

Monitoring and Mapping Open Burning in Ukraine

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Mapping Burning with Satellites

Satellites monitor burning (flames)

Satellites map burned area



Kiliis'kyi District, Odessa Oblast, Ukraine
VIIRS IMG and MODIS Active Fire Detections
24th July 2017



MODIS Aqua and Terra – 1km spatial footprint

VIIRS IMG – 375m spatial footprint

 = MODIS and VIIRS Active Fire Points

Kiliis'kyi District, Odessa Oblast, Ukraine
VIIRS IMG and MODIS Active Fire Detections
24th July 2017

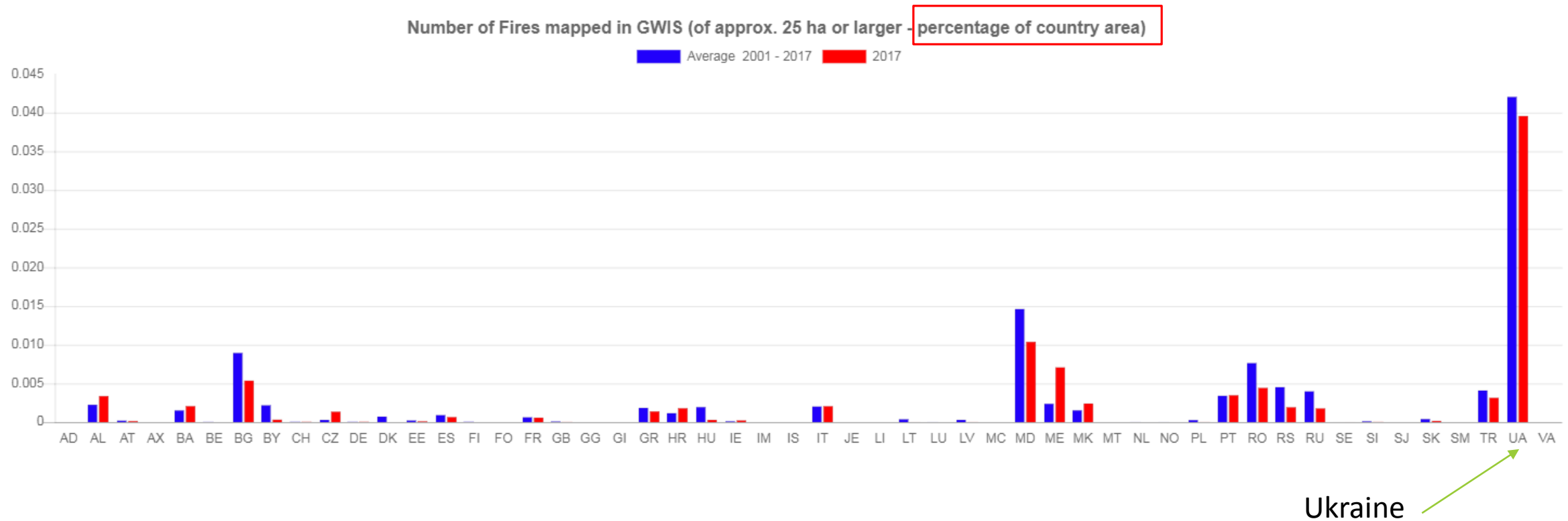


Google Earth

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Ukraine Burning

Ukraine area: ~70% agricultural (cropland, pastures, meadows)



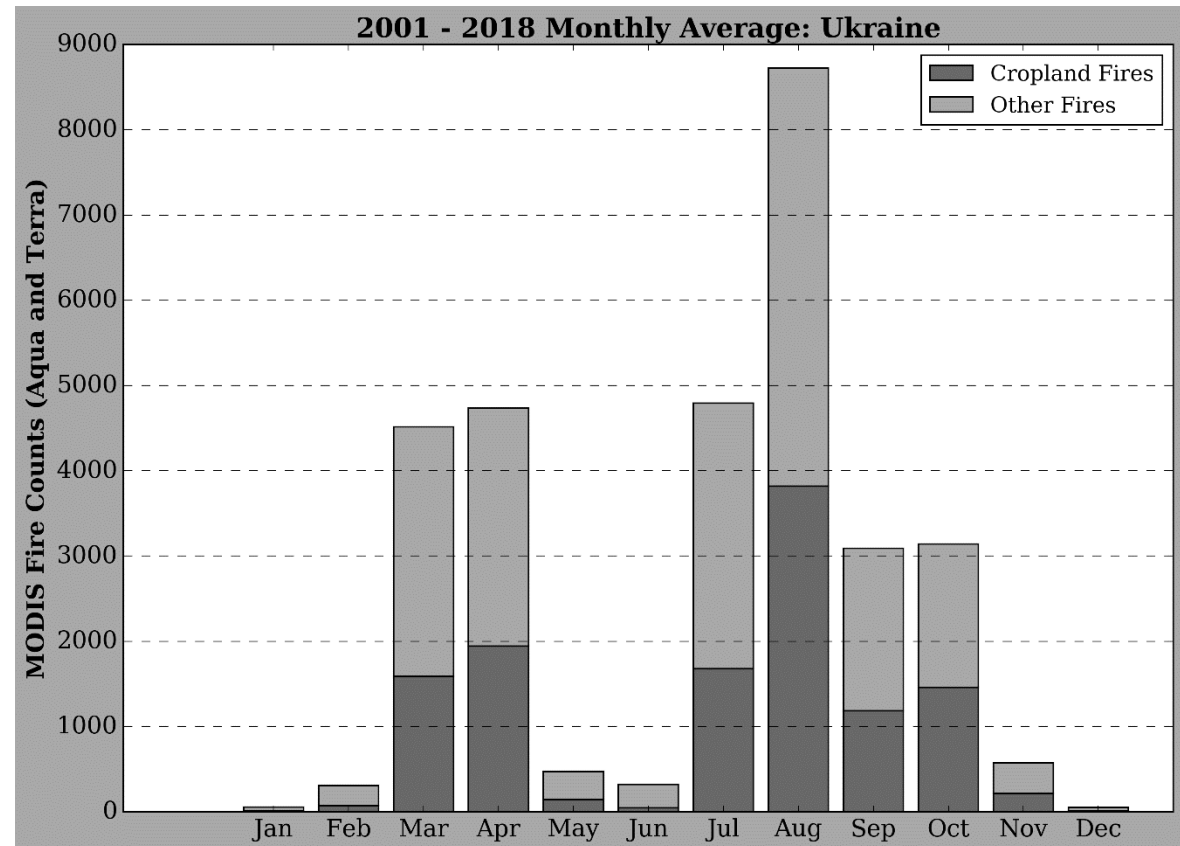
Open Burning Patterns: 2001 - 2018

March – April

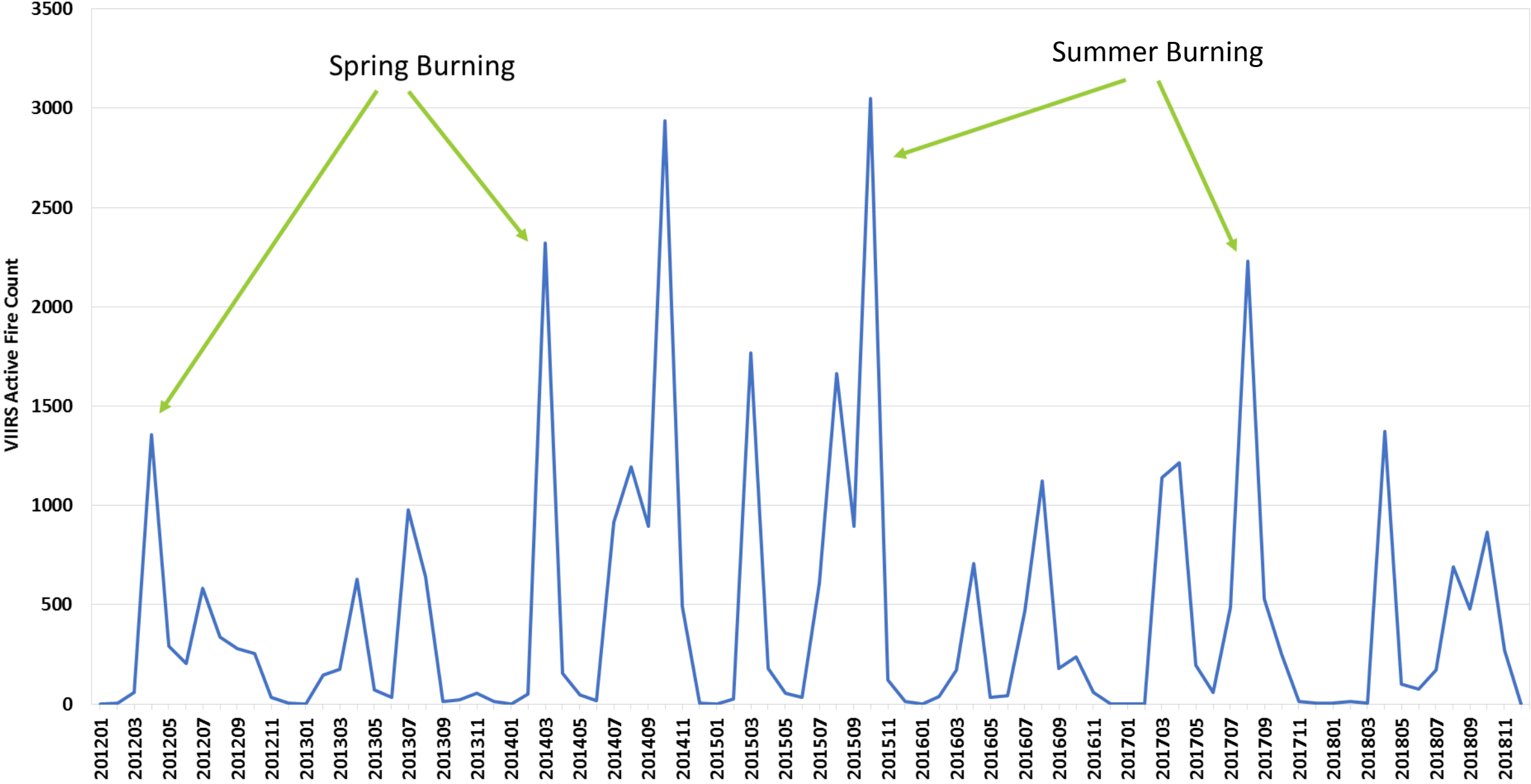
- Pre-planting fires

July – August

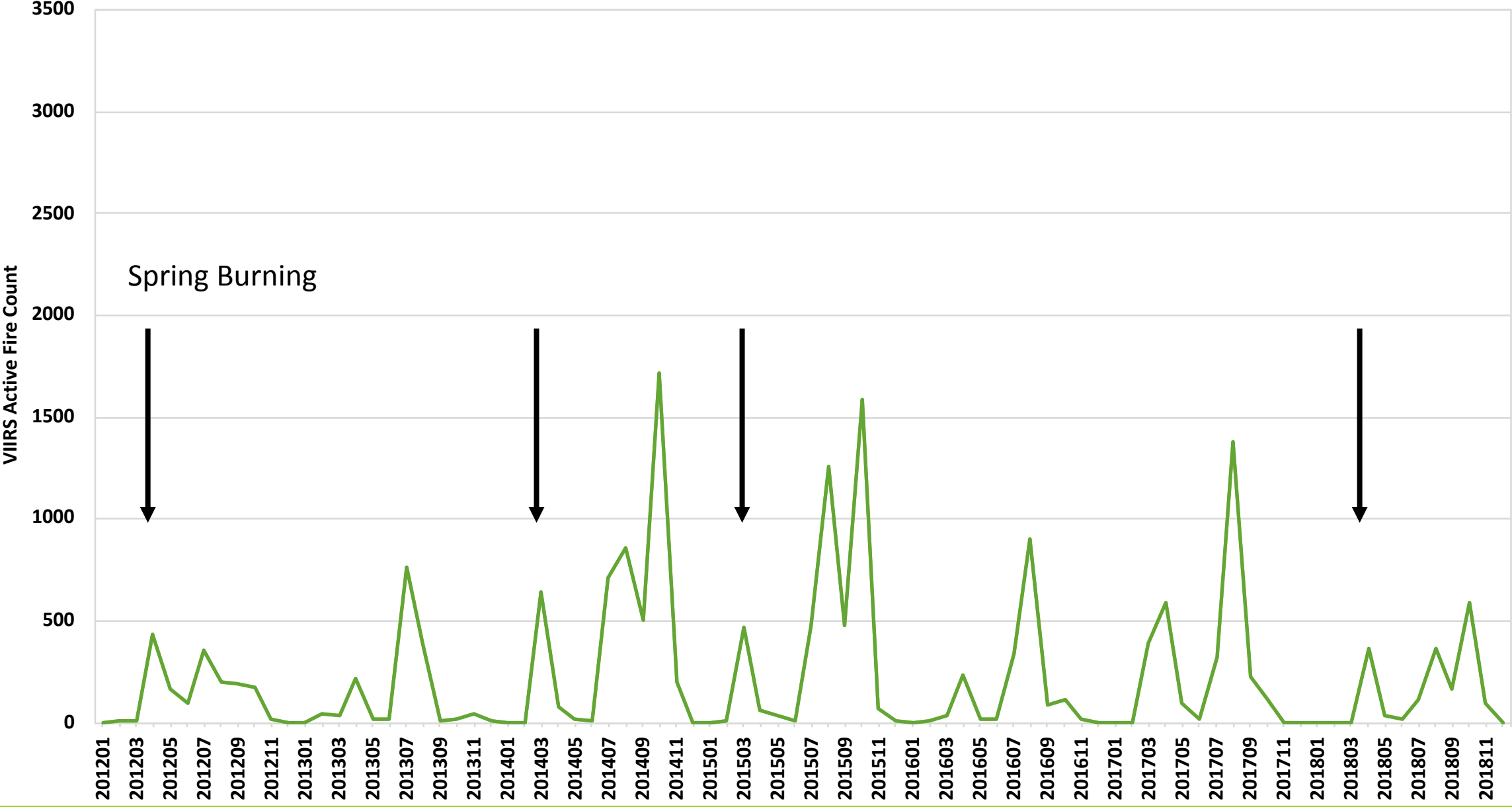
- Post-harvest fires



Kharkiv Oblast Burning Monthly Patterns: 2012 - 2018

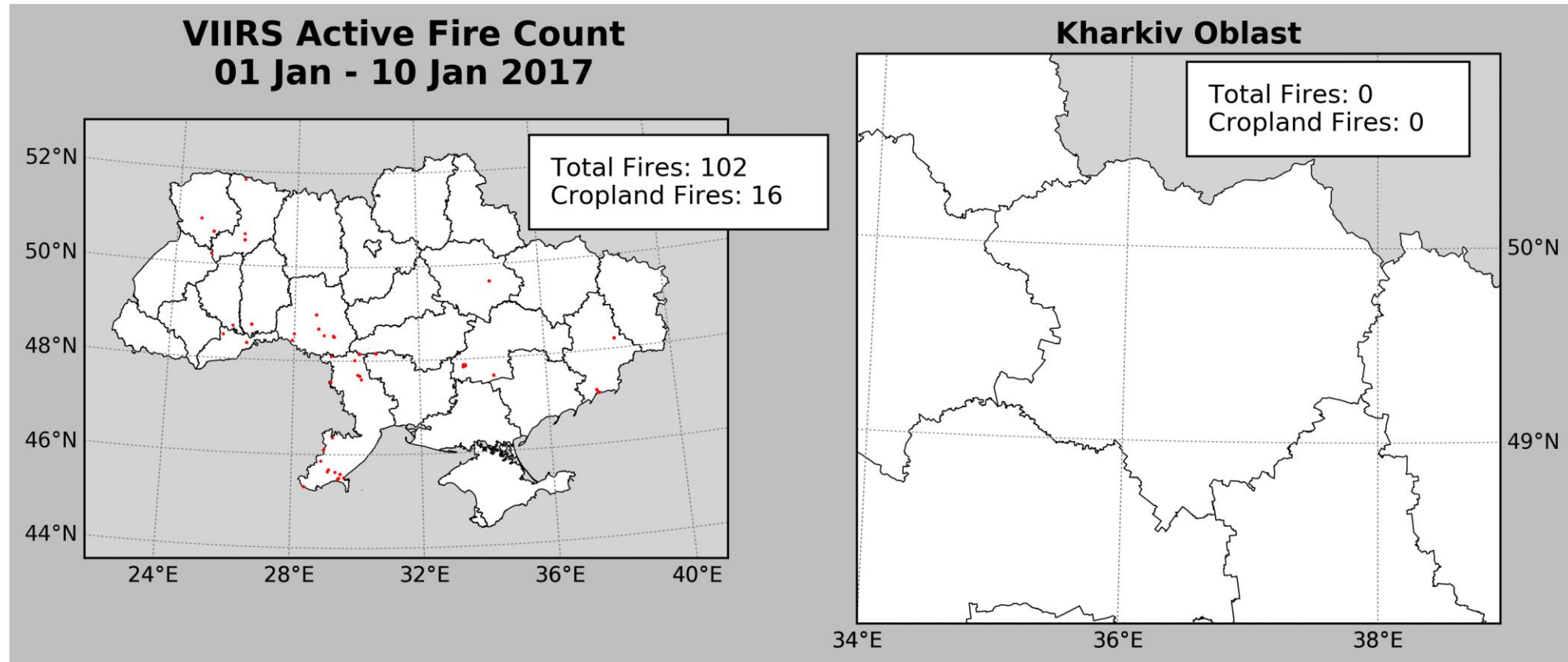


Kharkiv Oblast Cropland Burning Monthly Patterns: 2012 - 2018



Open Burning – 2017 and 2018

- All Fires
- Cropland Fires



Emissions Calculation using Satellites

$$\text{Emissions} = A \times PB \times FL \times CF \times EF$$

- A^* = Planted area
- PB^* = Percent of the surface burned
- FL = Fuel load (amount of straw and stubble available to burn)
- CF = Combustion factor (completeness of combustion)
- EF = Emissions factor of a trace gas species

*Modifications from standard GOCF-GOLD/IPCC-AFOLU equations by Lasko and Vadrevu (2018) to account for lack of reliable burned area data at the field scale

Ukraine Cropped Area Maps

Посівні площі культур сільськогосподарських

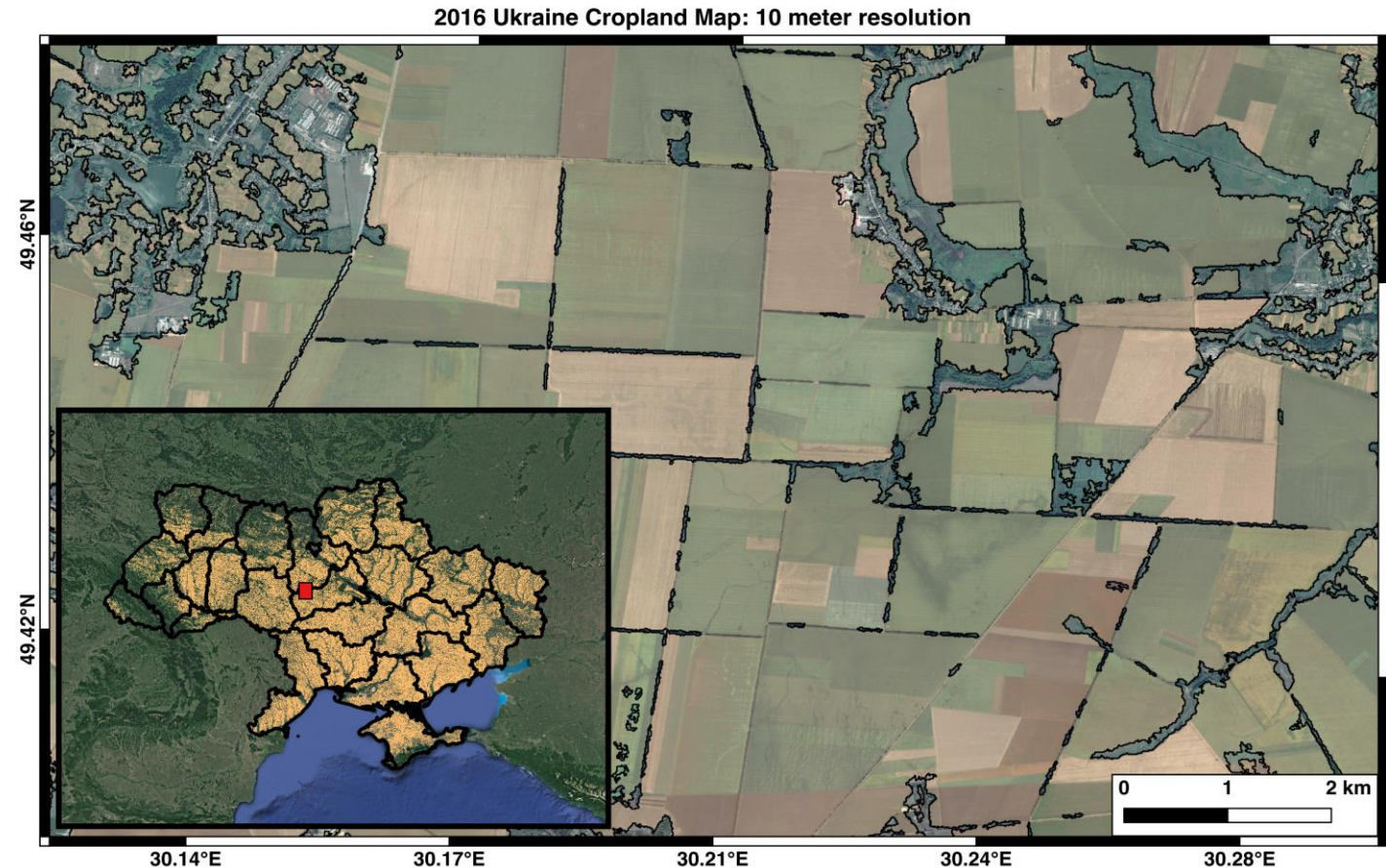
2016 Sown Area (map)

- 282,837 km² (47%)

2016 Sown Area (official UA statistics)

- 270,026 km² (45%)

Very detailed cropland maps



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Geographical Sciences
BE GLOBAL

Cropland Data References:
Kussul et al., 2017; Lavreniuk et al., 2015

Coordinate System: WGS-84

Crop Type Maps

Identify crop types using satellites

Crop type is important to accurately calculate emissions from burning

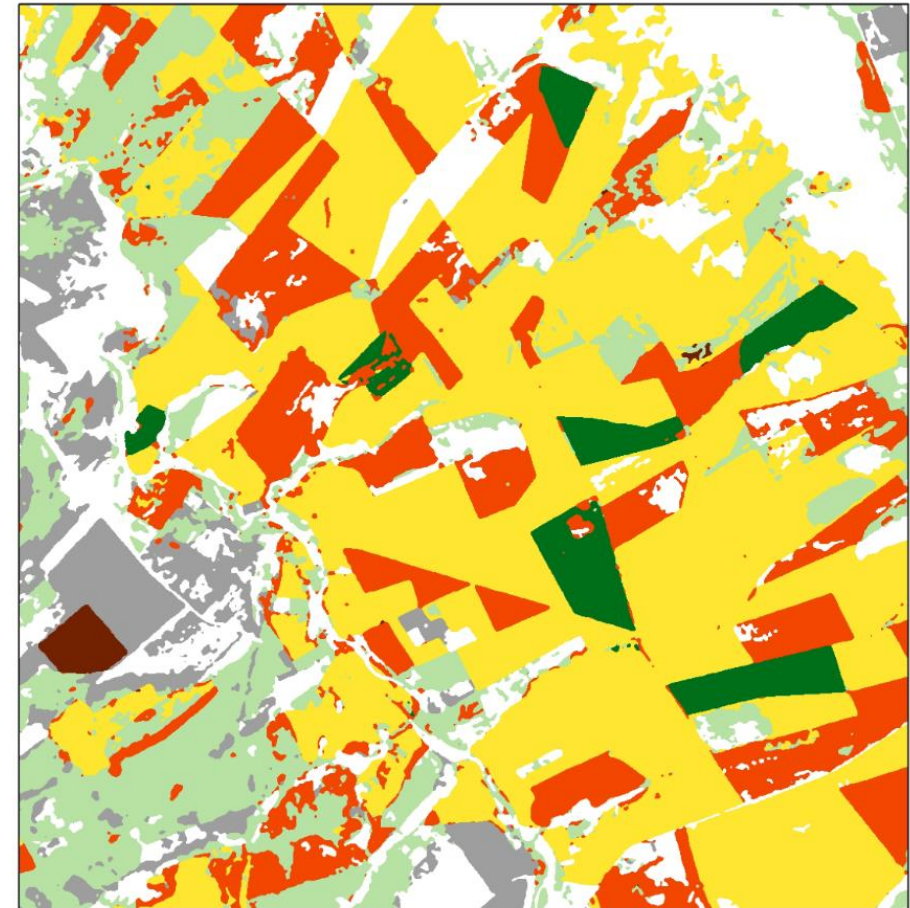
Crop type impacts emission factor

**Example from
southern Africa**

Legend

- Barley
- Lupins
- Fodder crops
- Other crops
- Winter wheat
- Oilseed crops

0 1 2 4 km



Louisiana Sugar Cane Fields
30.03°N - 30.09°N, 90.85°W - 90.91°W
Image Date: 11/13/2017



Louisiana Sugar Cane Fields
30.05°N, 90.89°W
Image Date: 11/13/2017



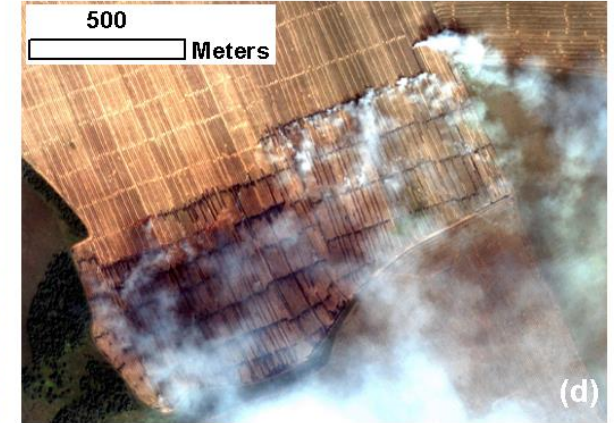
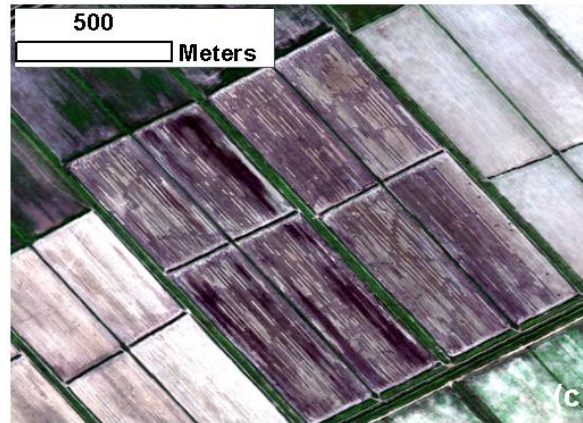
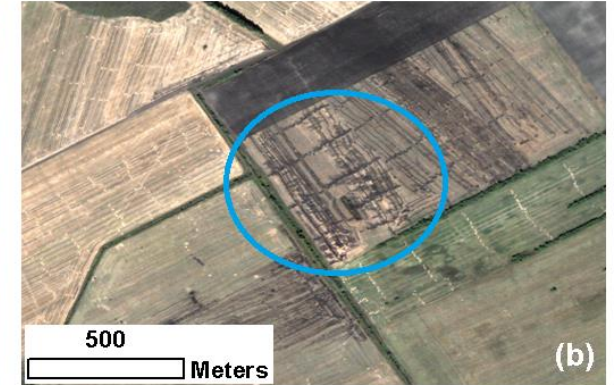
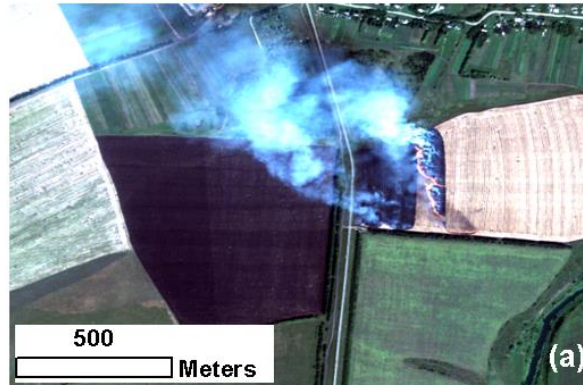
Vietnam Rice Straw Burning
(Lasko and Vadrevu, 2018)



Improvements are needed

Field level information to help improve fire mapping and emissions calculations in cropland

- 1) Causes of burning
- 2) Why are some fields only partially burned?
- 3) How quickly do you till/plow after burning?
- 4) How do you burn your fields?



Thank you
