GLOBAM – a Globally Distributed Agricultural Monitoring Experiment based on EO

4-y research project supported by Belgian Science Policy Office (2007-2010)

based on an international partnerships combining research labs, EO production entities and (pre-)operational systems (currently MARS-FOOD, GMFS)

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with close collaboration with national partners
Overall GLOBAM objectives

- Methodological development/adjustment to take advantage of state of the art and research findings for use in global operational systems

- Scientific research to tune and to assess methods potentially operational over large areas and in different agro-ecological contexts

- ‘Globally distributed’ ag monitoring experiment for cereals in 2007 (3 sites of 300 x 300 km) and 2009 & 2010 (5 sites) including large scale validation strategy for performance assessment
GLOBAM – a Globally Distributed Agricultural Monitoring Experiment to develop generic methods for advanced EO use while recognizing local diversity of ag. practices

Spatial resolution
Revisiting capabilities

Crop Type Classification
MODIS/MERIS - DMC/AWIFS

Crop type at parcel level
LAI crop specific retrieval
Hi. Res. Optical and SAR TS
MODIS/MERIS TS

LAI assimilation in Crop Growth Models

Yield estimation

Area
Entire region

Crop Growth
Overall vgt conditions
Agriculture vgt conditions
Anomalies assessment

Yield
**GLOBAM Key Ideas:**

- crop type mapping for specific monitoring (mask for each main eq-reasoning crop)
- crop specific retrieval of LAI, biomass from optical and SAR data
- ET retrieval from MSG for croplands area
- focus EO effort on early stage crop growth (high variability, better sensitivity of the rs signal) and decaying phase to calibrate the growth model
- select / adjust crop models sensitive to EO retrieved variables
- assimilation of EO retrieved variables including ET from MSG into crop growth models
- synthetic production indicators

=> Target scale for information production : NUTS 3
GLOBAM — a Globally Distributed Agricultural Monitoring Experiment

3 study sites of 300 x 300 km in Northern Europe, China and Ethiopia

joint field and EO data collection during the 2007 growing season

for cereals and maize to look for robust and generic methods
GLOBAM field campaign protocol (2007) – Data collection

• Plant density

• Plant height
GLOBAM field campaign protocol (2007) – Data collection

- Leaf area index
- Canopy cover
GLOBAM field campaign protocol (2007) – Data collection

• Top soil moisture
GLOBAM field campaign protocol (2007) – Northern Europe

(when large scale aerial photographs or existing vector database allow identifying accurately the crop type over blocks corresponding to about 3x3 MODIS 250m pixels)

**Calibration set**
- 60 fields visited
- 5 times to measure on SAR acq. dates
- 6 variables:
  - Field geolocation
  - Leaf Area Index
  - Green canopy cover
  - Canopy height
  - Volumetric Top Soil Moisture (humid and dry weight)

**Validation site (300 x 300 km)**

**LAI validation set**
- 70 fields observed by photographs taken during
- 1 times to measure
- 2 variables:
  - Field geolocation
  - Green canopy cover

**Crop type validation set**
- 100 blocks of fields observed by photographs taken during
- 1 visit to measure
- 2 variables:
  - Field geolocation
  - Crop type
GLOBAM field campaign protocol (2007) – Ethiopia

(when, in addition to the calibration site, several HiRes images allow classifying accurately the crop type over the whole validation site thanks to DMC/AWiFs imagery)

**Validation site** (300 x 300 km)

**Calibration set**
36 fields visited
5 times to measure:
- Field geolocation
- Leaf Area Index
- Green canopy cover
- Canopy height

**LAI validation set**
30 fields visited
1 times to measure:
- Field geolocation
- Leaf Area Index
- Canopy height

**Crop type validation set**
100 fields of various crops to train HiRes classification
1 visit to measure
2 variables:
- Field geolocation
- Crop type
GLOBAM field campaign protocol (2007) – China

(when, in addition to the calibration site, several HiRes images allow classifying accurately the crop type over the whole validation site thanks to DMC/AWiFs imagery)

**Validation site** (300 x 300 km)

Calibration set
18 fields visited
1 time to measure
6 variables:
- Field geolocation
- Leaf Area Index
- Green canopy cover
- Canopy height
- Volumetric Top Soil Moisture (humid and dry weight)

LAI validation set
13 fields visited
1 times to measure
3 variables:
- Field geolocation
- Leaf Area Index
- Canopy height

Crop type validation set
60 fields of various crops to train HiRes classification
1 visit to measure
2 variables:
- Field geolocation
- Crop type
Figure 1

Overall flowchart of the research strategy
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GLOBAM experiment is seen as a pilot experiment for the agricultural global community

Gathered under the GEO/IGOL Agriculture Monitoring Working Group

Towards a Global Earth Observing System of Systems