R. Ottmar)

Measure the physical characteristics, composition, distribution, and condition of each fuelbed element before and after each fire.

Fuel Characteristics

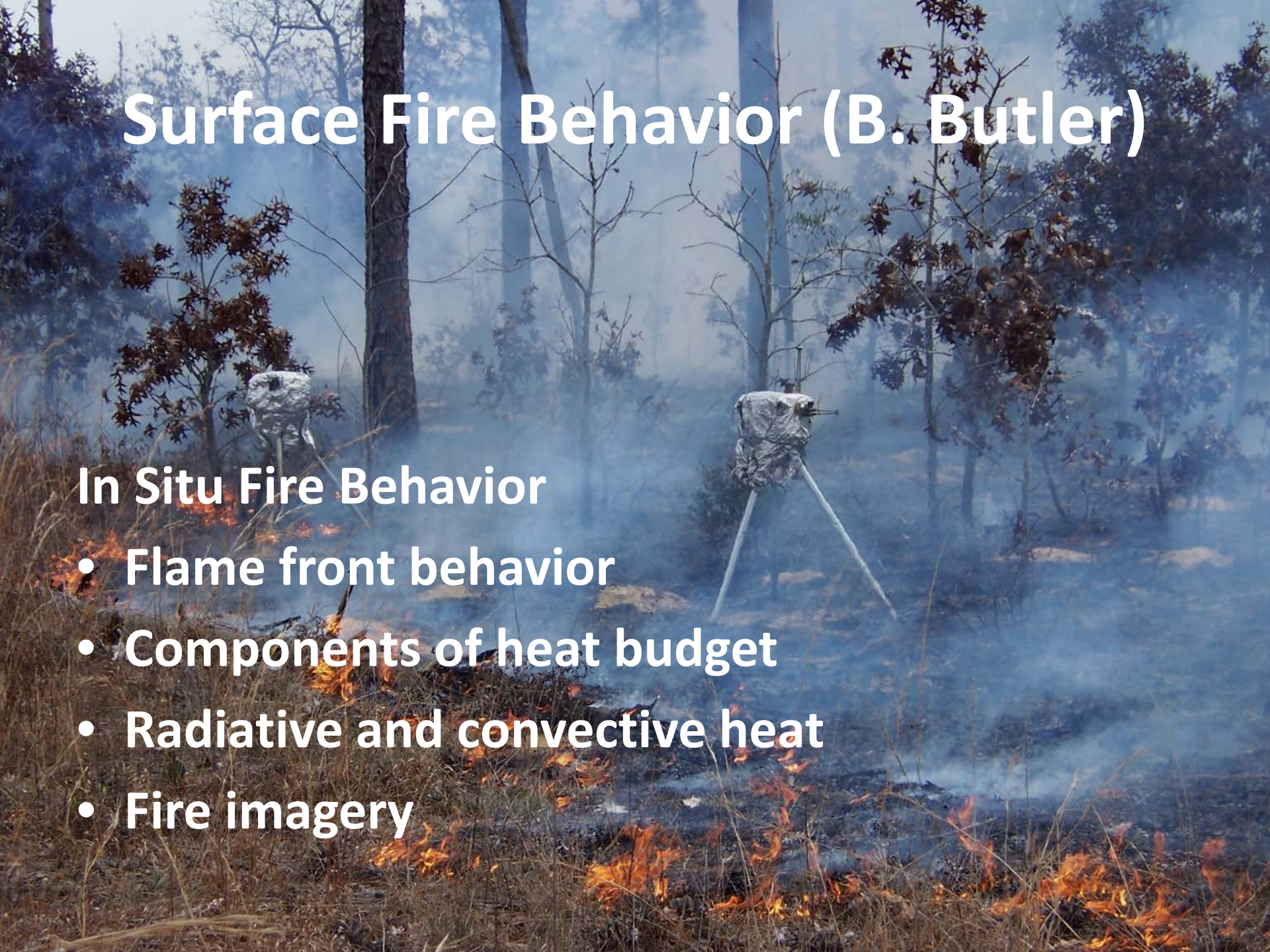
Aerial LiDAR

Terrestrial LiDAR (C. Seielstad)

Meteorology (C. Clements)

- Surface winds, temperature, relative humidity
  - 75 wind direction and anemometers
  - sonic anemometers
  - MAPS, SoDAR
  - Wind LiDAR
- Upper level winds, temperature (Radiosonde, aircraft, Wind LiDAR)
- In-plume temperature, moisture, turbulence and winds (Wind LiDAR)

Surface Fire Behavior (B. Butler)

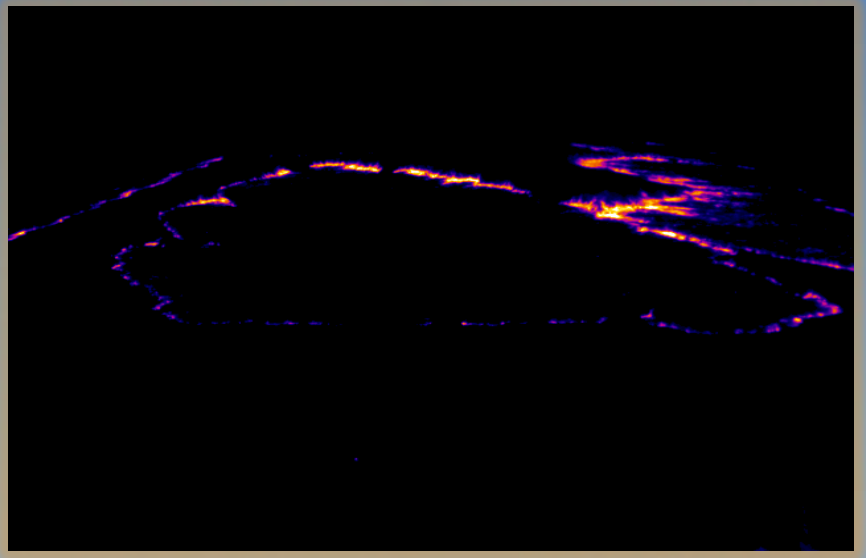


In Situ Fire Behavior

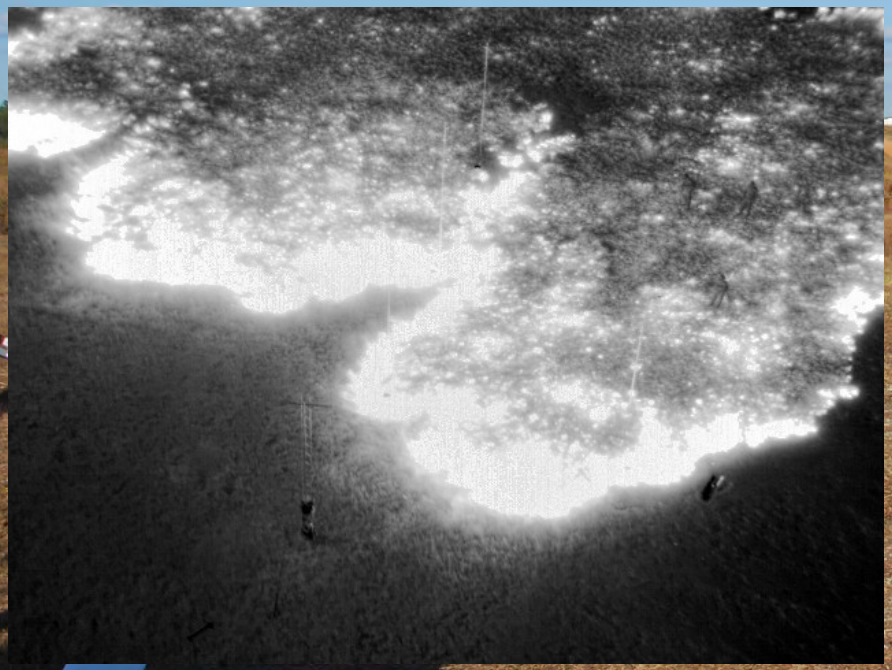
- Flame front behavior
- Components of heat budget
- Radiative and convective heat
- Fire imagery

Surface Fire Behavior (O'Brien)

-IR/Visible imagery
-85 foot boomlift

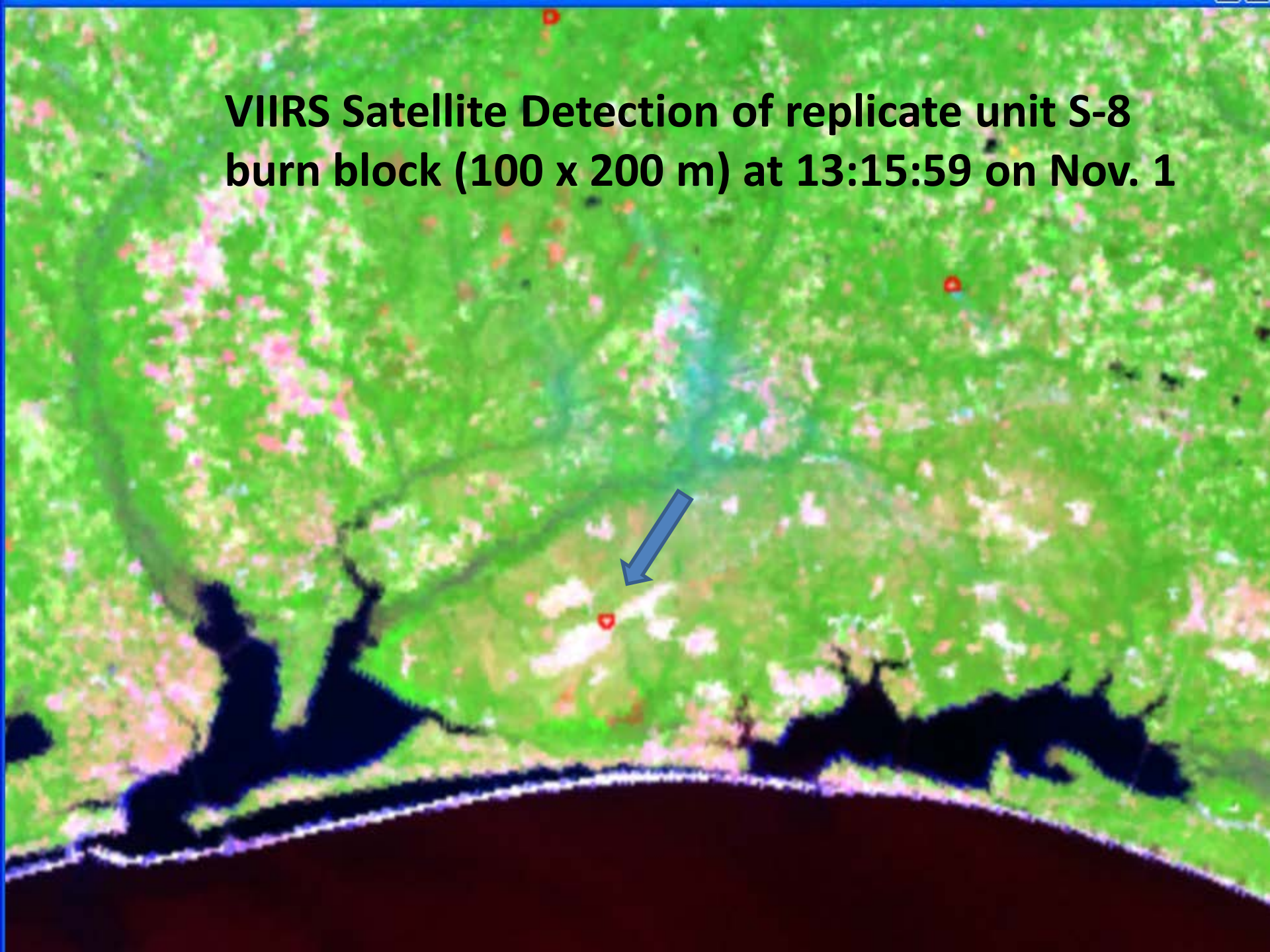


Surface Fire Spread—Unmanned Aerial Systems (T. Zajkowski)



Fire Radiative Mapping (M. Dickinson)

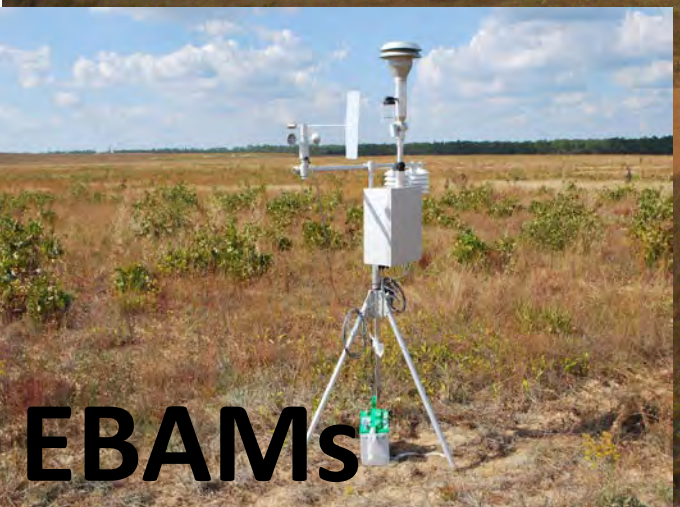
- Fire progression (airborne)
- Radiative power (airborne)
- Fire radiative energy (airborne)


VIIRS Satellite Detection of replicate unit S-8
burn block (100 x 200 m) at 13:15:59 on Nov. 1

Smoke (B. Potter/Urbanski)

Surface and airborne measurements of smoke

- CO CO_2, H_2O, black carbon, PM
- Time dependent structure of plume
- Aerostat emissions sampling unit (EPA)



Fire Effects (J. O'Brien)

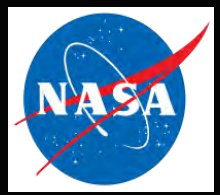
- Fire radiative power
- Fire radiative energy
- Soil heating
- Plant injury

Next Steps

- Process data
- Distribute data—Repository
- Journal Edition
- Management workshop
- Next RxCADRE--complex fuels, west

Leverage

- Funding assistance with partners
- More data acquired with partners



QUESTIONS?