
Airborne Imaging Spectroscopy Workshop

**8 October 2004
Bruges, Belgium**

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Earth Observation programmes





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



The rationale behind the Belgium RS programme is to:

- Maintain and develop the Belgian expertise, and bring it to the international level
- Encourage innovation and use of new technologies
- Support the development of products and services

Our RS programme rests on four main pillars

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

How do we preserve and reinforce the Belgian scientific expertise?

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

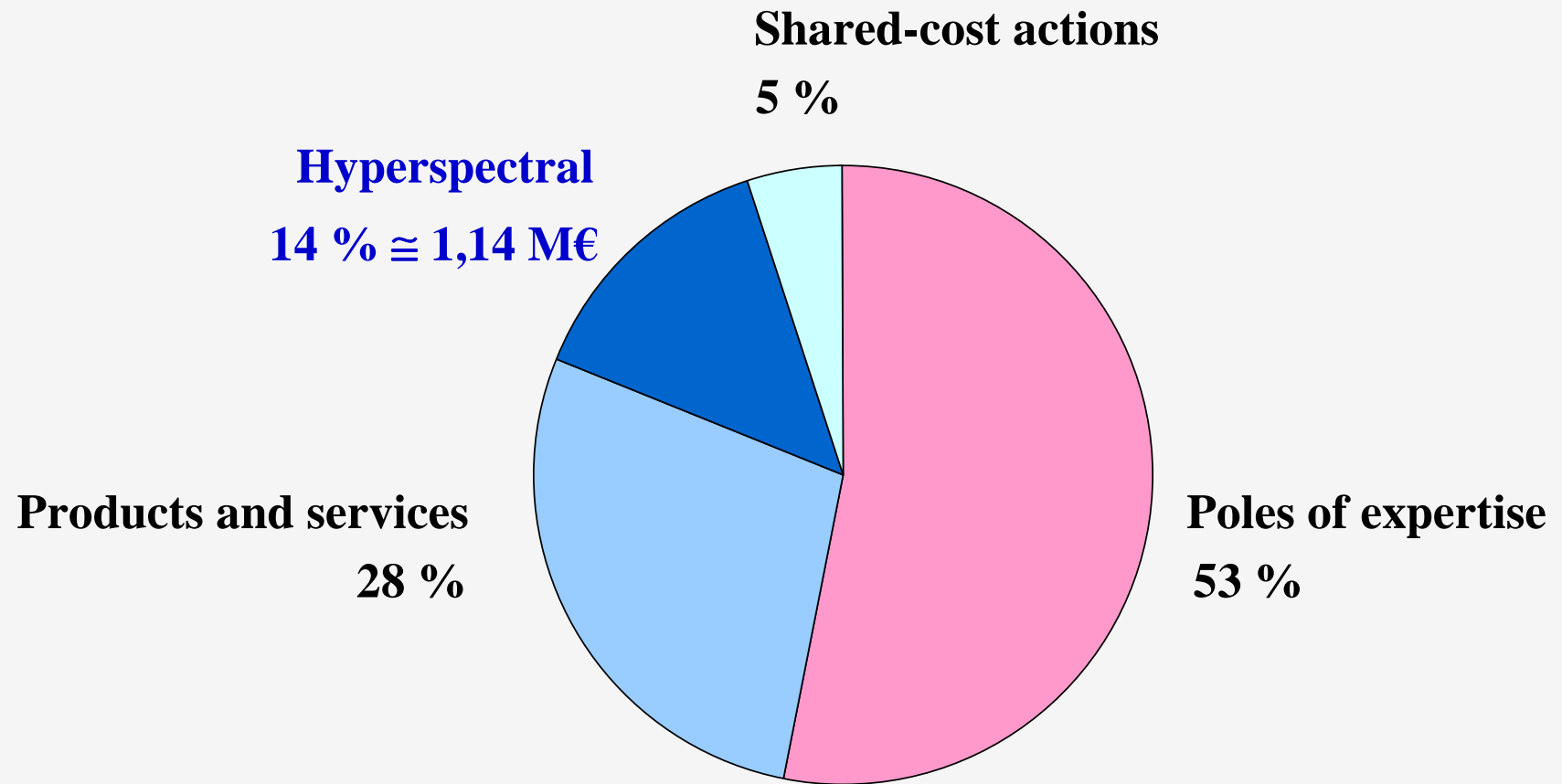
- **APEX** means “Airborne Prism Experiment”
- **APEX** is a hyperspectral airborne simulator for the support and development of hyperspectral spaceborne missions of ESA: CHRIS, MERIS, Land Mission (SPECTRA)
- **APEX** is developed as part of Belgo-Swiss cooperation in the framework of an ESA project : <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?

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

What's the budget dedicated to APEX exploitation from 2002 to 2006?



Since 2002, 3 hyperspectral flight campaigns have been organized

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

The 2002 campaign flew with CASI-2 and SWIR instruments

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

The flight campaign flew over 6 test sites



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

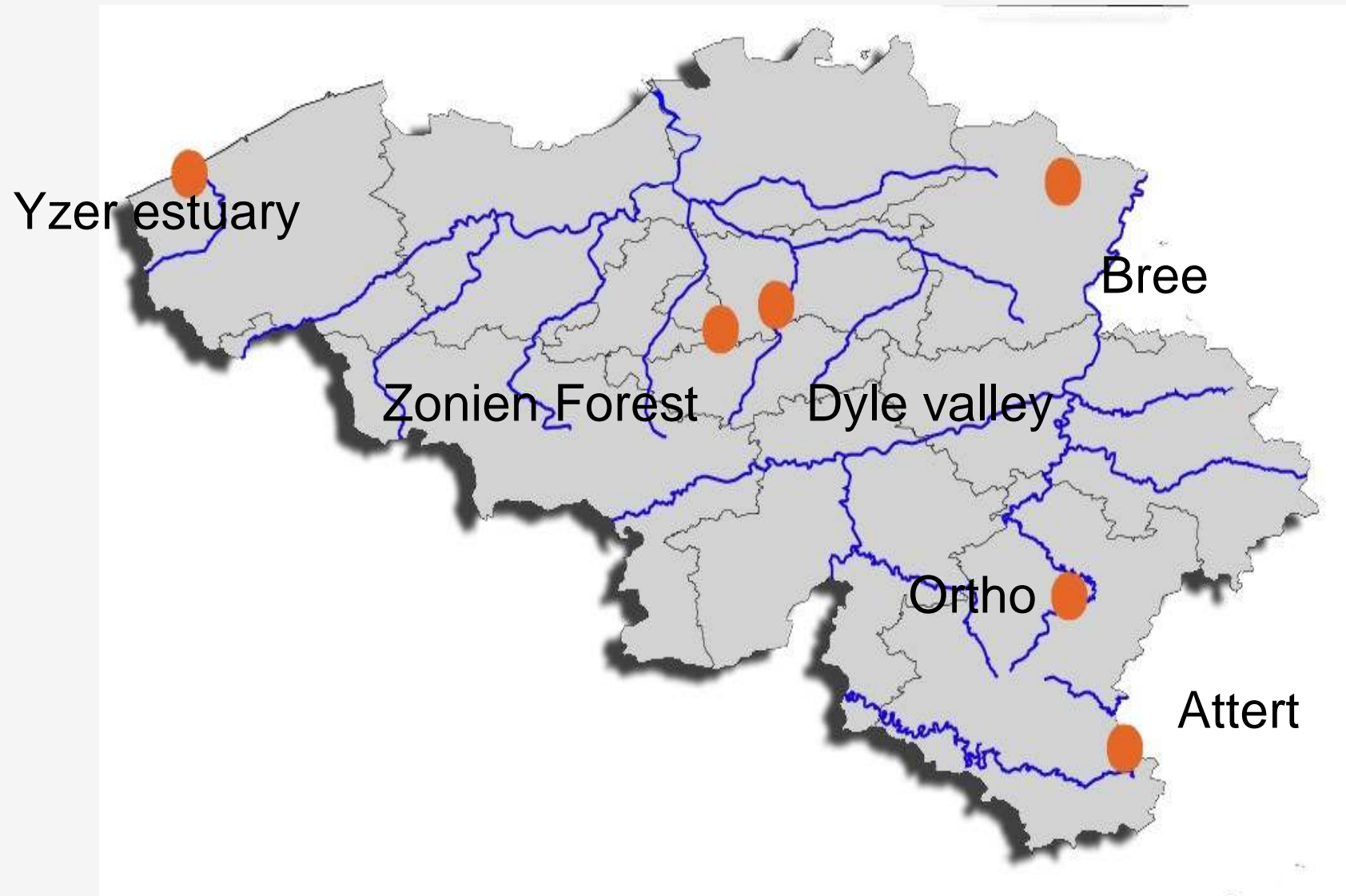
- Prodex budget of the call: 87 k€
- CASI: up to 288 channels from 400 nm to 950 nm, 0.6 – 6 m
- ATM: 1 TIR band from 8.5 to 13 μm , 0.75 – 7.5 m
- Onboard a Dornier 228
- Organized by VITO and NERC
- Flight windows: June 2003 and October 2003
- Workshop in 2004 (Today!)



Evaluators renewed 3 projects of 2002 and selected 4 new projects

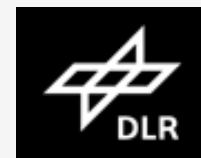
<i>Application field</i>	<i>Topic</i>	<i>Test site</i>
Coastal monitoring	The Yzer estuary	Yzer estuary KUL, RUG, VLM
Geology	Detection of changes induced by active faults	Roer Graben MRAC, OMA
Soil	Dynamics of soil organic Carbon	Ardennes UCL
Forestry	Monitoring of stress vegetation and water quality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

Test sites of the CASI-ATM 2003 campaign



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

- 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)





- Partnerships between Belgian universities and foreign scientists/research institutes/ Belgian government agencies
- Partners get data cubes, but are not funded
- Geometric and radiometric corrections: DLR
- Atmospheric corrections: VITO
- Delivery of calibrated and corrected datasets by the end of November 2004



9 projects are still running (1/2)

<i>Application field</i>	<i>Topic</i>	<i>Test site</i>
Coastal monitoring and inland waters	Bottom reflectance and adjacency experiment	Oostende (B)  
	Time-dependent changes in the optical properties of sediments	Westerschelde (NL)  
Vegetation - Agriculture	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/Lubbek (B)   

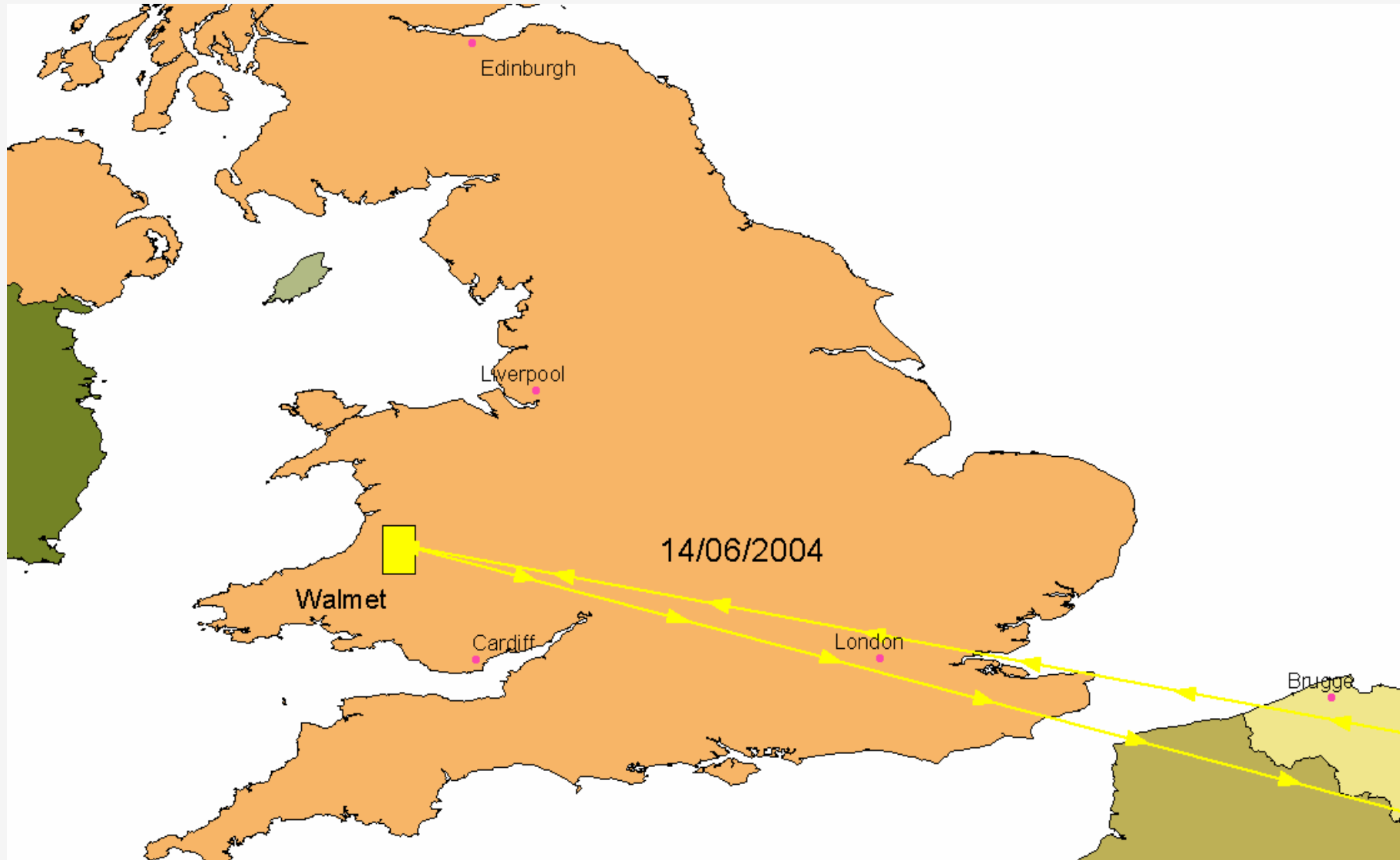
9 projects are still running (2/2)

<i>Application field</i>	<i>Topic</i>	<i>Test site</i>
Methodology	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) 
Pollution monitoring	Lead dispersal from abandoned metalliferous mining	Rheidol Valley, Wales (UK) 
Urban studies	Man-made object classification using fused polarimetric SAR and hyperspectral data	Penzing, Grundremmingen, Oberpfaffenhofen (G) 

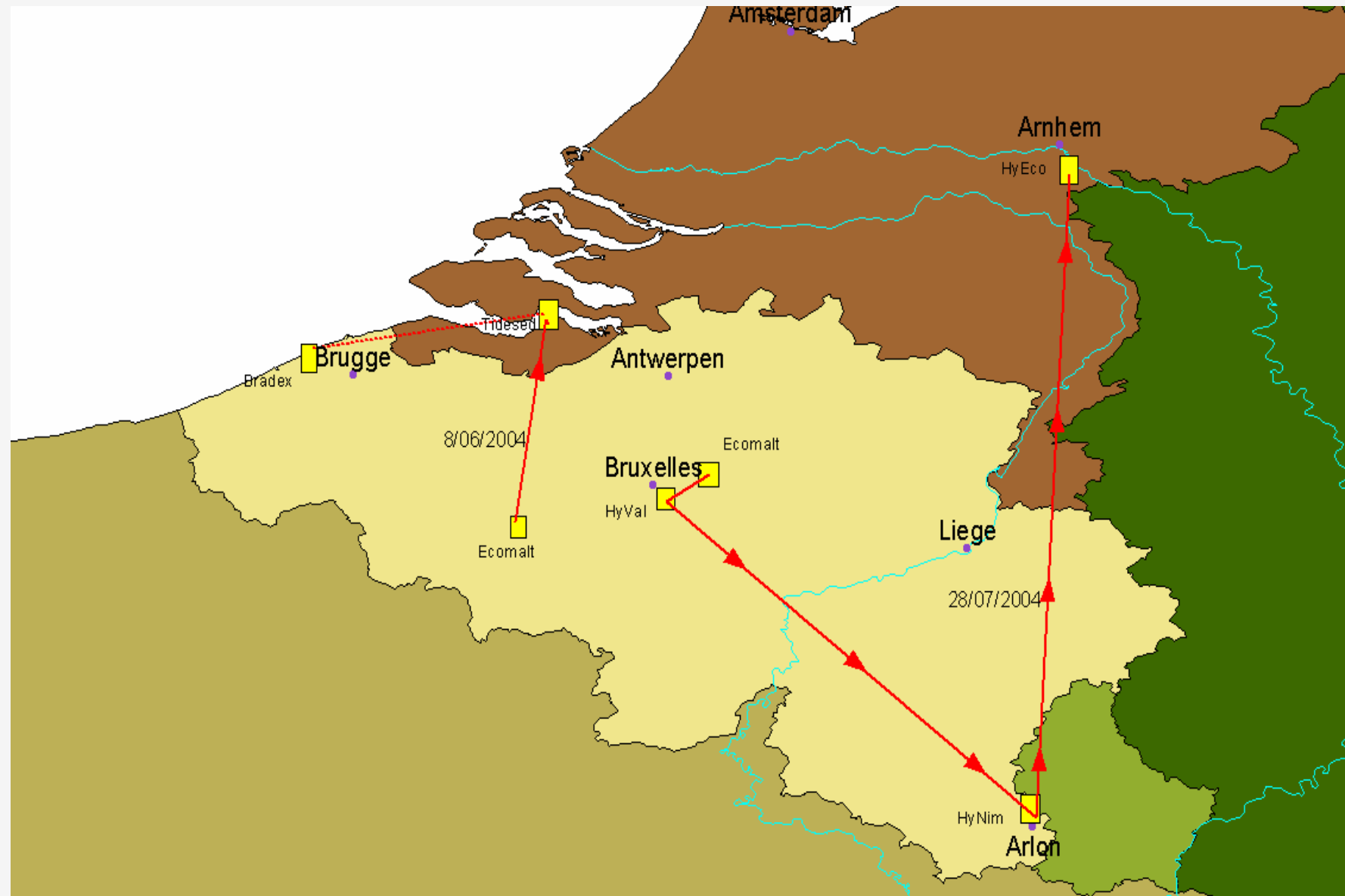
Flights near Munich (G)



Flights over Wales (UK)




Flights over Benelux





Objectives of the workshop: Towards new frontiers

- Present and discuss results
 - Exchange experiences with the keynote speakers and colleagues from other countries
 - Exchange of datacubes
 - Foster new collaborations and ideas
 - Provide feedback to the organizers of the 2003 and 2004 campaigns
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From Monday, our website will provide you with

- **Presentations, proceedings and pictures:**

<http://telsat.belspo.be/documents/bruhyp2004.html>

- **The results of the CASI-SWIR 2002 campaign:**

<http://telsat.belspo.be/documents/documentresult.asp?var=30>

Announcements

- Results of the HYMAP 2004 campaign: Workshop in May 2005
- **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 abstracts: 15 November 2004

- **5th Workshop on Imaging Spectroscopy, Bruges, April 2007**



Thanks to our keynote speakers!

- Prof. Paul Curran from United Kingdom
- Prof. Eyal Ben Dor from Israel
- Prof. Pablo Zarco-Tejada from Spain

We wish you a hyper-fruitful day in Bruges!

