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# **The 2005 hyperspectral flight campaign**

**18 January 2005  
Mol, Belgium**

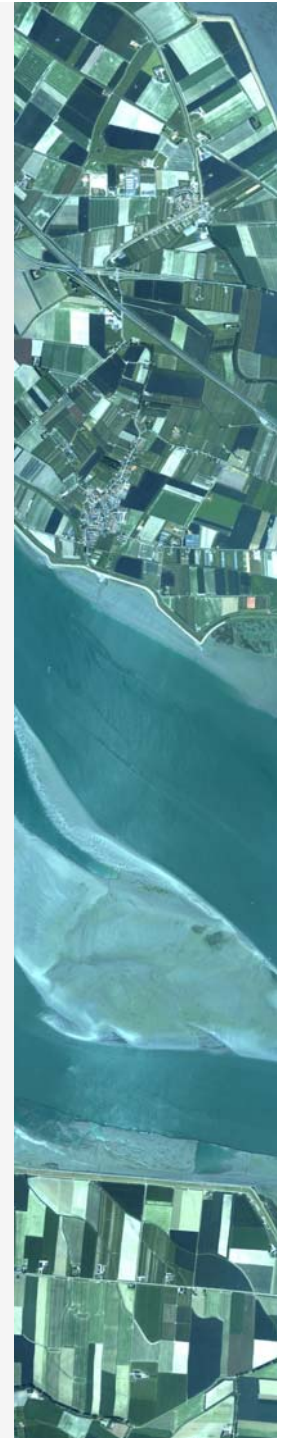
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**Carine Petit & Joost Vandenabeele**  
Earth Observation programmes





- Since 2002, the Belgian Science Policy Office has supported activities in airborne Hyperspectral RS
- New frontiers for Belgium
- Organization
- Funding



# Our RS programme rests on four main pillars

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- **Preserving and strengthening scientific expertise**
- Fostering the development of products and operational services for both public and private sectors
- Supporting users
- Enhancing the visibility of the know-how and results

# How do we preserve and reinforce the Belgian scientific expertise?

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**4 action lines are being developed to support:**

- Internationally recognised thematic expertise poles in
  - Global and local-scale vegetation and agriculture
  - Land management and cartography
  - Study of coastal regions
- Poles of expertise dedicated to new technologies and innovation
- Shared-cost actions (FP6, ESA, ISPRS-CNES, ...)
- **Exploitation of instruments aboard aircrafts**

# Belgium opted to support the exploitation of the APEX instrument

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- **APEX** means “Airborne Prism Experiment”
- **APEX** is a hyperspectral airborne simulator for the support and development of hyperspectral spaceborne missions:  
ESA future missions (Sentinel), CHRIS, MERIS
- **APEX** is developed as part of Belgo-Swiss cooperation in the framework of an ESA project : <http://www.apex-esa.org>
- **VITO will exploit the APEX instrument on Belgium’s behalf from 2006**



# What's the role of the Belgian RS programme?

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- **To prepare the exploitation of APEX at VITO by supporting the development of capabilities :**
  - To operate flight campaigns and process the data
  - To distribute and archive the data
  - To develop and promote news applications
- **To familiarize the Belgian scientists with hyperspectral data by sponsoring :**
  - Flight campaigns with existing hyperspectral sensors
  - Small case studies and workshops

## Since 2002, 3 hyperspectral flight campaigns have been organized

<i>Line of actions</i>	2001	2002	2003	2004	2005
<b>Building of expertise</b>					
Vegetation	<b>2</b>				
Cartography - land management	<b>1</b>				
Coastal regions	<b>1</b>				
Innovation	<b>2</b>		<b>4</b>		
<b>APEX exploitation</b>		<b>7</b>	<b>7 (PRODEX)</b>	<b>9</b>	<b>Open call</b>
<b>Market development</b>					
Private research		<b>5</b>	<b>1</b>	<b>1</b>	<b>1</b>
Public research		<b>3</b>	<b>1</b>	<b>1</b>	
<b>Shared-Costs actions</b>			<b>2</b>		

# The 2002 campaign flew with CASI-2 and SWIR instruments

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- CASI-2 sensor: 400-950 nm, 288 channels, 0.6 - 6 m
- SWIR sensor: 850-2500 nm, 160 channels, 0.5 - 10 m
- Onboard a DORNIER 228
- Organized by VITO, NERC and ITRES
- Budget of the call: 124 k€
- Flight window: September 2002
- Workshop: 4th September 2003, Bruges



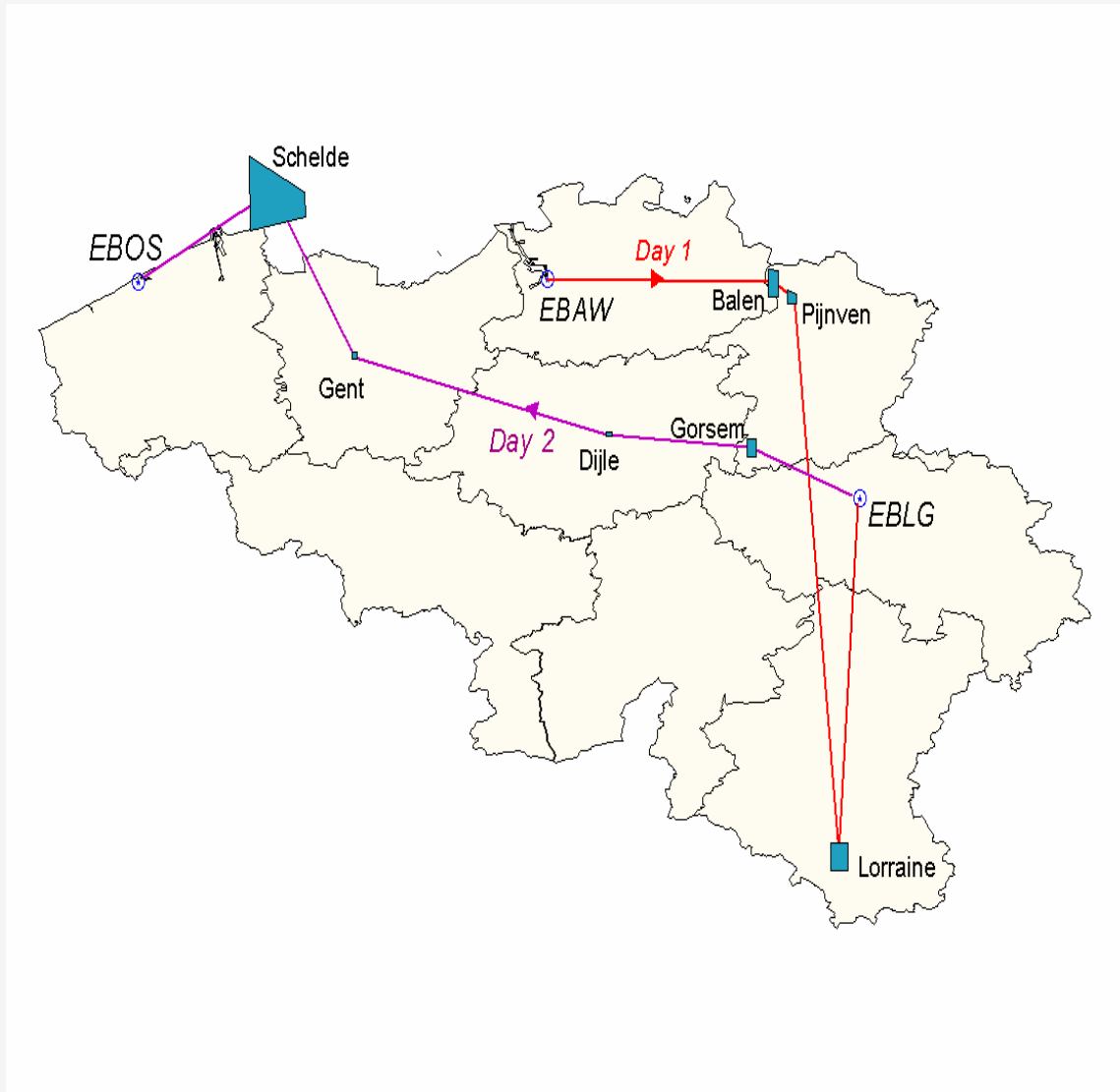


# We granted 7 small studies of 8 months

<i>Application field</i>	<i>Topic</i>	<i>Test sites &amp; Teams</i>
<b>Coastal monitoring</b>	Biogeochemistry of Scheldt estuary and plume	Scheldt estuary <b>RMA, ULg, ULB, RUG</b>
<b>Hydrology</b>	Detection of soil moisture gradients	Dijle Valley <b>VUB</b>
<b>Forestry</b>	Vitality of perennial plants	Limburg <b>KUL</b>
<b>Pollution monitoring</b>	Detection of heavy metals in plants and solid matrices	Campine <b>VITO, LUC</b>
<b>Agriculture</b>	Characterisation of permanent grassland canopy	Lorraine <b>CRAGx</b>
	Estimation of soil organic matter content	Lorraine <b>FUL</b>
<b>Urban studies</b>	Spatial information extraction for urban areas	Ghent <b>RUG, VUB, ULg, ULB</b>

# The flight campaign covered 6 test sites

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# The ESA's Prodex programme supported our CASI-ATM campaign of 2003

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- Prodex budget of the call: 87 k€
- CASI: up to 288 channels from 400 nm to 950 nm, 0.6 – 6 m
- ATM: 1 TIR band from 8.5 to 13  $\mu\text{m}$ , 0.75 – 7.5 m
- Onboard a Dornier 228
- Organized by VITO and NERC
- Flight windows: June 2003 and October 2003
- Workshop: 8 October 2004, Bruges

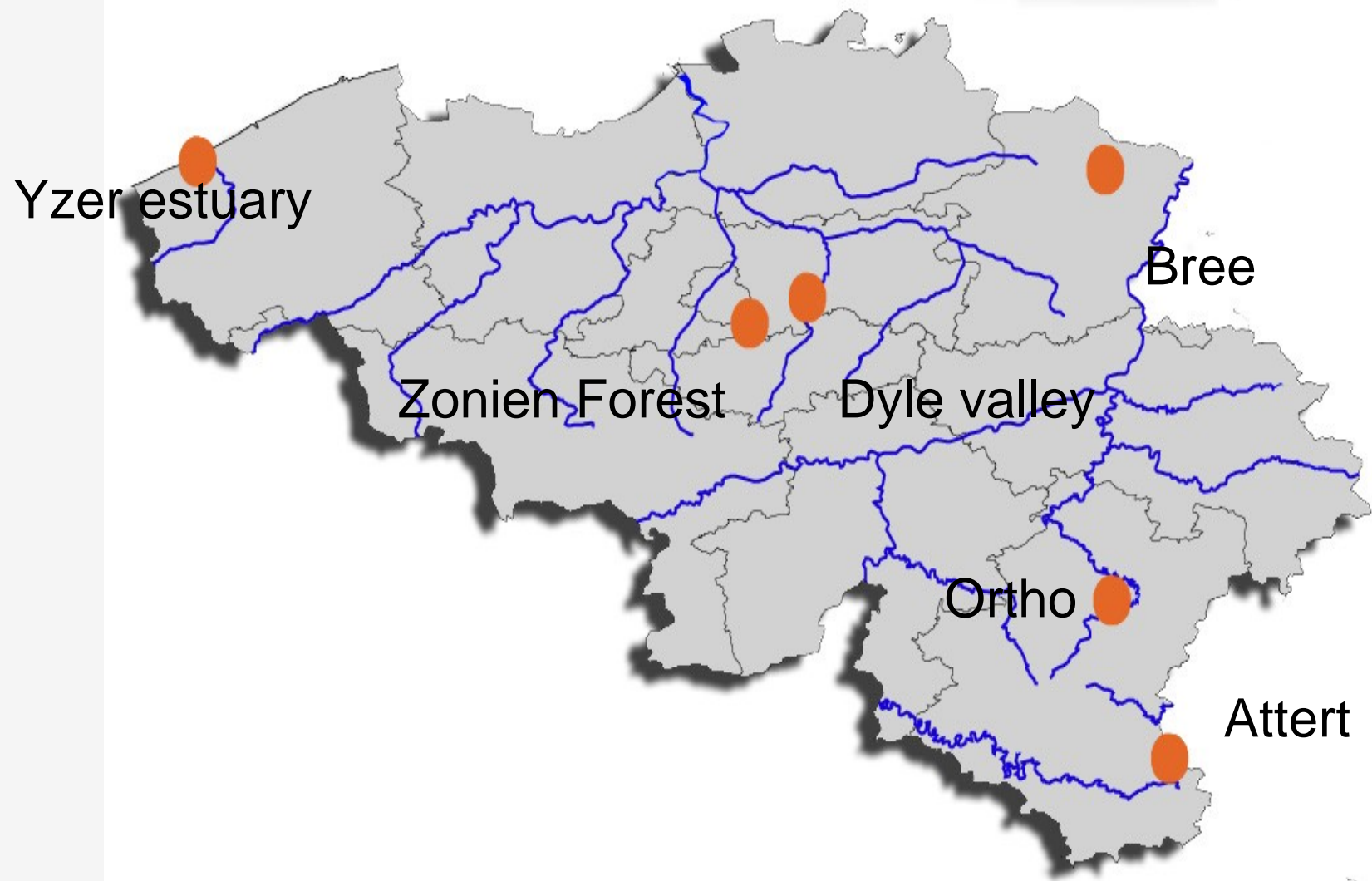


# Evaluators renewed 3 projects of 2002 and selected 4 new projects

<i>Application field</i>	<i>Topic</i>	<i>Test sites &amp; Teams</i>
<b>Coastal monitoring</b>	The Yzer estuary	Yzer estuary <b>KUL, RUG, VLM</b>
<b>Geology</b>	Detection of changes induced by active faults	Roer Graben <b>MRAC, OMA</b>
<b>Soil</b>	Dynamics of soil organic Carbon	Ardennes <b>UCL</b>
<b>Forestry</b>	Monitoring of stress vegetation and water quality	Sonian Forest <b>VUB, KMI</b>
<b>Agriculture</b>	Characterisation of permanent grassland canopy	Lorraine <b>CRAGx</b>
	Estimation of soil organic matter content	Lorraine <b>FUL</b>
<b>Hydrology</b>	Water and energy fluxes in a Riparian wetland	Dijle Valley <b>VUB</b>

# Test sites of the CASI-ATM 2003 campaign

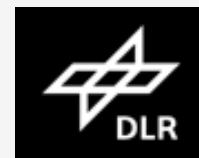
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# The HYMAP 2004 campaign was organized by VITO in collaboration with DLR (1/2)

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- Spectral range of the HYMAP sensor: 400 - 2500 nm, 126 channels (<http://www.intspec.com>)
- Ground resolution: 4 – 10 m
- Onboard a DORNIER 228
- 3 flight windows due to bad weather: May, June and July 2004
- Budget of the call: 192 k€



# The HYMAP 2004 campaign was organized by VITO in collaboration with DLR (2/2)











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- Partnerships between Belgian universities and foreign scientists/research institutes/ Belgian government agencies
- Partners received data cubes, but were not funded
- Geometric and radiometric correction: DLR
- Atmospheric correction: VITO
- Delivery of calibrated and corrected datasets : December 2004











## 9 projects are still running (1/2)

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<i>Application field</i>	<i>Topic</i>	<i>Test sites &amp; Teams</i>
<b>Coastal monitoring and inland waters</b>	Bottom reflectance and adjacency experiment	Oostende (B)  
	Time-dependent changes in the optical properties of sediments	Westerschelde (NL)  
<b>Vegetation - Agriculture</b>	Derived nitrogen indicators for maize crop	Lorraine (B+L)  
	Machine learning techniques for Ecotope classification	Dender/Idegem/Moerbeke (B) 
	Crop productivity – soil erosion relationship	Hageland/Holsbeek/Luibeek (B)   



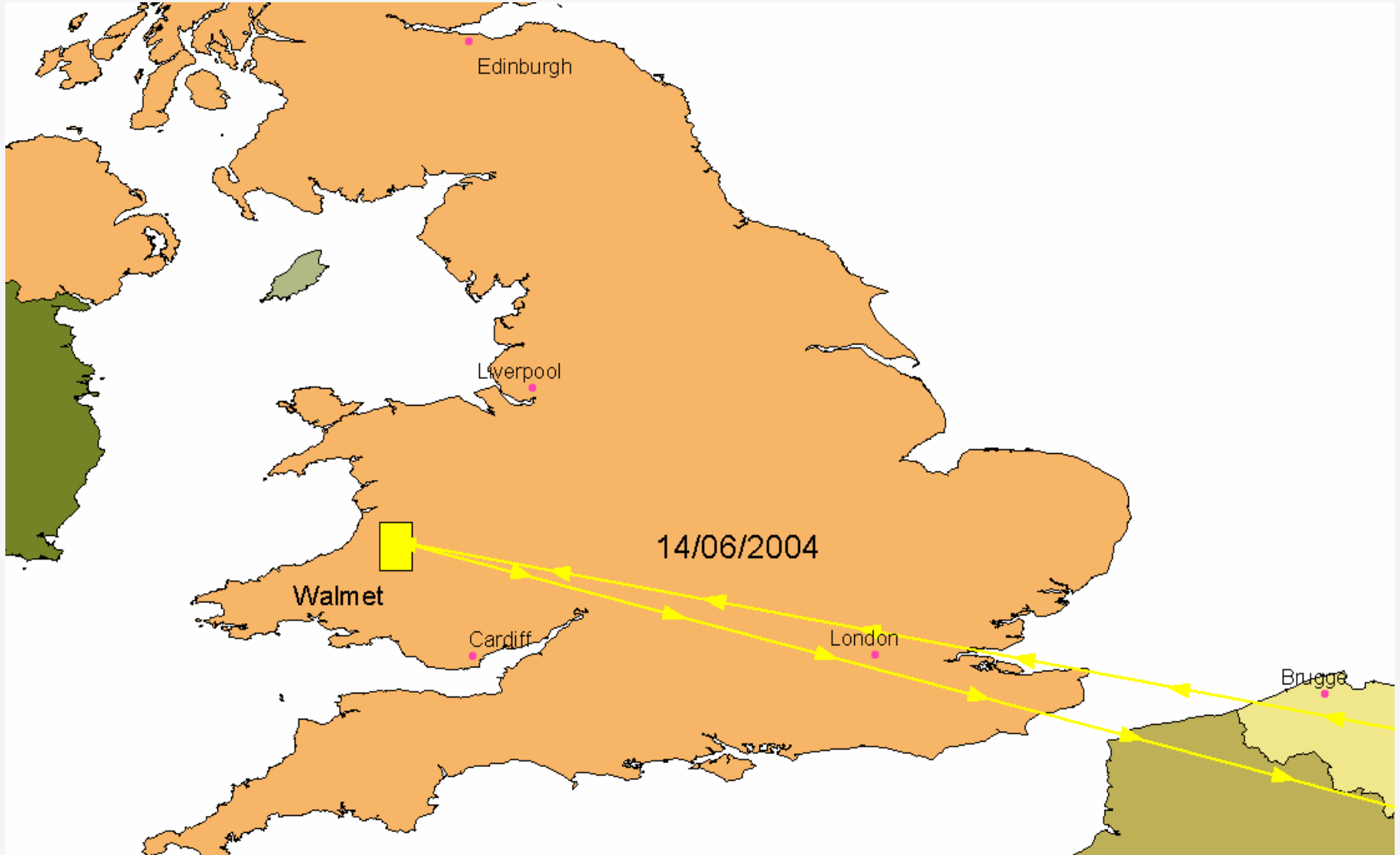
## 9 projects are still running (2/2)

<i>Application field</i>	<i>Topic</i>	<i>Test site</i>
<b>Methodology</b>	Hyperspectral measurements for the validation of SPOT data products	Sonian Forest (B)  
	Linking biochemical and biophysical variables derived from IS to ecological models	Millingewaard (NL)  
<b>Pollution monitoring</b>	Lead dispersal from abandoned metalliferous mining	Rheidol Valley, Wales (UK)  
<b>Urban studies</b>	Man-made object classification using fused polarimetric SAR and hyperspectral data	Penzing, Grundremmingen, Oberpfaffenhofen (D)  

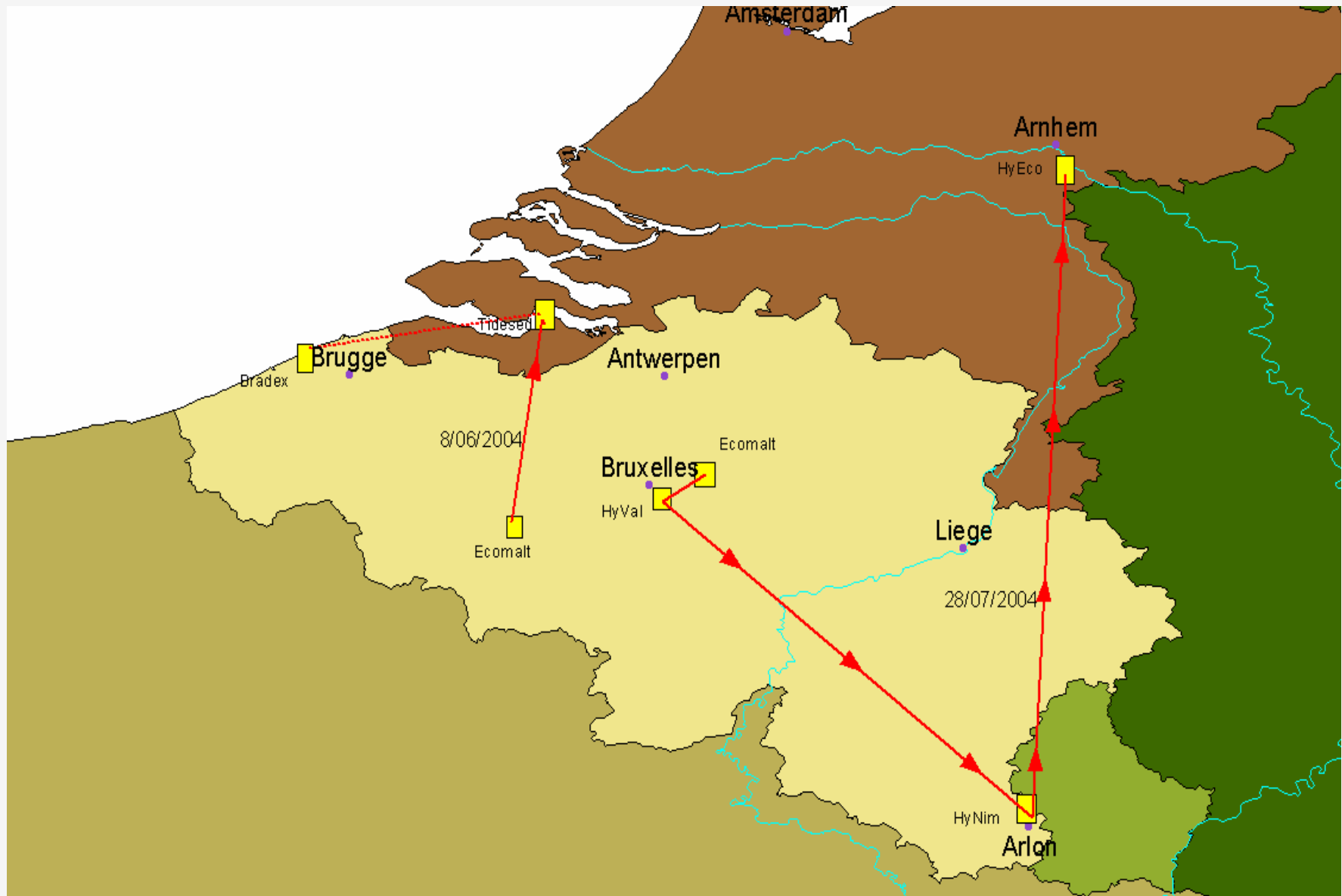
# Flights near Munich (D)



# Flights over Wales (UK)



# Flights over Benelux





## Main features of the 2005 campaign (1/2):

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- Maximum 7 test sites will be covered
- Maximum 7 proposals will be selected
- Flight window: June 2005 and possibly Autumn 2005
- Available budget: 124 k€
- Maximum funding per proposal: 20 k€
- Declaration of interest: end of February
- Deadline for submission: 13 March 2005





## Main features of the 2005 campaign (2/2):

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- Instrument: AHS 160 in collaboration with INTA (Spain)
- Test sites: Belgium or neighboring countries
- Partnerships between Belgian universities/research institutes and foreign scientists or Belgian government agencies
- Partners get data cubes but no STEREO funding
- Possibility to get CHRIS or MERIS data for free over your test site





## Selection criteria for 2005:

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- Novel idea and perspectives for use the data in new areas
- Scientific quality
- Expertise of the partners
- International cooperation
- Interdisciplinary cooperation
- Sharing of test site or use a previous site
- Size of the requested datasets





# Calendar

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DOI	<b>End of February 2005</b>
Final submission date	<b>13 March 2005</b>
Selection of proposals	<b>Early April 2005</b>
WK for selected teams	<b>Mid-April 2005</b>
Start of contracts	<b>May 2005</b>
Flight window(s)	<b>June 2005 (+ Autumn ?)</b>
WK - results 2004	<b>7 October 2005</b>
Delivery of datasets	<b>Autumn 2005</b>
WK - results 2005	<b>October 2006</b>





# From Monday 24 January 2005

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- **Call for proposals and submission file:**

<http://www.belspo.be>

- **DOI and additional information:**

[AHS2005@belspo.be](mailto:AHS2005@belspo.be)

# Announcements

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- 4th Workshop on Imaging Spectroscopy: « Imaging Spectroscopy. New quality in environmental studies »  
27-29 April 2005, Warsaw, Poland  
<http://www.wgsr.uw.edu.pl/zts/workshop/index.htm>  
Deadline for early registration: 1 April 2005
- HyperTeach Training course, 26-30 September 2005, Vito, K.U.Leuven, RMCA
- Results - HYMAP 2004 campaign: Bruges, 7 October 2005
- 5th Workshop on Imaging Spectroscopy, Bruges, 23-25 April 2007