BruHyp 2012

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European Space Agency

Airborne Prism Experiment (APEX)

APEX timeline

1991 APEX is initiated by Klaus I. Itten

1994 ESA is identified as funding agency

1996 Belgium is asked to join

1998 First instrument concept identified

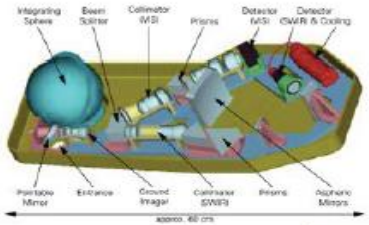
2001 Requirements, specifications, feasibility studies

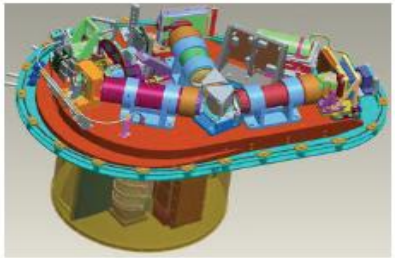
5 x Hyperspectral flight campaigns

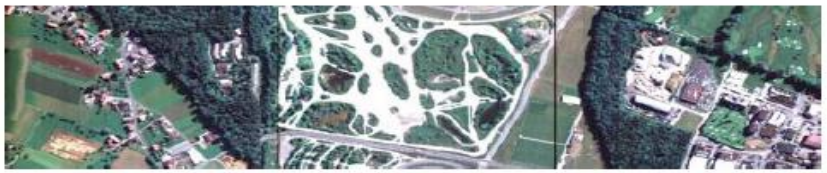
4 x Bruhyp

Belgian Science Policy

2008, 1st test flight







Agency

Hyperspectral flight campaigns

1. **Prepare for the exploitation of APEX and capacity building in order to:**
   - Operate flight campaigns and process the data
   - Archive and distribute of IS data
   - Develop and promote new applications
2. **Familiarize the Belgian scientists with hyperspectral data through:**
   - Flight campaigns with existing hyperspectral sensors and APEX (since 2008)
   - Small case studies and workshops

BruHup conferences, a ‘tradition’ with thanks to Belspo and APEX

1. First **hyperspectral campaign** in **2002**

2. First **BruHyp** conference organised in **2003**







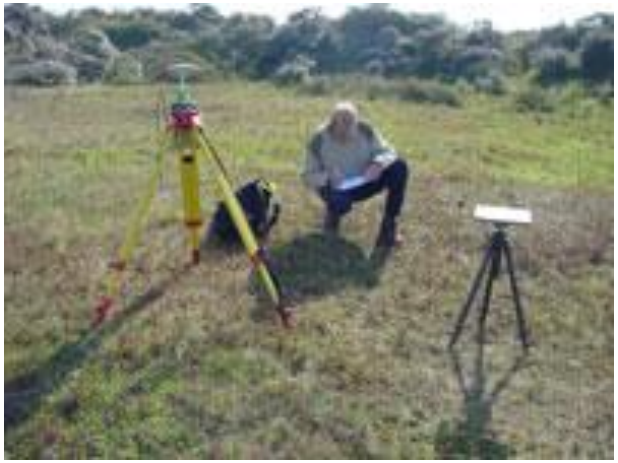




Pool of field equipment

Hand-held spectrometers, sunphoto-meters, GPS, … ;

VITO manages this pool for the research community, maintains, makes it available and provides training and support



http://islab.vgt.vito.be/

5 Campaigns

1. Research topics similar to those covered by you today
2. Evolution from purely Belgian research interest and collaboration to European research partnerships
3. Geographical coverage gradually spread over Europe
4. Switching partnerships wrt to sensors and flight operators

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The CASI 2002 campaign

1. Organized by VITO, NERC (UK) and ITRES (Can)
2. Belgian researchers from RMA, ULg, ULB, RUG, VUB, KUL, VITO, LUC, CRAGx, FUL
3. Flight window : September 2002

4. CASI-2 sensor: 400-950 nm, 288 channels, 0.6 - 6 m
5. SWIR sensor: 850-2500 nm, 160 channels, 0.5 - 10 m
6. Onboard a DORNIER 228
7.

Ghent, 13/09/2002

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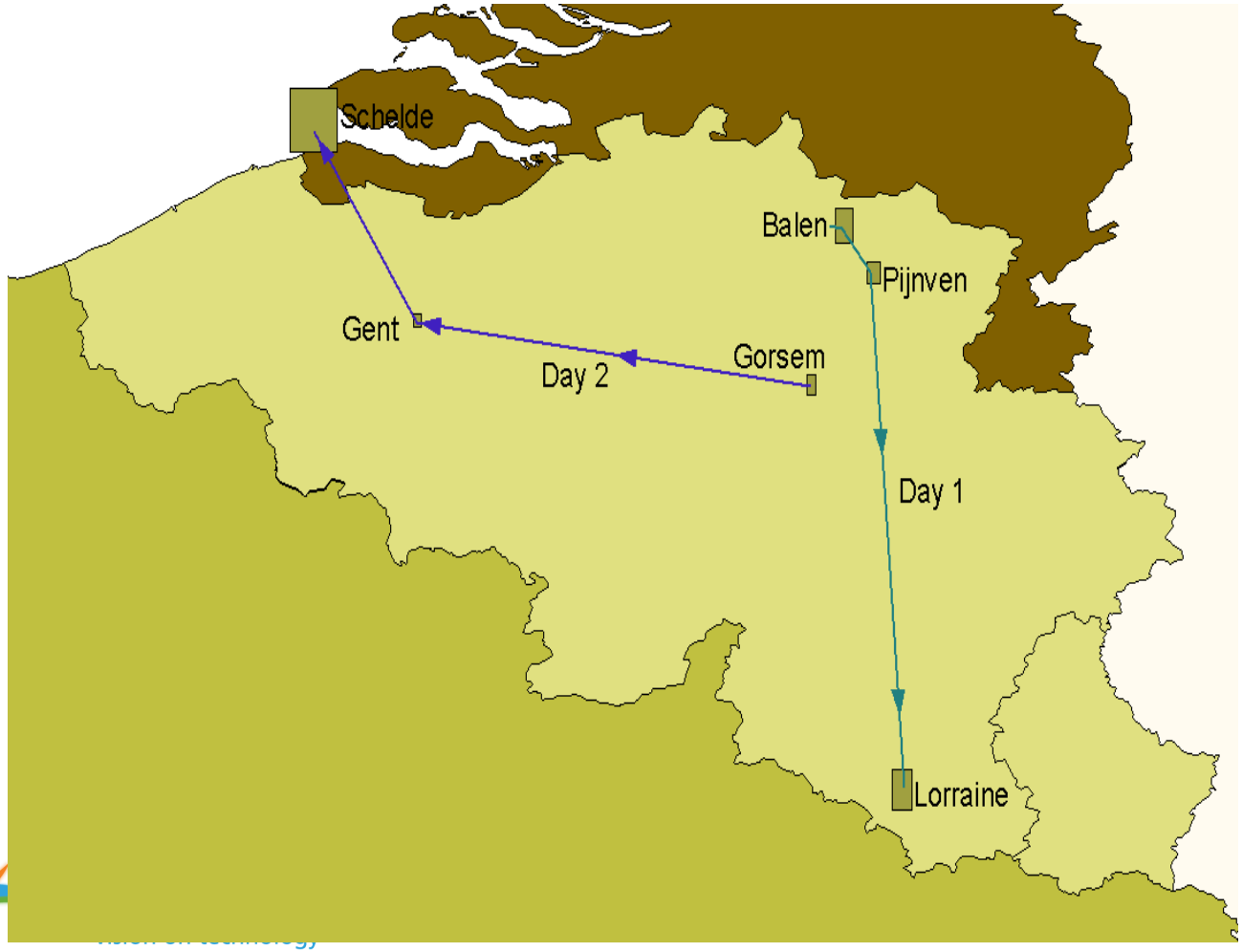
Test sites of CASI 2002 Campaign

The flight campaign covered 6 test sites



The CASI/ATM 2003 campaign

1. Organized by VITO and NERC
2. Belgian researchers from KUL, RUG, VLM, MRAC, OMA, VUB, KMI, UCL, CRAGx, FUL, VUB
3. Flight windows: June 2003 and October 2003

4. CASI 2: up to 288 channels from 400 nm to 950 nm, 0.6 – 6 m
5. ATM: 1 TIR band from 8.5 to 13 µm, 0.7 – 7.5 m
6. Onboard a Dornier 228

Oostende, 16/06/2003

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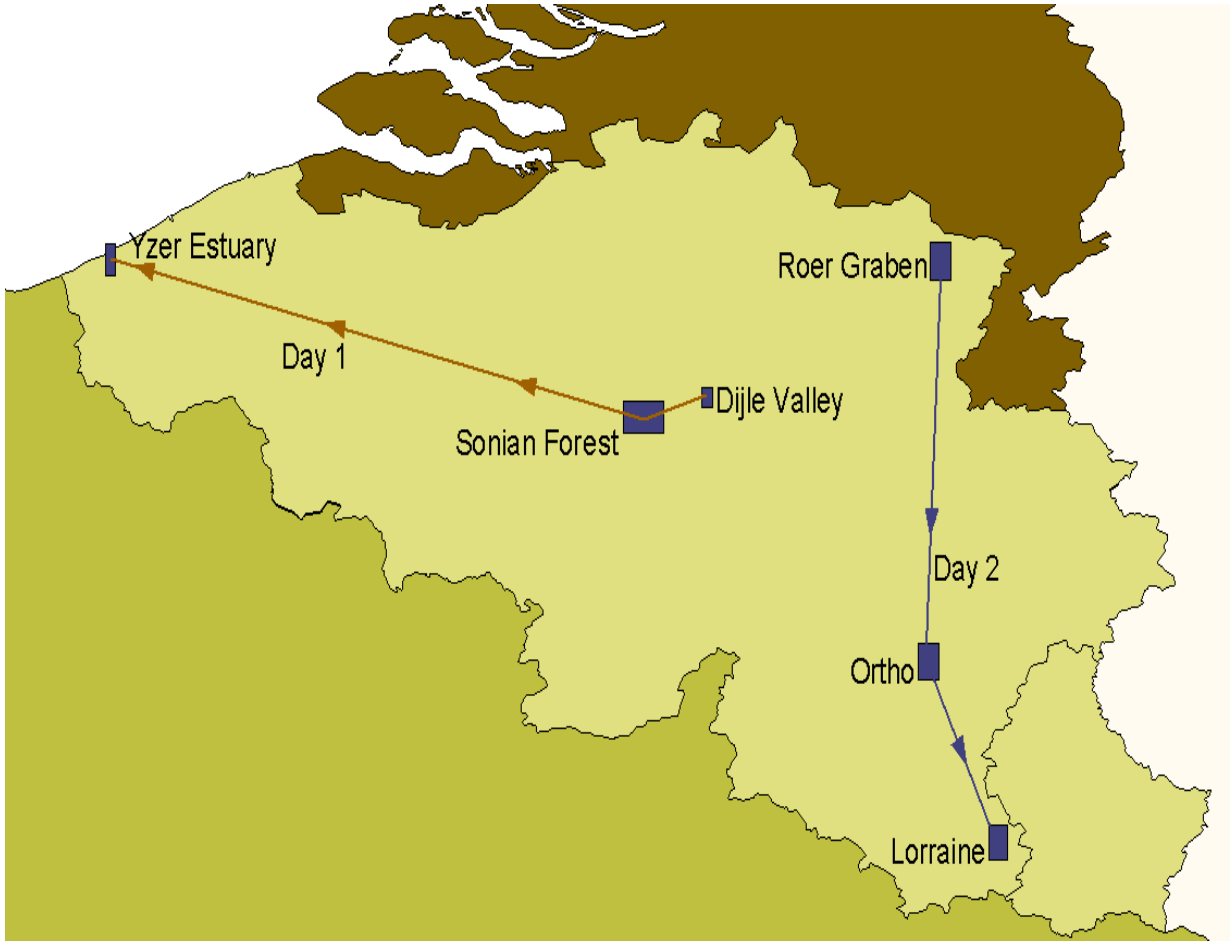
Belgian Science Policy

European Space Agency

Test sites of the CASI-ATM 2003 campaign



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The HyMap2004 campaign

1. Collaboration with DLR (D)
2. For the first time international partnerships between Belgian universities and foreign scientists/research institutes/ Belgian government agencies
3. 3 flight windows due to bad weather: May, June and July 2004

4. Spectral range of the HYMAP sensor: 400 - 2500 nm, 126 channels (http://www.intspec.com)
5. Ground resolution: 4 – 10 m
6. Onboard a DORNIER 228

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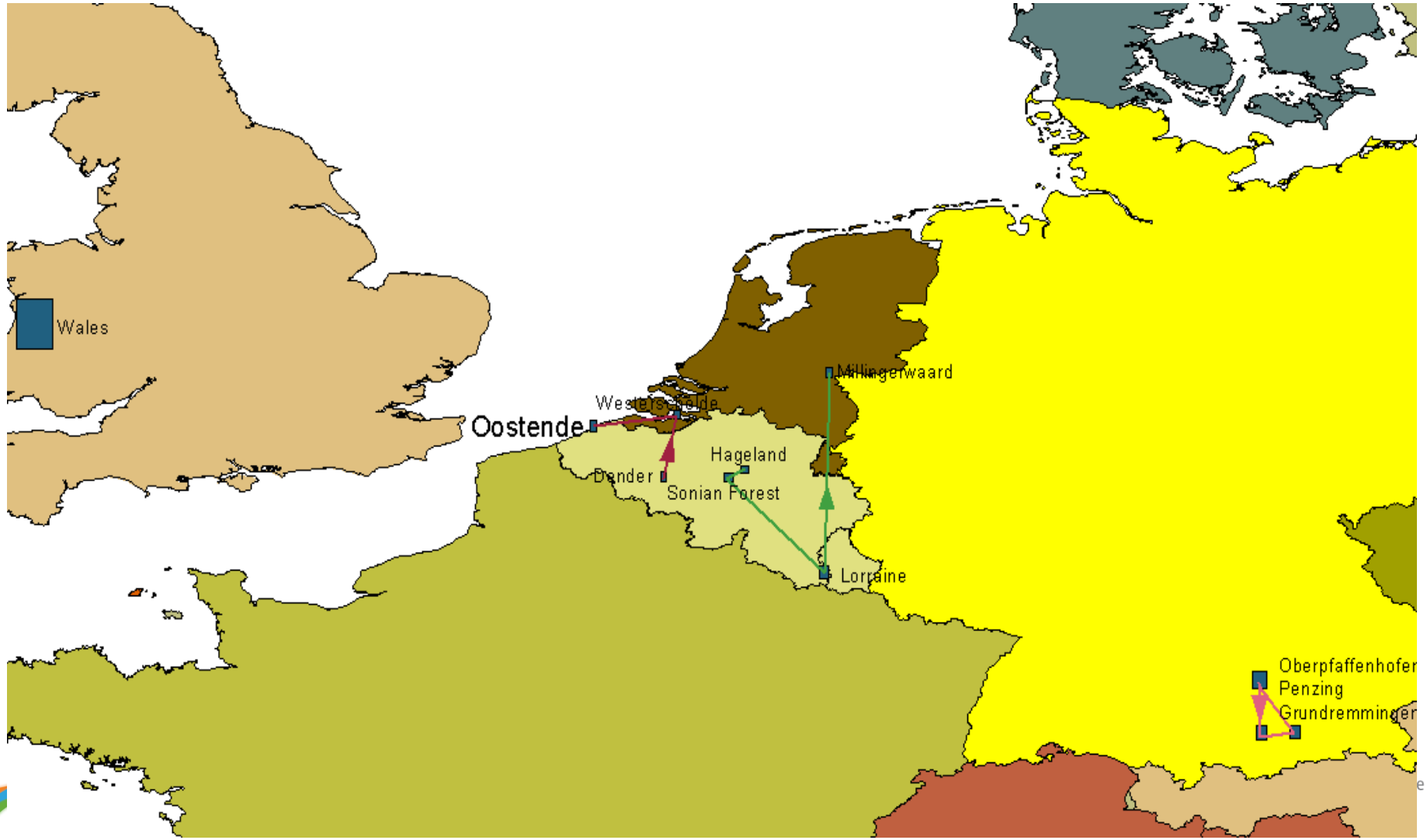
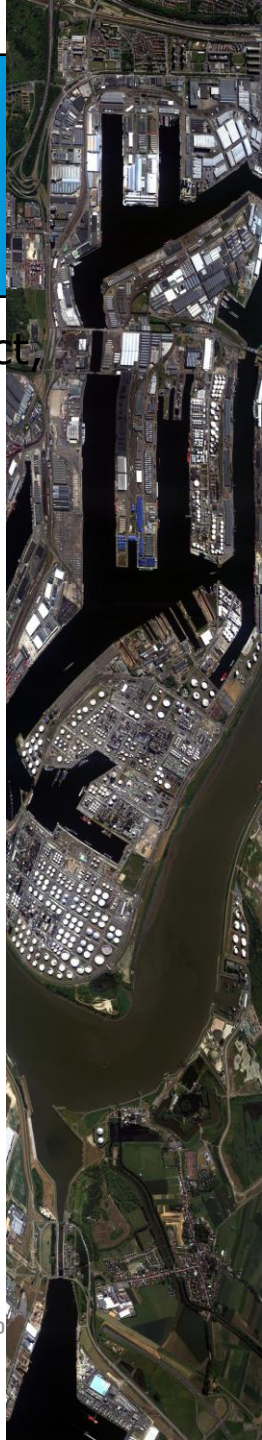
Test sites of the HyMap 2004 Campaign



The AHS 2005 campaign

1. Airborne Hyperspectral System (AHS) onboard a CASA 212-200 from **INTA** (ESP)
2. Partnerships between Belgian universities/research institutes and foreign scientists or Belgian government agencies
3. AHS images (VIS-NIR, SWIR, MIR, TIR) from 11 test sites in Belgium, the Netherlands and Spain were collected.



ORMES project, 15/06/2005

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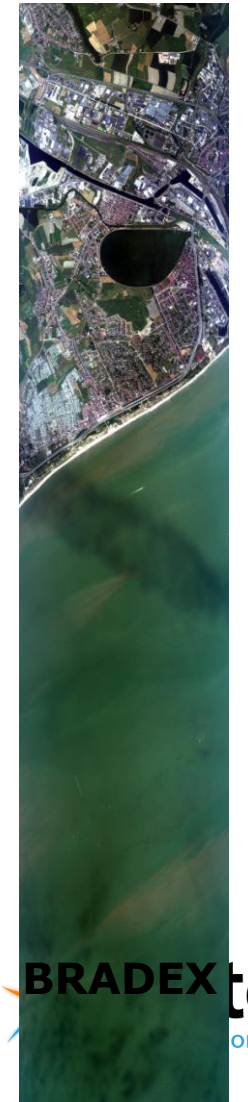
Testsites of the AHS 2005 Campaign



Millingerwaard

BRADEX

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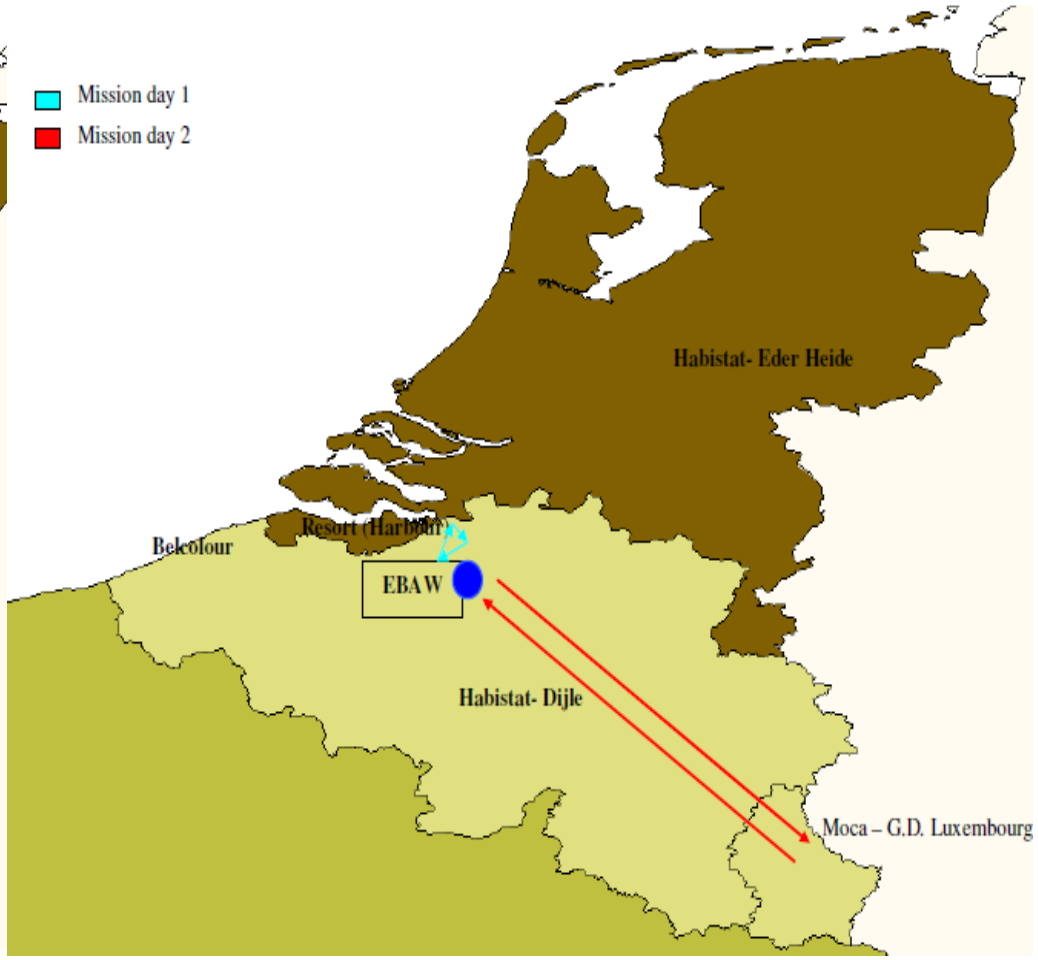
The AHS-CASI 2007 Flight campaigns

1. Airborne Hyperspectral System (AHS) onboard a CASA 212-200 from **INTA** (ESP)
2. Two flight campaigns in June and September.
3. The Advanced Hyperspectral System (AHS) flown in both periods, the CASI sensor (HDI) flown in June.
4. Both sensors installed in a CASA 212-200 aircraft.
5. 8 test sites in Belgium, Luxembourg and the Netherlands.

Testsites of the AHS-CASI 2007 Campaigns



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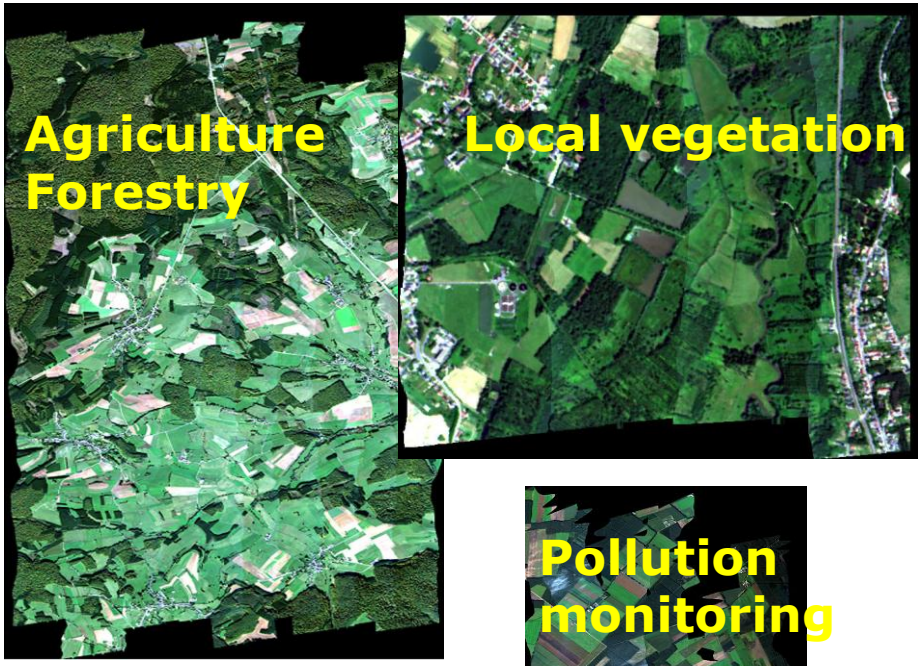
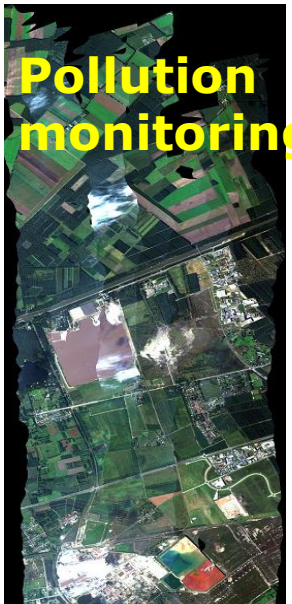
Research topics





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Practical lessons learned (anno 2007)

1. "Groupshoot" concept is ok
2. Communication: a lot of people involved
3. Main constraint = weather conditions and predictions
4. ATC permissions and military areas
5. Supporting ground measurements needs careful planning
6. Flexible flightplanning allows optimization e.g. sunglint

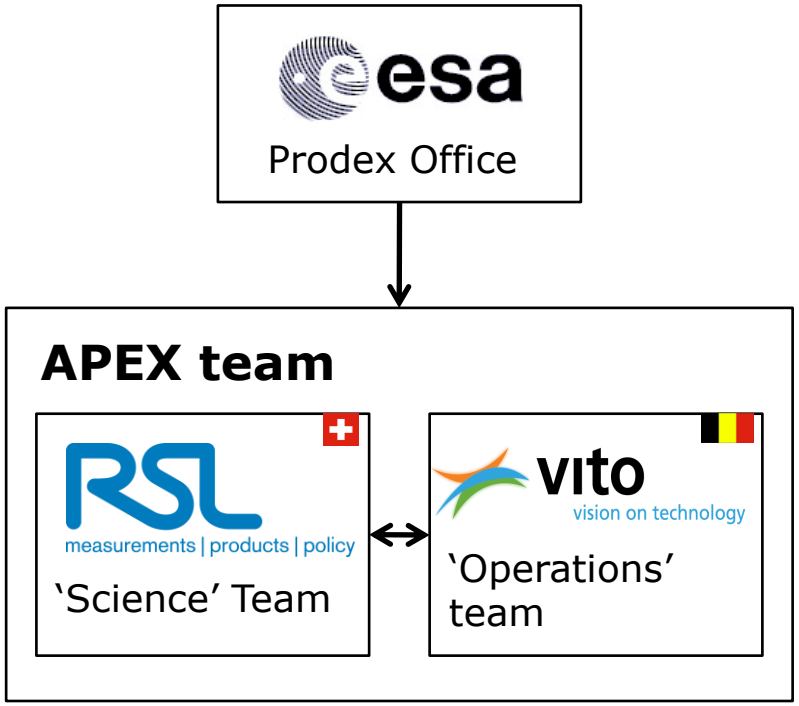
→ **Flexibility** is a key issue

BruHyps and EARSEL-SIGIS

- 4 BruHyps organized in **2003, 2004, 2005, 2006**
  - 29 datasets collected
  - 29 small projects financed
  - 32 Belgian and 14 international research teams involved
  - on average 80 participants from Belgium and abroad
- VITO organized the **EARSEL-SIGIS** conference in Bruges in **2007**

Since 2008, APEX has been ‘operated’

APEX team: organization



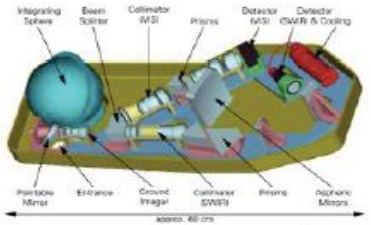
APEX 'Operations' Team based at VITO, Mol,B

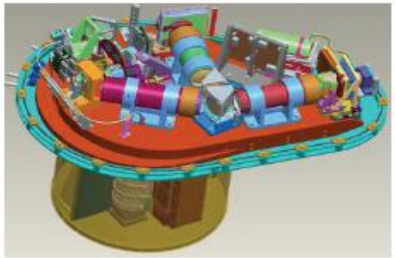
Team tasks:

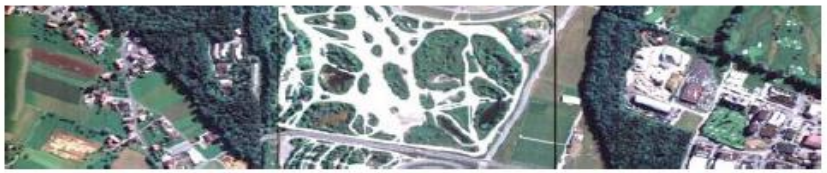
a. Flight planning and preparation
b. Aircraft and ATC planning and coordination
c. Instrument Operations and handling
d. APEX Processing and Archiving and Data dissemination
e. Laboratory calibration together with RSL and generation of calibration parameters
f. Website

APEX timeline

- 1991 APEX is initiated by Klaus I. Itten
- 1994 ESA is identified as funding agency
- 1996 Belgium is asked to join
- 1998 First instrument concept identified
- 2001 Requirements, specifications, feasibility studies
- 2003 Breadboarding activities
- …
- 2006 Critical Design Review
- 2007 Instrument prototype built
- 2008, 1st test flight
- 2009 1st Acceptance flight campaign
- 2010 2nd Acceptance flight campaign
- **Instrument accepted by ESA**
- 2011-2015 Exploitation Operations







2011: APEX first operational year

1. Flights for STEREO projects, HyperSwissNet, EUFAR and open to other interested users joining
2. Two campaign windows: June + September
3. International dimension with research teams and areas spread over Belgium, the Netherlands, Luxembourg, Switzerland, Germany, Italy, Austria and Spain

Now it's up to you

- **Build on the hyperspectral investments of Belspo , ESA and many others**
- **Make APEX and the hyperspectral imaging a lasting success**

VITO has always been at the fore front and intends to remain there