

High-resolution satellite-based UAV solution for soil moisture and ground water monitoring

GWF 2017 - Water Resource

Ground Water Mapping, Monitoring and Analyzing

High-resolution satellite-based UAV solution for soil moisture and ground water monitoring



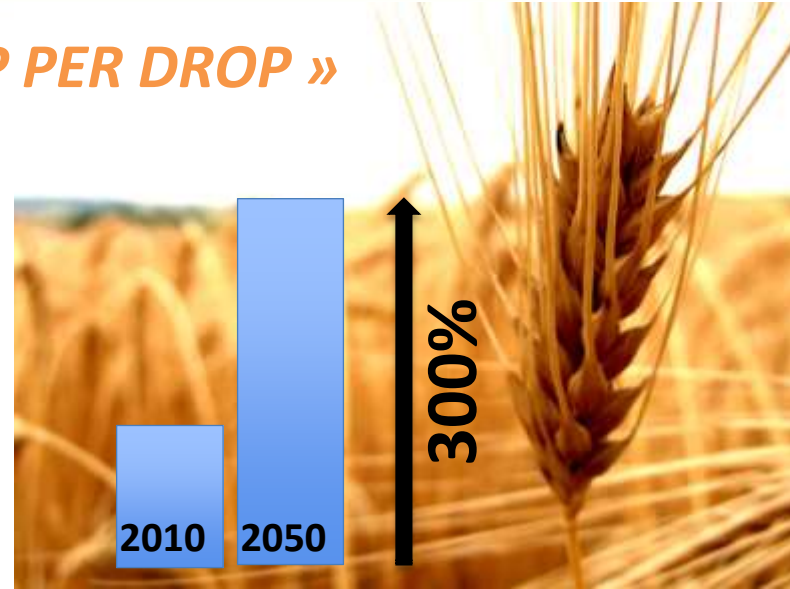
- Introduction

« MORE CROP PER DROP »

Worldwide Freshwater Withdrawal



 **2 x**
 **70%**



World Food Production Needs



High-resolution satellite-based UAV solution for soil moisture and ground water monitoring



- Soil moisture measurements today

Satellite

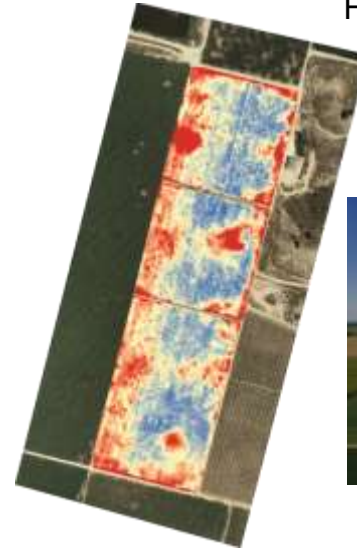


- ↑ Global picture (large areas)
- ↓ Low resolution
- ↓ No periodicity flexibility

In situ



- ↑ Continuous measurements
- ↓ No maps



Helping farmers to make better decisions on irrigation by providing them soil moisture maps



Soil moisture map service



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- MISTRALE applications

Waterland/Flooded areas monitoring



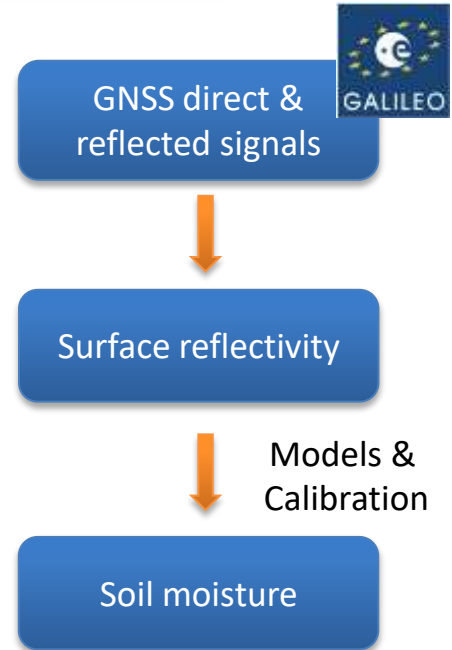
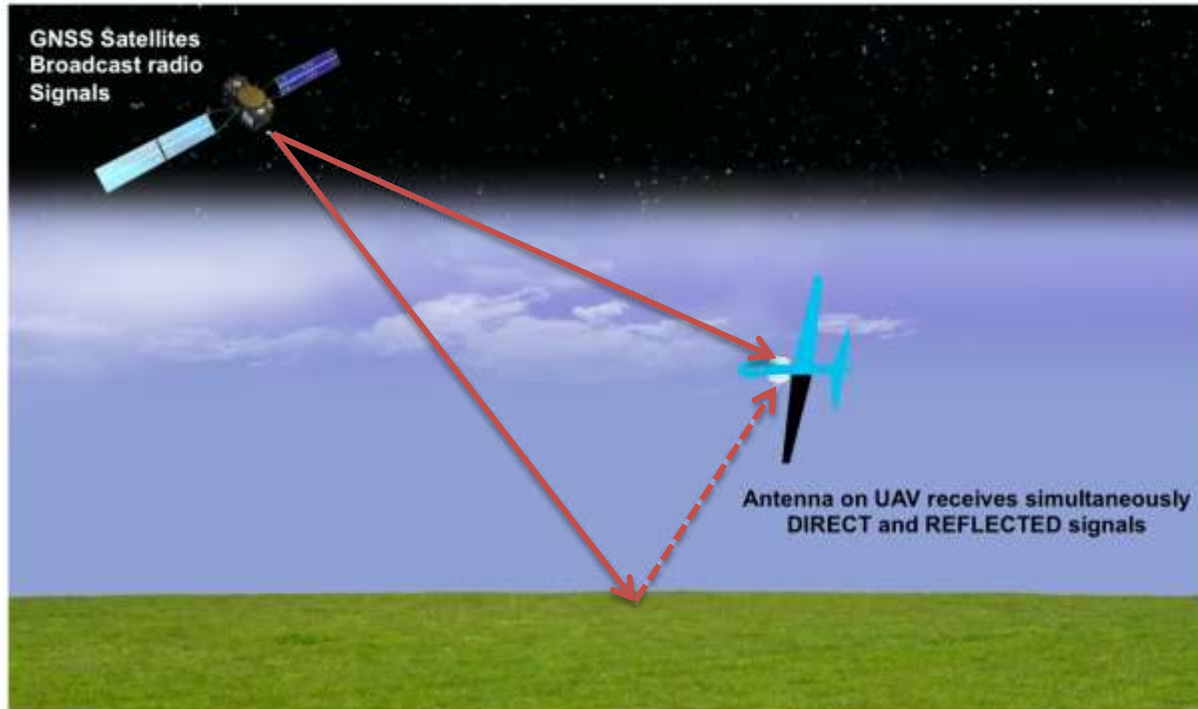
Scientific applications
(e.g., forest coverage analysis)



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- GNSS reflectometry



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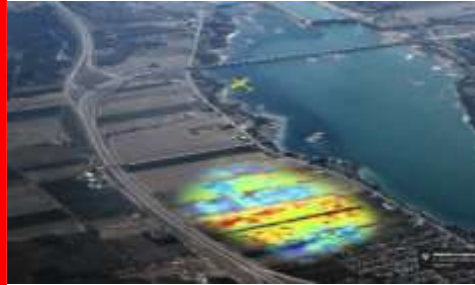


- MISTRALÉ : a new complementary solution

Satellite



- ↑ Global picture (large areas)
- ↓ Low resolution
- ↓ No periodicity flexibility



- ↑ High resolution maps (field)
- ↑ On demand

In situ



- ↑ Continuous measurements
- ↓ No maps

High-resolution satellite-based UAV solution for soil moisture and ground water monitoring



- The UAV



Endurance: 10h / 1000 km

Payload: 5 kg

MTOW: 25 kg

Ceiling: 4500 m

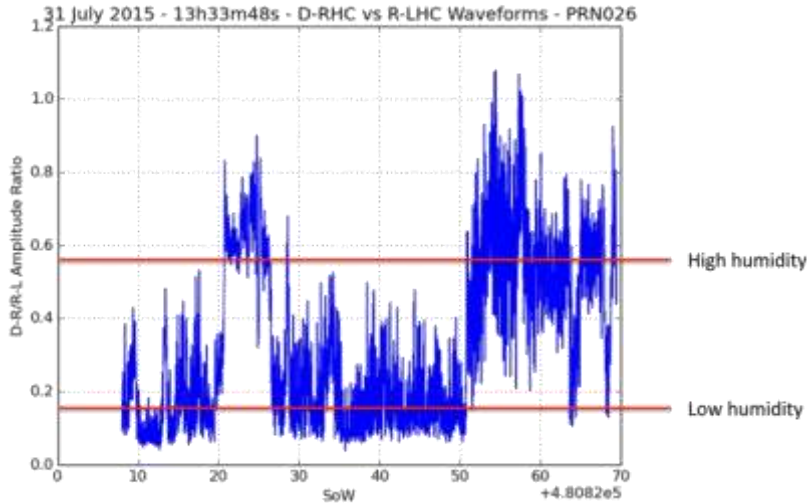
Speed range: 70 / 150km/h



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- Test flights results : Reflectivity



Legend

Reflectivity

- 0.000 - 0.095
- 0.095 - 0.190
- 0.190 - 0.285
- 0.285 - 0.380
- 0.380 - 0.475
- 0.475 - 0.570
- 0.570 - 0.665
- 0.665 - 0.760
- 0.760 - 0.855
- 0.855 - 0.950

Copernicus data

- Copernicus Permanent Water Bodies
- Copernicus Wetlands

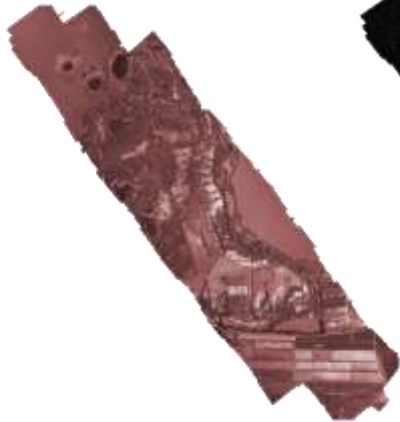


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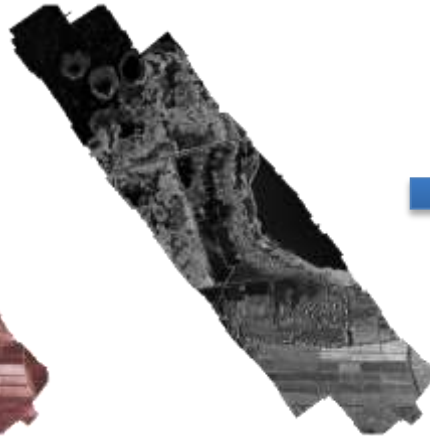


- Test flights results : Calibration (NDVI, thermal measurements)

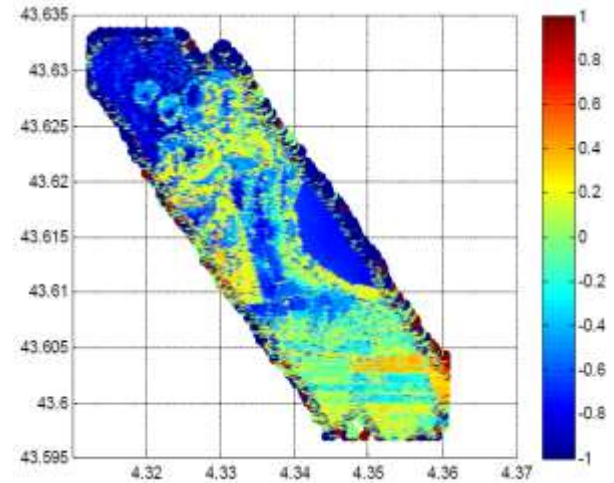
Red



Near Infra-red



NDVI

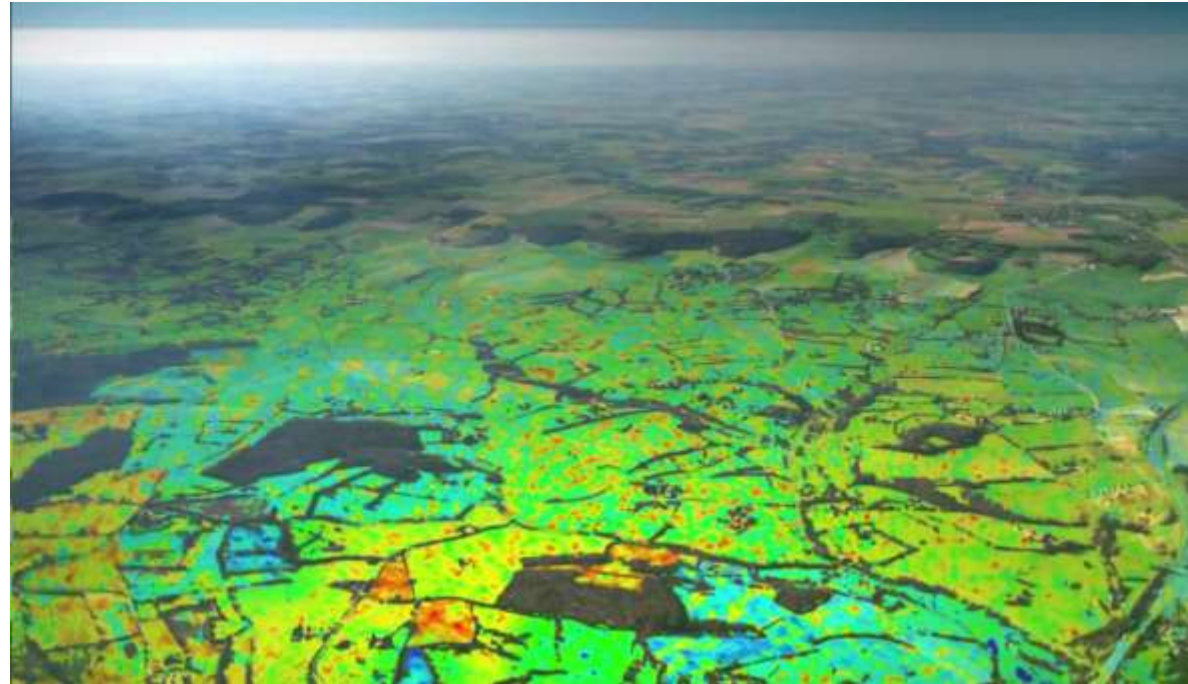


- Conclusion

GNSS – Reflectometry is a promising technique for soil moisture monitoring

GNSS-R sensor embedded on a UAV

- ⇒ On demand
- ⇒ High spatial resolution
- ⇒ Simplified procedures
- ⇒ Low-cost



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