

# 2020: update on common ragweed remote-sensing data in France

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**20 years of work**



International Ragweed Symposium : 14 SEPT. 2020



# These organizations have responded to our call

## AFEDA thanks them:

Rhône-Alpes Region, Bayer

### A lot of agencies is involved in these studies:

- Géosciences Environnement Toulouse (GET)
- Centre National d'Etudes Spatiales (CNES 2003)
- CESBIO Centre d'Etude Spatial de la BIOsphère
- CESBIO CNRS Université P. Sabatier Toulouse
- Données SPOT/Programme ISIS



IRS : VODICE 14 SEPT. 2020



# In the 1930s *Ambrosia* was accidentally introduced in the Eastern part of Lyon, France

Its pollen causes a severe summer pollinosis  
It is spreading in France through this area since the 1960s

It was mixed with clover seeds (Argentina).



It was

included in the soil of potato plants (North-America)



**Early mapping of *Ambrosia*  
by ground identification is difficult  
*by the annual crop rotation*  
*imposed by Common-Agricultural-Policy.***



Spot5



Sentinel-2 ESA



Formosat 2

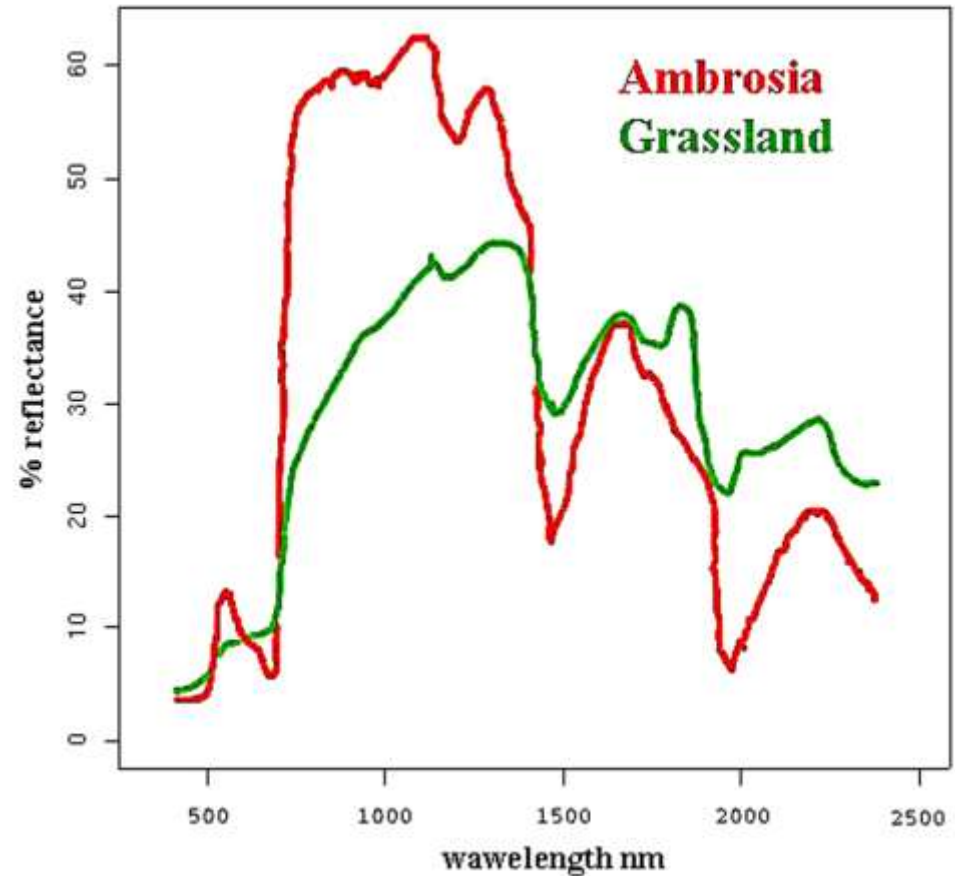
**So, our aim was to engage in  
mapping campaigns of this plant  
with a laboratory specialized  
in the digital analysis of satellite images.**

# 2001- This laboratory determined the spectral reflectance of *Ambrosia* for the first time: GER 2000 spectrometer

This spectral reflectance is particularly different for

red wavelength (660nm),

so optical sensors which record data in red and near infrared bands are adequate to detect *Ambrosia*.



# FIRST IDENTIFICATIONS: 2001

On July 27 2001, land use was recorded on a small area : 2 km<sup>2</sup> in Saint-Priest (around Lyon, Rhône department).

On the same date and on the 13 of August, Terra Aster Images were acquired.



## A is green



*Roads and forests were correctly classified. Maize fields heavily infested could be easily distinguished from other crops (15m/pixel)*



**But this zone was too small to allow definitive conclusions about ragweed detection.**



# FIRST IDENTIFICATIONS: 2003

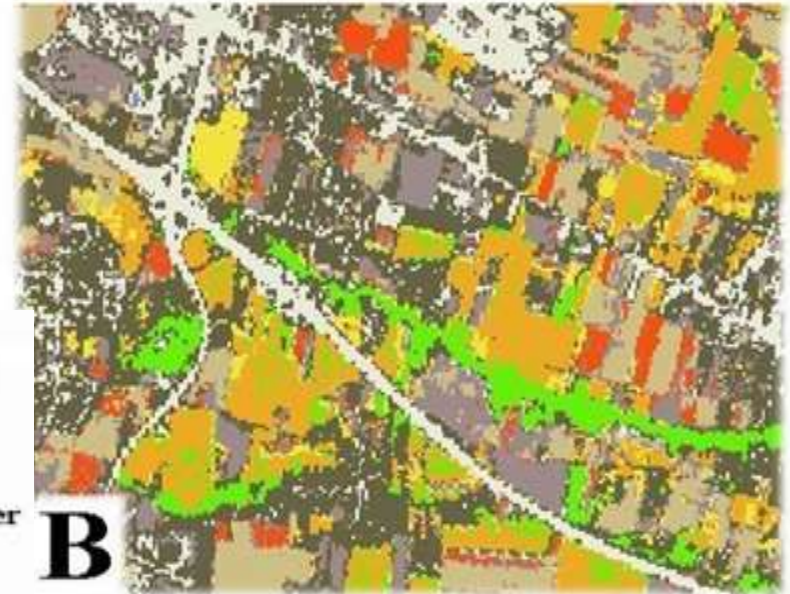
In 2003 resarchs were extended to an other area - *-Saint-Priest- (20m/pixel)*.

Ragweed infested area covers 4% of the studied zone.

If the calculation was extended to the whole satellite image 2% of the area (89 km<sup>2</sup>) would be infested.

*90% pixels were correctly classified*

The exceptional drought left only ragweed green among crops and grass, while other species turn yellow.

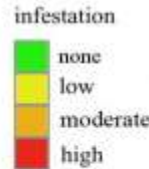


Nord  
↑  
0 1 km  
**Red: ragweed**

# 2005: Identifications in Estrablin (Iserre dept)

## East Vienne

The importance of the infestation was registered by an observer who walks around each parcel. Spot 5 image shows the type of culture, the intensity of its infestation. 81% of crops were correctly classified.



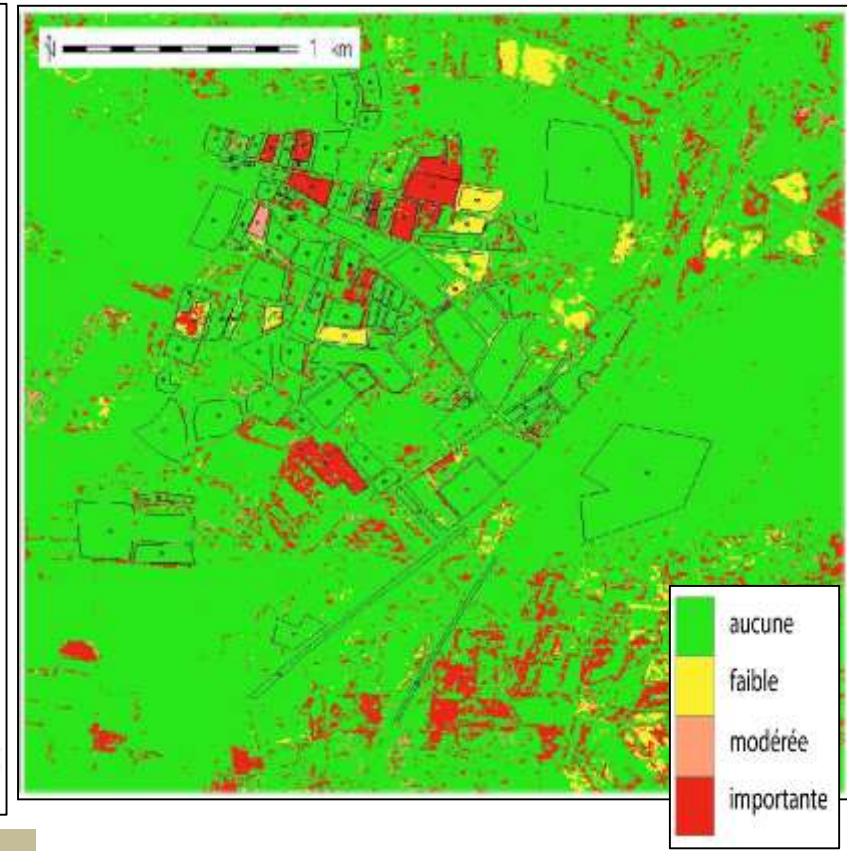
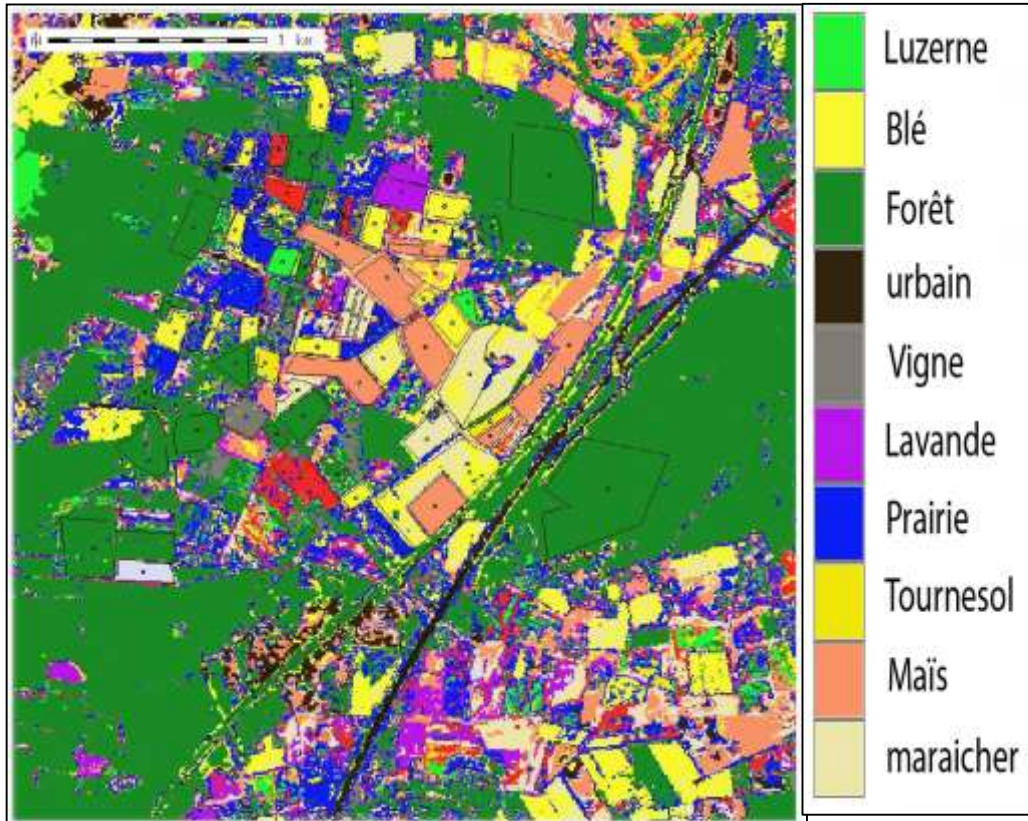
Values were greater than 80% for maize, colza, sunflower.

Moderate quality results

for harvested wheat fields is due to a confusion with fallow lands.



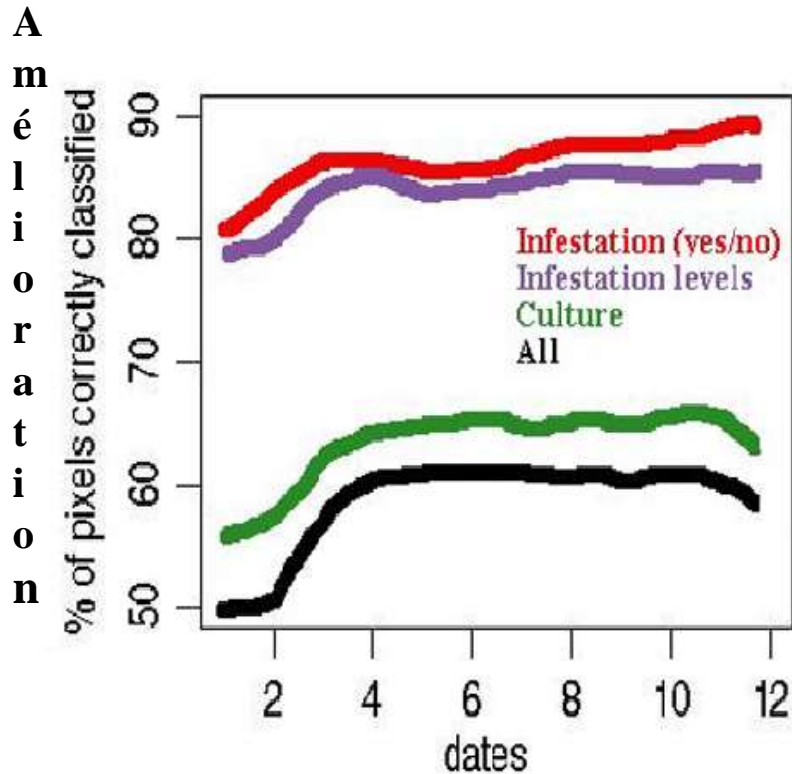
In 2007, 12 Formosat-2 images were acquired  
Field surveys represented 600 cultivated plots,  
24 km swath, space resolution: 8m.,  
around Montélimar (Drôme dept)



**Culture map: sunflower, maize**

**Red: high infestation**

# It was a multitemporel acquisition that increases the success of a good quality image



With one image (28 June) :  
56% pixels are correctly  
classified.

With 4 images, 79% pixels are  
correctly classified  
for infestation.

With 4 images, 86% pixels are  
correctly classified for crops.

With more than 6 images no  
increase.

So it will be possible to identify *Ambrosia* before pollination

# 2017: the last study used images of maize fields from a drone and Sentilen-2 (Saint-Priest, Rhône dept.)



-Areas studied are: 2 maize plots

-Passages are for drone and Sentilen-2, on **May 29** 2017.



**-Spatial resolution:** the drone is equipped like Sentinel-2 in four bands : green, red, red edge, NIR-Infra-red.

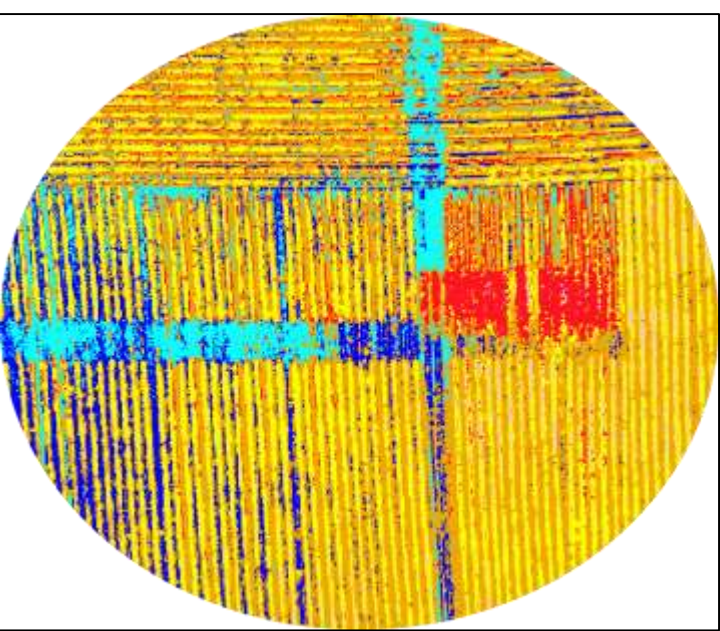
**The spatial resolution of drone images is 6 cm**

**The spatial res. of Sentinel-2 images is 10 or 20 m**

**5 Sentinel-2 images are acquired,**

**only one image is compared as it is cloud free**

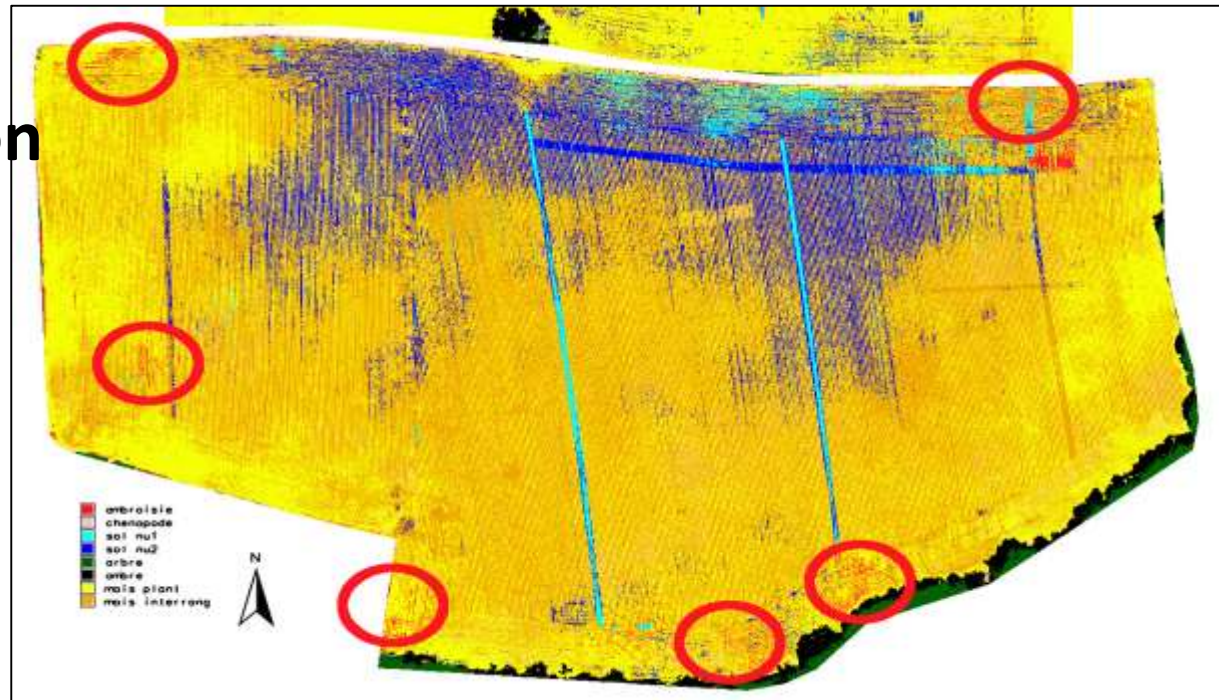




For having a comparison between the areas, a small one was non treated with phytosanitary products / **10 m x 5 m**  
 The studied areas are in a red circle.

The conclusion of this last study is that the optimal resolution would be 1m to have a tricky comparison between drone and Sentinel-2 Images.

**Ragweed is in red**





# Conclusion

**Technological developments and European and international scientific policies have led to major achievements in the remote-sensing of ragweed. For example, the Very High Space Resolution satellite (Sentinel-2 10 m) provides free images every 5 days for the entire globe.**

**UAVs equipped with sensors adapted to the detection of vegetation have become affordable for all organisms.**

**Coupling these two remote-sensing approaches, without forgetting the ground surveys that remains indispensable, will lead to major advances in the coming years.**

# Thank you for your attention

Thanks to:

**Géosciences Environnement Toulouse (GET)**

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