ESA's New Integrated Applications Promotion (IAP) & User Driven Satellite Missions

UN
Feb. 8th 2011, Vienna

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European Space Agency (ESA)

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The Integrated Applications Promotion (IAP) Programme

The goal :

Foster new utilization of existing space capacity and capability through the development, in close partnership with end-users, and with the required stakeholders of integrated (different space and non space technologies) applications projects which demonstrate a potential for sustainable services.

Addressing global challenges in different thematic areas:

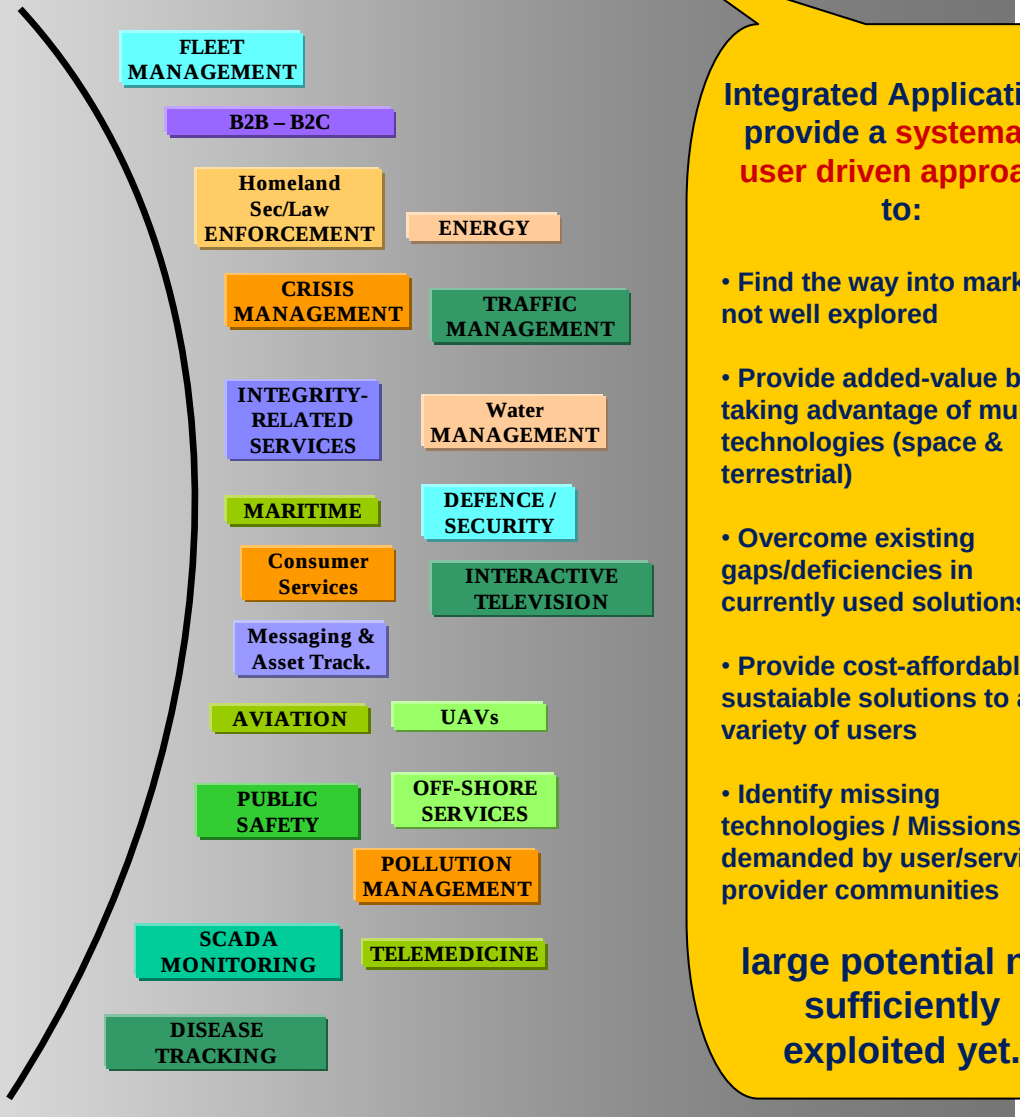
“Space 4 All”

Integrated Applications

Technological

Technology Enabled Applications

Integrated Applications



Integrated Applications provide a systematic user driven approach to:

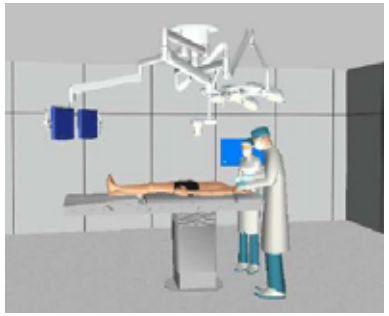
- Find the way into markets not well explored
- Provide added-value by taking advantage of multiple technologies (space & terrestrial)
- Overcome existing gaps/deficiencies in currently used solutions
- Provide cost-affordable sustaiable solutions to a variety of users
- Identify missing technologies / Missions demanded by user/service provider communities

large potential not sufficiently exploited yet.

The eight thematic areas of ARTES 3-4 Applications

Telemedicine/ Medical Education

- 29 Projects
- 22.8 MEUR (ESA part)



Satcom Networks Systems & Services

- 38 Projects
- 34.5MEUR (ESA part)

B2B / B2C

- 36 Projects
- 45.8 MEUR (ESA part)

Location Based Satcom Services

- 13 Projects
- 3.9 MEUR (ESA part)

Disaster Relief/ Emergency Management

- 9 Projects
- 3.3 MEUR (ESA part)

Community Information Services & Capacity Building

- 15 Projects
- 7.3 MEUR (ESA part)

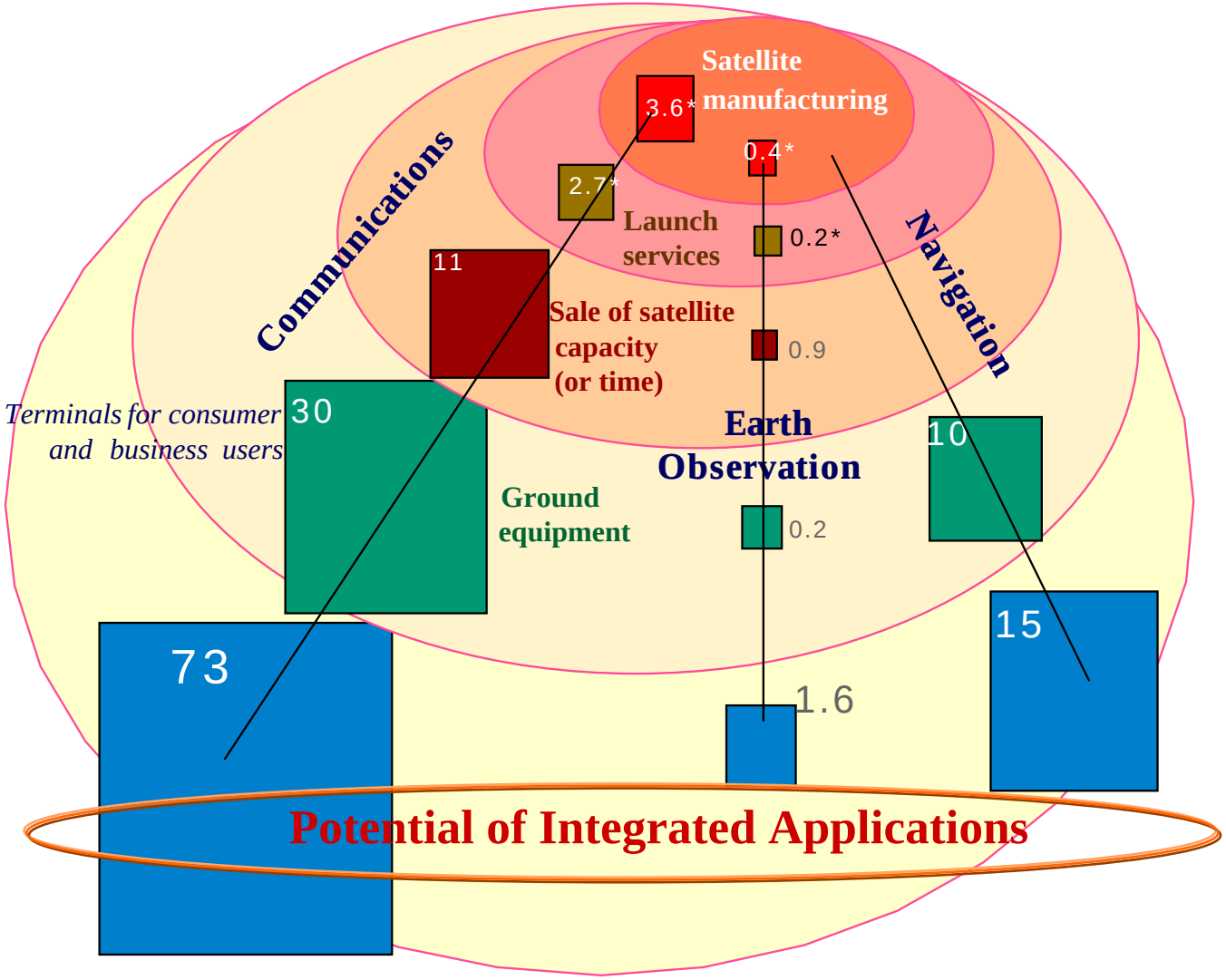
Distance Learning

- 11 Projects
- 6.3 MEUR (ESA part)

e-Government

- 2 Projects
- 2.0 MEUR (ESA part)

The three value chains in commercial satellite applications



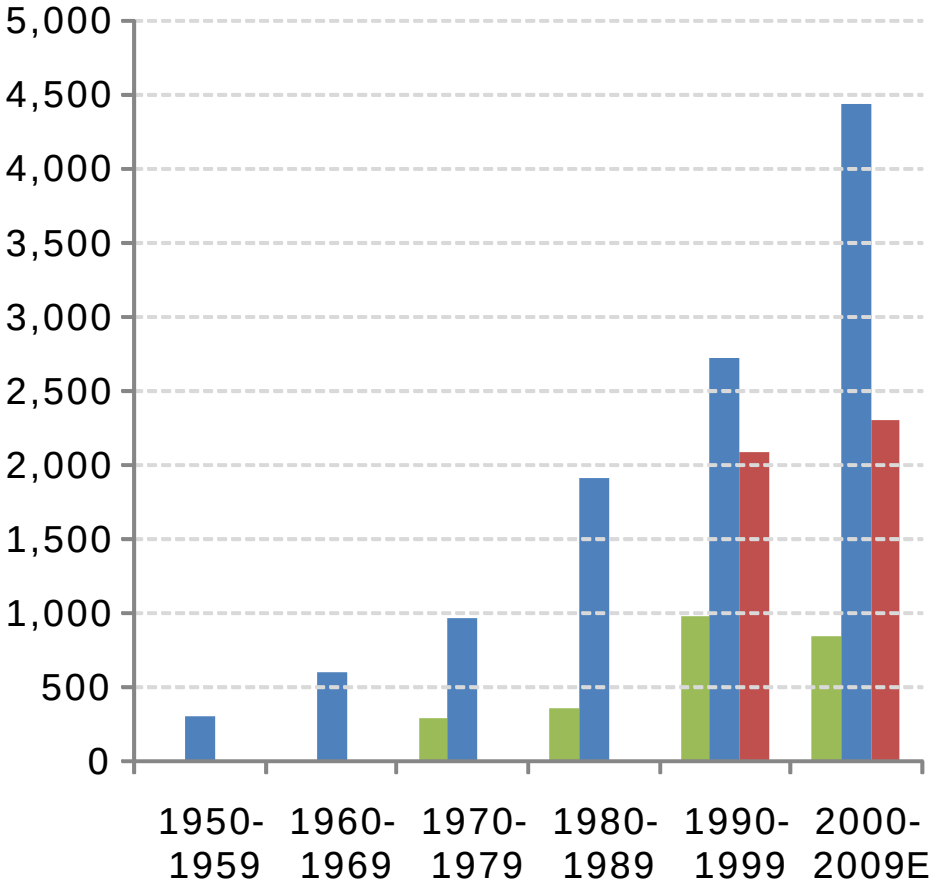
Value- Adding Services

Values for the year 2009 in billions of € (Satcom)

COURTESY OF Euroconsult

Disaster prevention & recovery
Sector overview & primary stakes

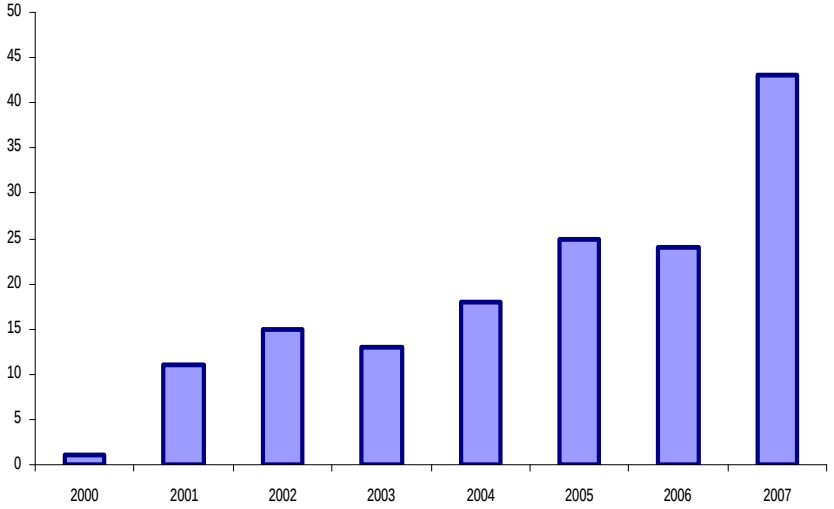
An increasing impact of disasters per decade



Source: ISDR, Euroconsult estimates

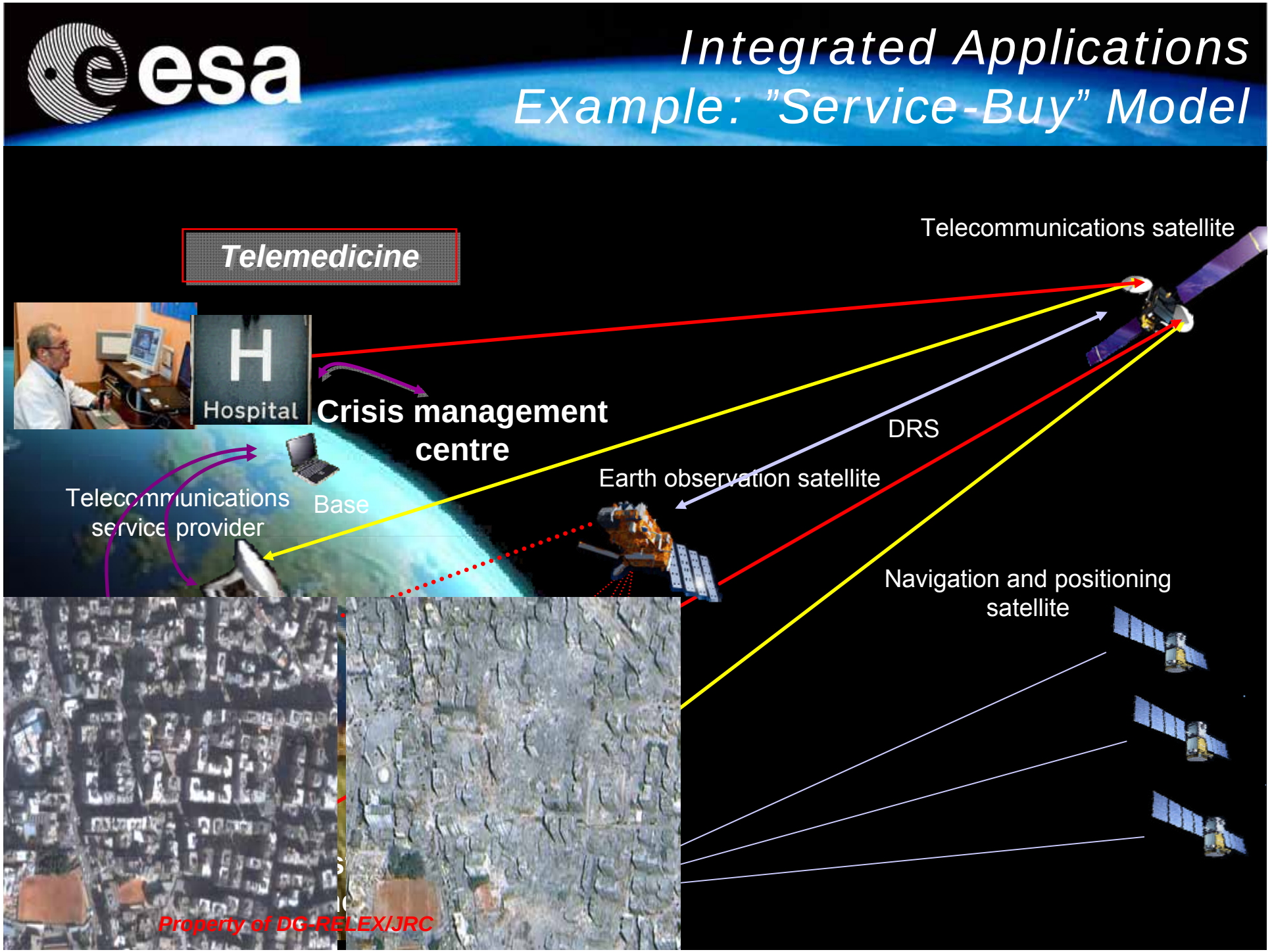
- Fast growing number of disasters reported in the different world regions
- Over 2 billion people impacted
- Economic damage over $500 billion

International Charter Activations by Year



Source: International Charter

Integrated Applications
Example: "Service-Buy" Model



Geographic and or Thematic AP representation

NO: AP for E-Health in inaccessible regions (by NST)

UK: AP for Enhanced mobility

AT: AP for Integrated Application in Central & Eastern European Countries (by ESPI)

FR: AP for Environmental Risks & Hazards in the Mediterranean Region (by Pôle Risques)

ES: AP for EU adoption of renewable energies (by CENER)

FI: AP for the Baltic Sea Region (in prep. Q2 2011)

CH: AP for alpine environment (in prep. Q3 2011)

IT: AP for maritime Security (in prep. Q3 2011)

GER: AP topic not yet fixed (in prep. Q4 2011)

Adis Ababa

Space Application & User Driven Missions

- The activities emanating from:
  - **IAP Preparation Phase**
  - **IAP WorkPlan 2009 (8)**
  - **IAP WorkPlan 2010 (15)**
  - **IAP WorkPlan 2011 (16)**
  - **ARTES 3- 4 Open Call**
  - **ARTES 21**
  - **3rd Party Funding**

- Cover wide thematic fields, *Space 4:*
  - ***Development, Knowledge***
  - ***Energy, Transport***
  - ***Fisheries, Agriculture***
  - ***Health***
  - ***Security & Safety***
  - ***Civil Protection, Crisis Management***
  - ***Arctic***

Climate ➔ Energy, Health …

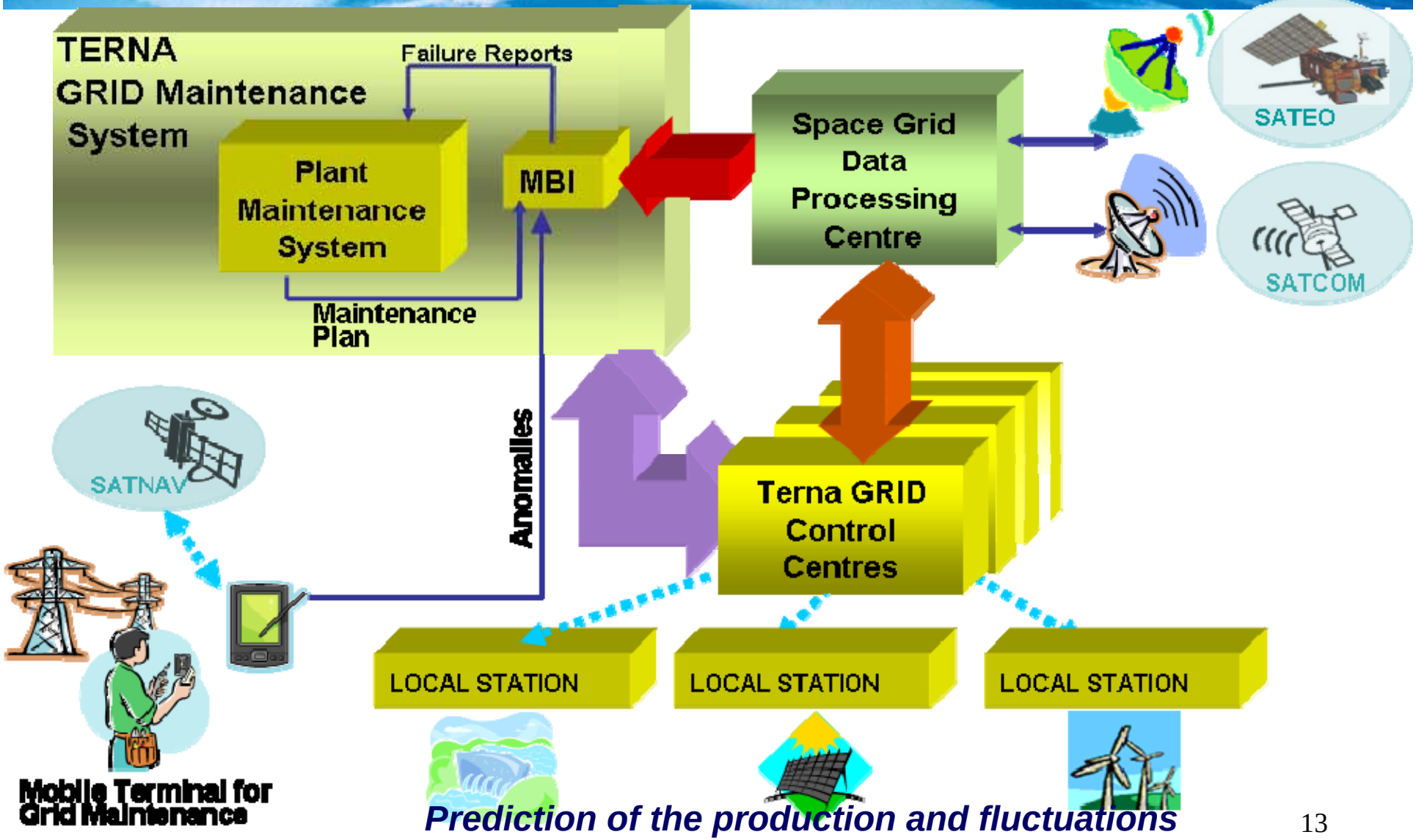
Nuclear Safeguard and Verification

IAP- Multi-Satellite Network

SpaceGrid Architecture

Theme: Energy

User: TERNA (I)



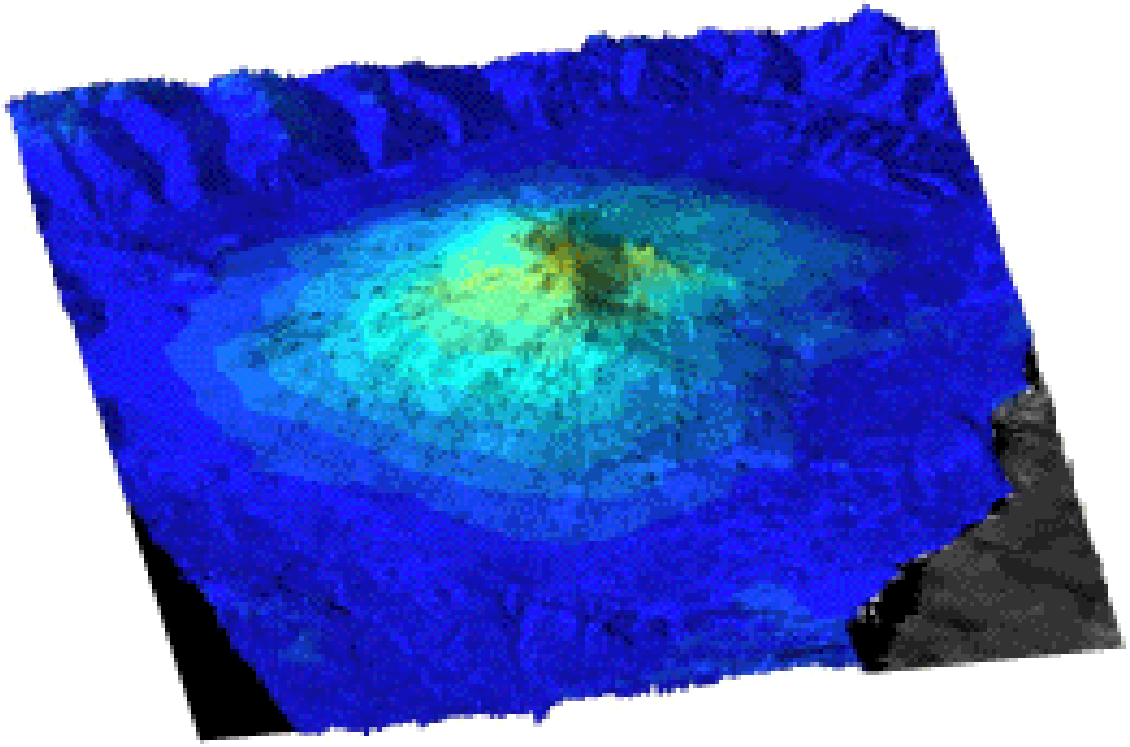
Prediction of the production and fluctuations of the Renewable Energy Sources (RES)

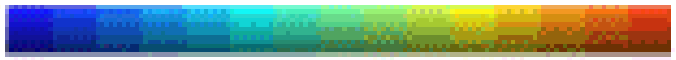
- Background:
  - Electricity generation from hydrological resources is essential in South America (up to 40 % of the total in some countries).
  - Current models, based on projections of previous years' measures, have deviations up to 60 %
  - Hydrological resources in South America are dependant on snow on the Andes mountains (isolated regions)

Laja basin (Chile)

- study:
  - Objective: to determine if space can help in the acquisition of data in isolated regions and on the overall improvement of resources in Chile.
  - Study includes:
    - consolidation of user requirements & state-of-the-art review
    - system and service design & proof of concept
    - viability analysis
    - roadmap for demonstration project

The Breathing of ETNA





0 range displacement 14 cm

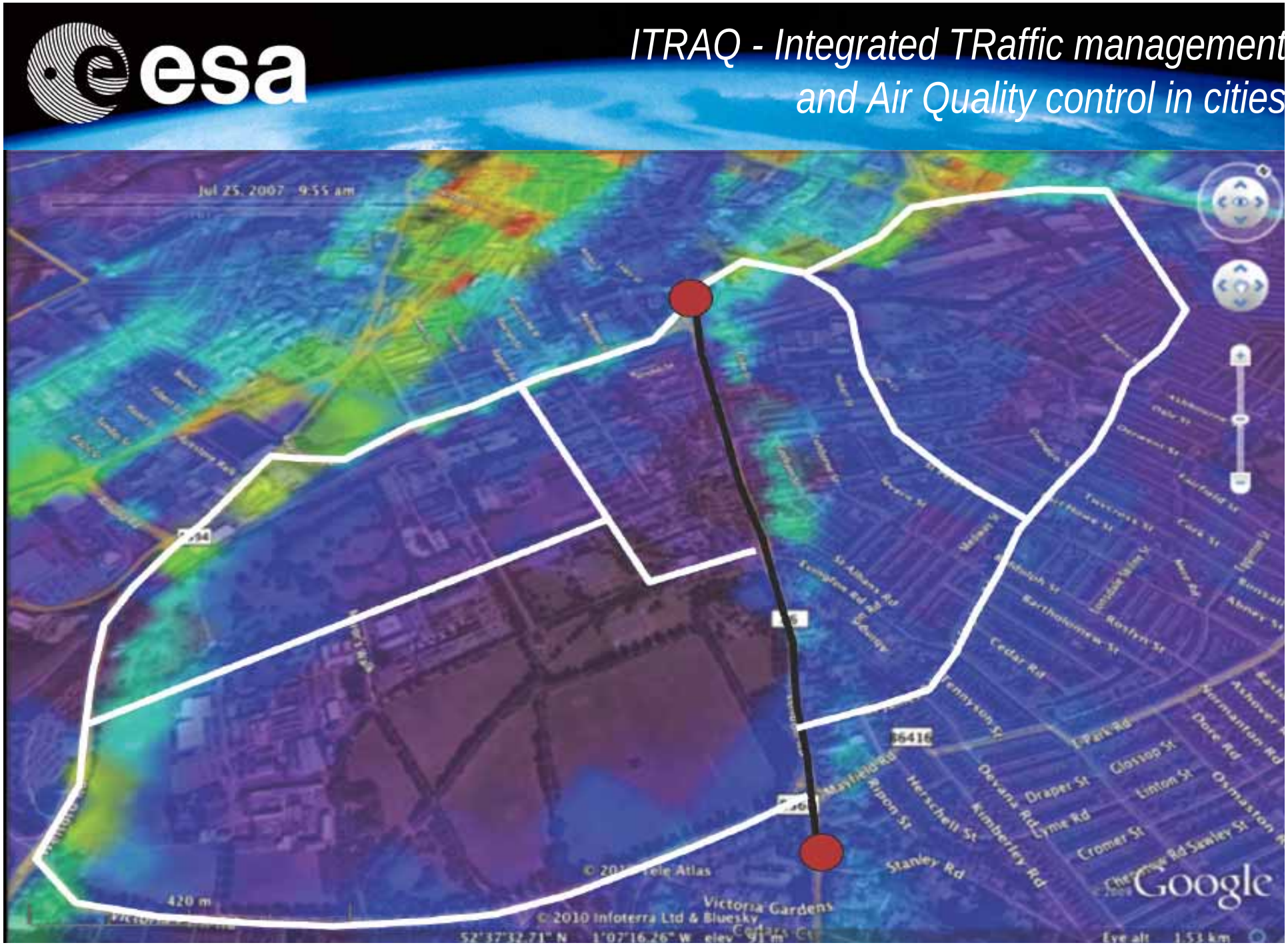
1992 year 2001

esa

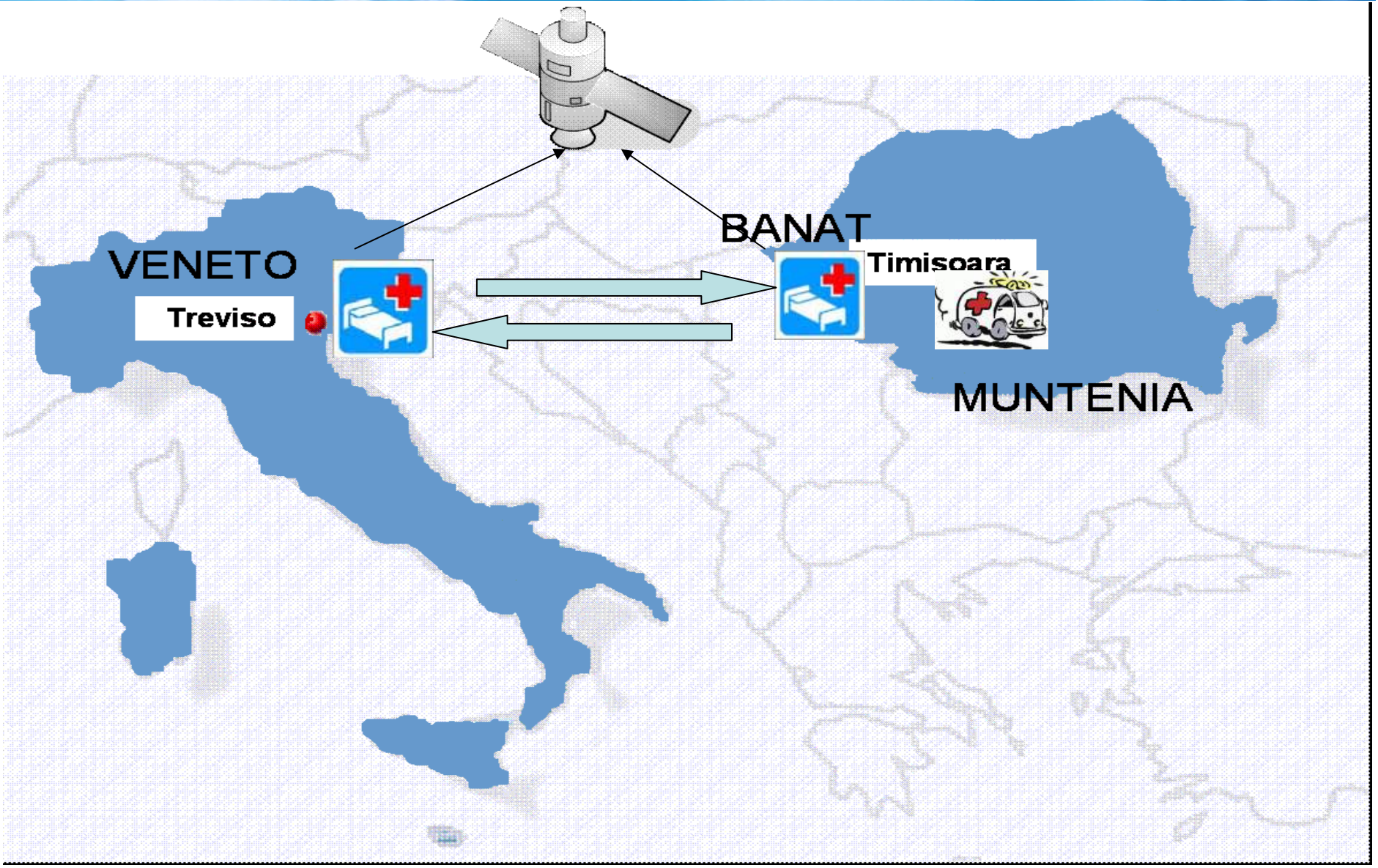
Integrated Application Promotion

Volcanic ash cloud monitoring

ITRAQ - Integrated TRaffic management and Air Quality control in cities



Italian – Rumanian PROJECT



T4MOD - Medical support in peacekeeping missions

Consultation, second opinion, training

Remote guiding

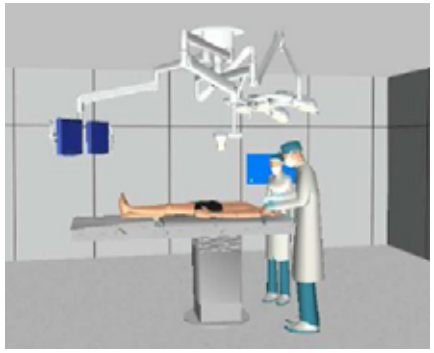


Image-based diagnosis

Project objectives:

to define, realise and validate a Telemedicine system capable to support remote assisted services (echography for F MoD, neurosurgery for D MoD) through an interoperable IP overlay satellite network

Remote manipulation

Remote maintenance

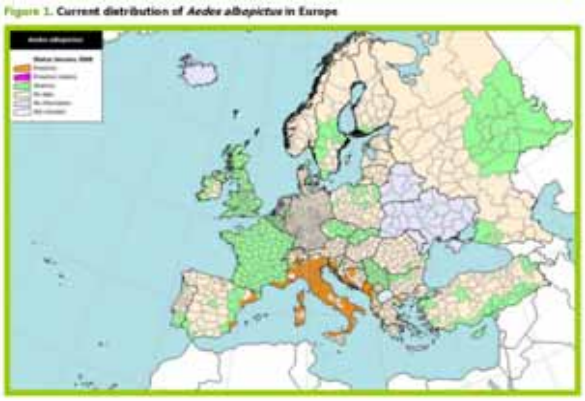
Medical Fields of interest:

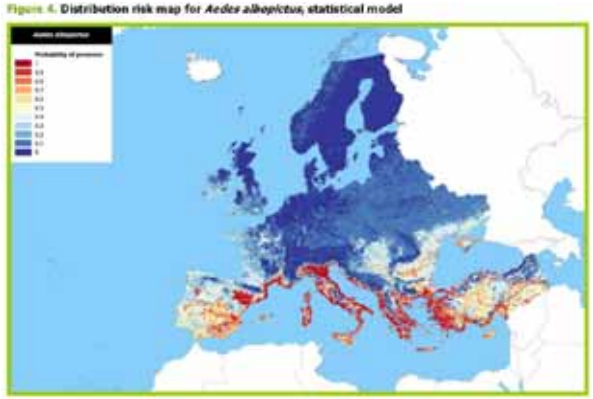
dermatology, ophthalmology, microbiology, haematology, orthopaedics, traumatology, anatomopathology, rtadiology (X-Ray / CT scan, US)

• Background

Aedes albopictus (Asian Tiger Mosquito), imported in 1979 from Asia to Europe, can transmit pathogens and viruses such as the West Nile virus, Yellow Fever virus, St. Louis Encephalitis, Dengue fever, and Chikungunya fever to name a few

Current distribution of *Aedes albopictus* in Europe and the Mediterranean basin





Risk map showing which areas are suitable for the establishment of the *Aedes albopictus*

➢ Chance for preventive measures, improvement of information services, and support to health authorities

Tracking Pharmaceuticals in Remote Regions

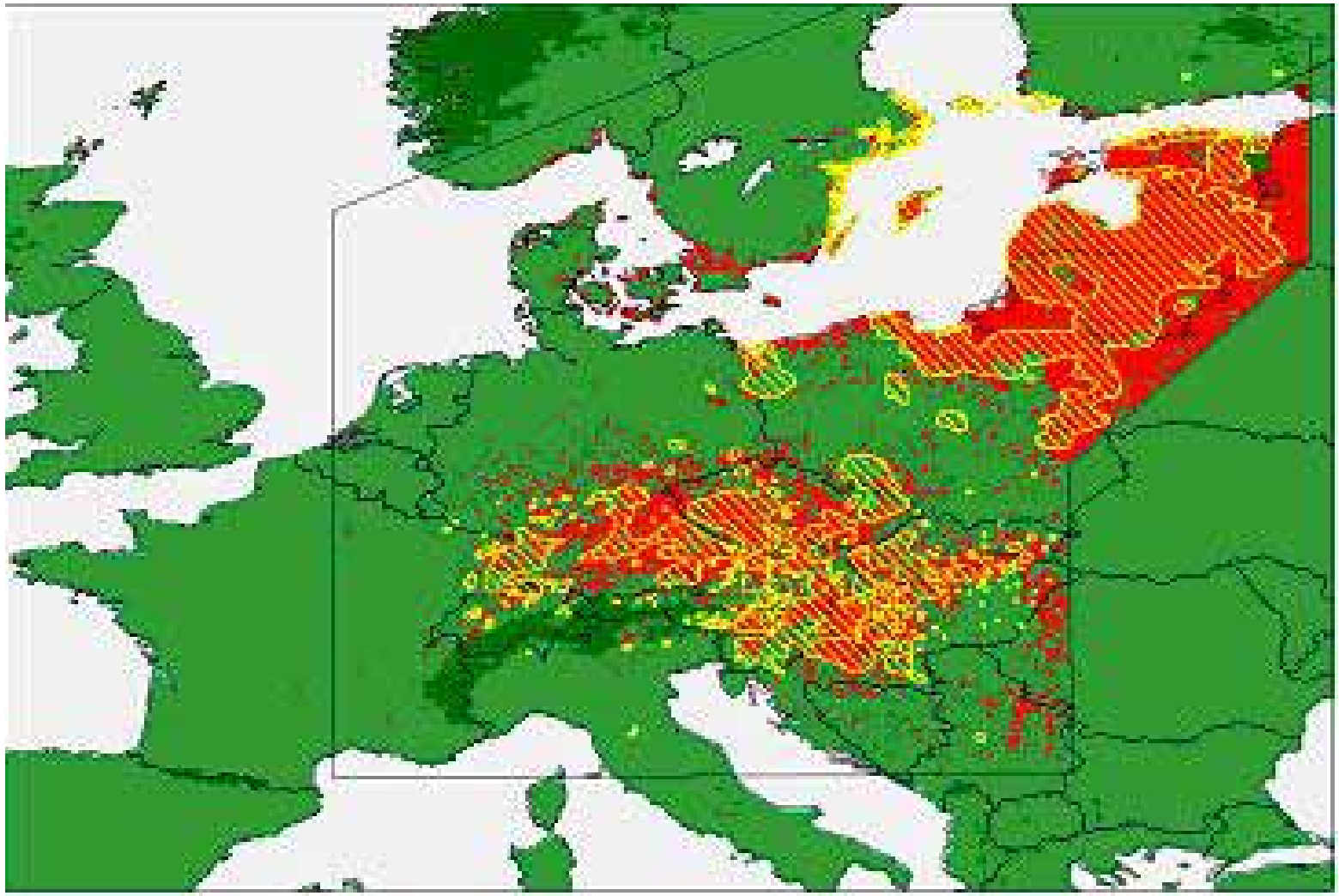
Theme: Health

- Background
  - Effective distribution of medicine in poor and developing countries is paramount for improving healthcare
  - In recent years pharmaceutical companies have developed programs to assist the cheap supply of vital medicines to such countries
  - Some major problems hinder this supply of medicine:

- Poor security – medicine is often hijacked and diverted illicitly
- Counterfeit medicines are a very significant threat to life in the developing world, with often devastating consequences
- There are major gaps in monitoring the supply chain in developing countries particularly with respect to remote or hazardous regions
- Lack of environmental control of pharmaceuticals in storage and transit could also contribute to the quality of the products, and result in waste or hazardous use of damaged materials

Disease risk map illustration

From “Observation” to “Prediction” (vaccine producers e.g. Baxter)



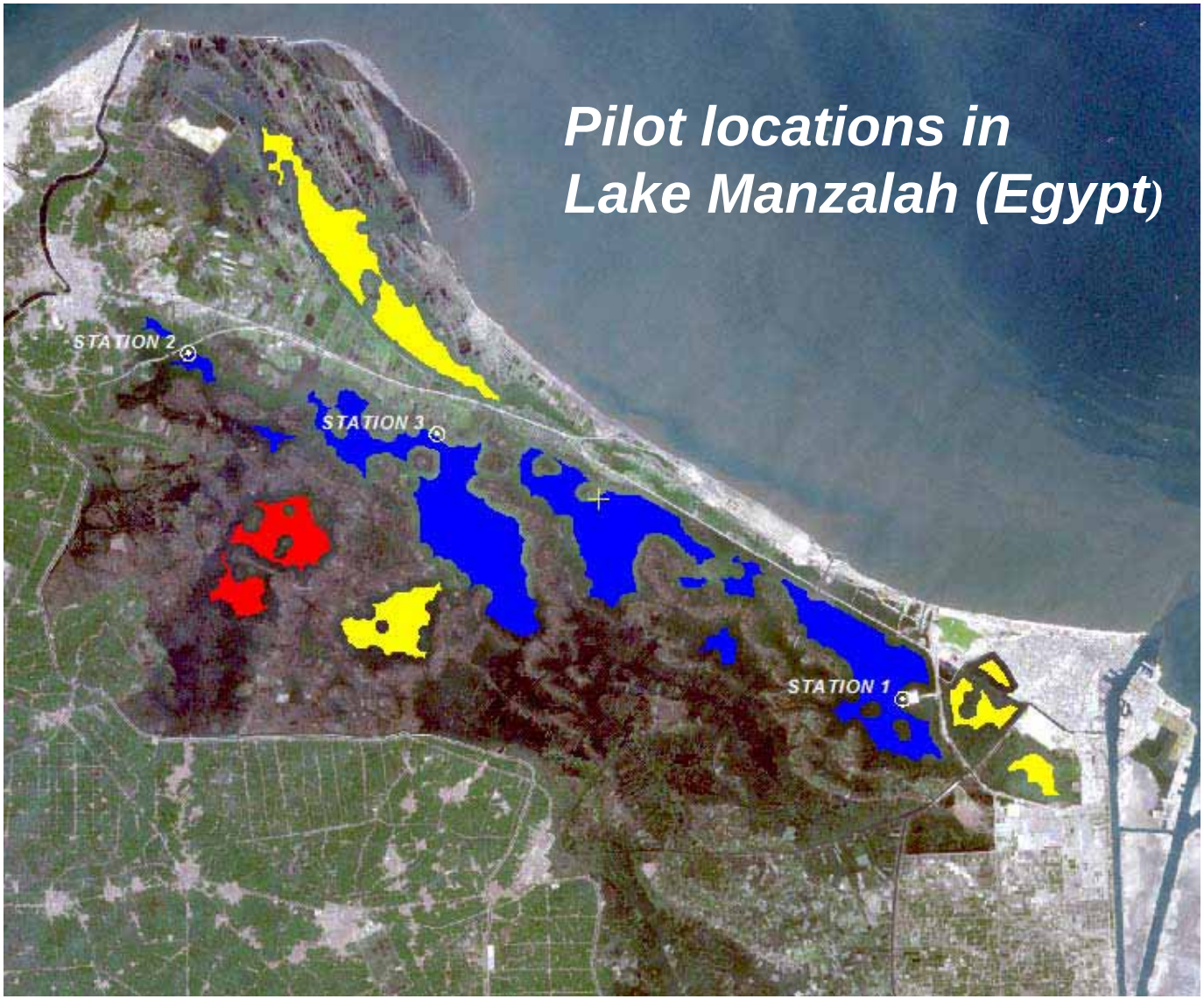
Observed (yellow) and Predicted (red) TBE in Europe, (Randolph and Rogers).

Water quality monitoring in Egypt

Theme: Development

Consortium :

- *C-CORE (Cnd) - Prime*
- *Water Resources Management Division (WRMD) (Fi)*
- *Finnish Environment Institute (SYKE) (Fi)*
- *Finnish Meteorological Institute (FMI) (Fi)*
- *Helsinki University of Technology (TKK) (Fi)*
- *GKSS*
- *Drainage Research Institute (DRI) (Egypt)*



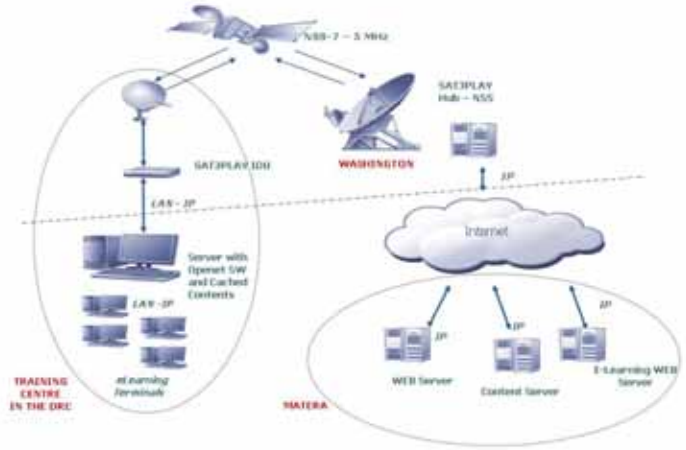
PIMS: Pipeline Integrity Monitoring
Theme: Safety

- Background:
  - **Today, gas and oil operators are requested to put in place a pipeline integrity management systems (PIMS) in order to prevent**
    - **Interruption of supply**
    - **Accidents and casualties,**
    - **Damage to the environment**
    - **Damage the image of the stakeholders.**
  - Most of the incidents are due to third party interventions, scavenging of the transported products

Pipeline in-situ instrumentation

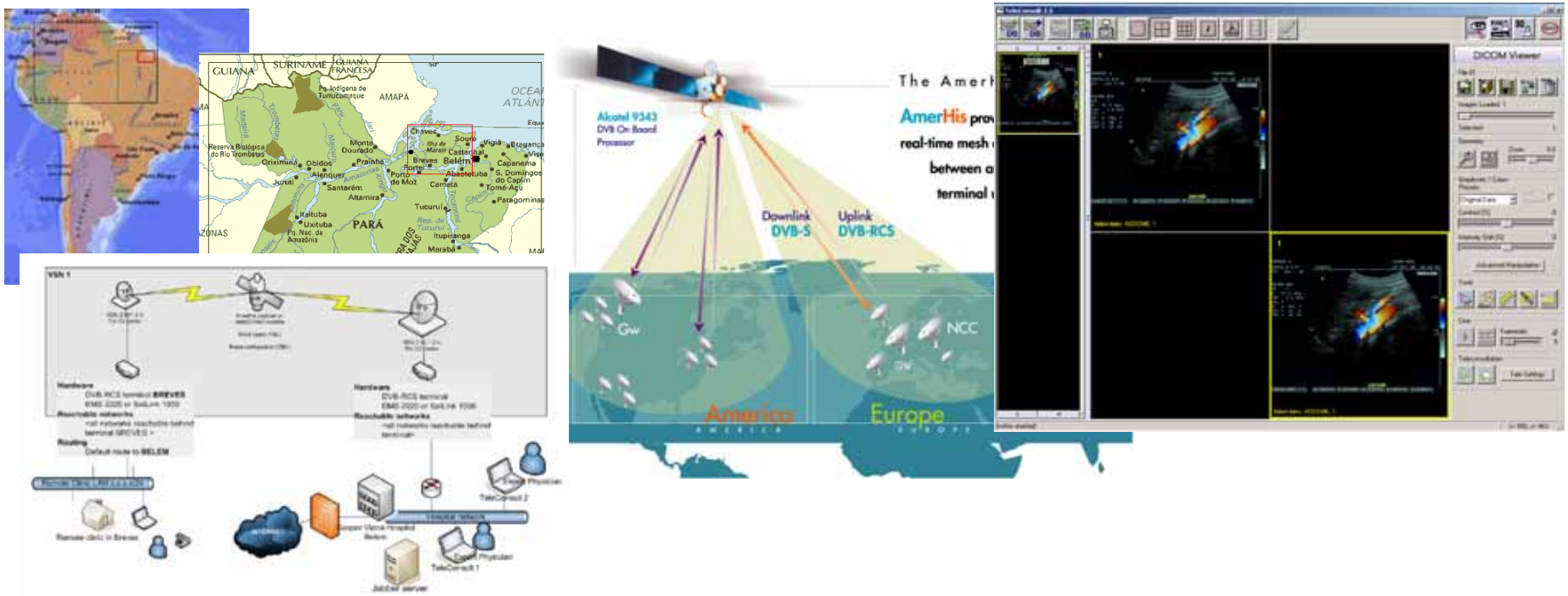
  - Current inspection is costly and hazardous: in-situ inspections by technicians, low-flying helicopters.
  - Operators have the ambition to benefit from new PIMS technologies
    - feature extraction algorithms
    - aerial spectrometers
    - automated processing and integration into a GIS environment
    - WiFi sensor networks.
  - These are to be combined with space assets to:
    - seamlessly integrate existing and novel real-time services
    - to detect problems easier and earlier, more continuous, reducing efforts, downtime, hazard and cost.

Electoral Assistance in Congo: SatElections



- **eLearning for Effective Electoral Assistance and Electronic Voting**
  - **In cooperation with the Task Force of UNDP-EC-IDEA on Electoral Assistance and the Independent Electoral Commission of the Democratic Republic of Congo (DRC)**
  - **Development of eLearning for administration staff and voting**
  - **Adoption of European Sat3Play technology to demonstrate through a real case pilot phase the provision of an effective, sustainable and scalable solution in support of African electoral cycles**
  - **Involvement of industrial and institutional actors from Belgium, Italy and Luxembourg**

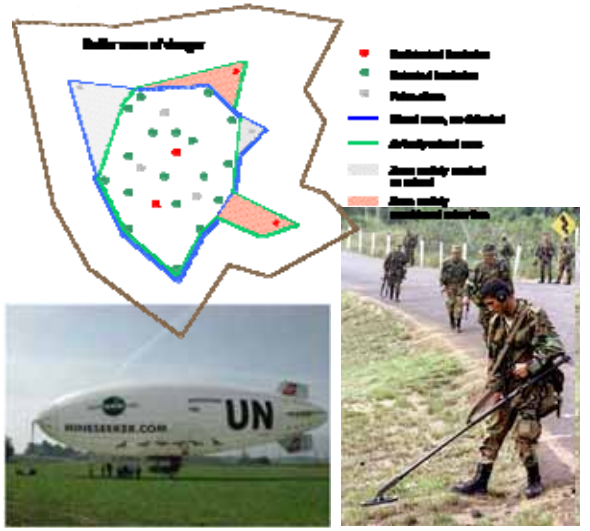
Telemedicine in Amazonas: T@HIS

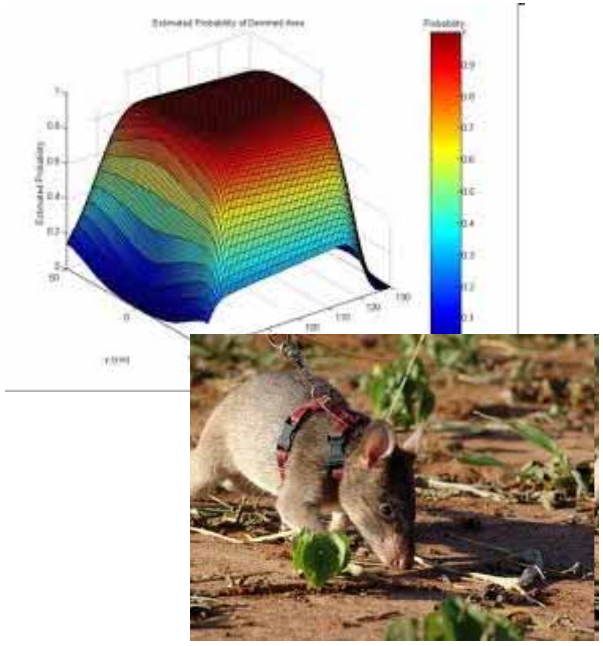


- **A Telemedicine system for remote clinics:**
  - **Reference Hospital: Bélem, 3 Remote Hospitals: Breves, Portel, Gurupá. Coordinated by TAS Spain (E)**
  - **First Opinion and Second Opinion**
  - **Evolution: Availability “Doctor Always On”, interconnection with other T@lemed network,**
  - **Multicast capabilities of the system for training of the doctors: from Brazil and from Europe**

Space Assets for Demining Assistance (Safety)

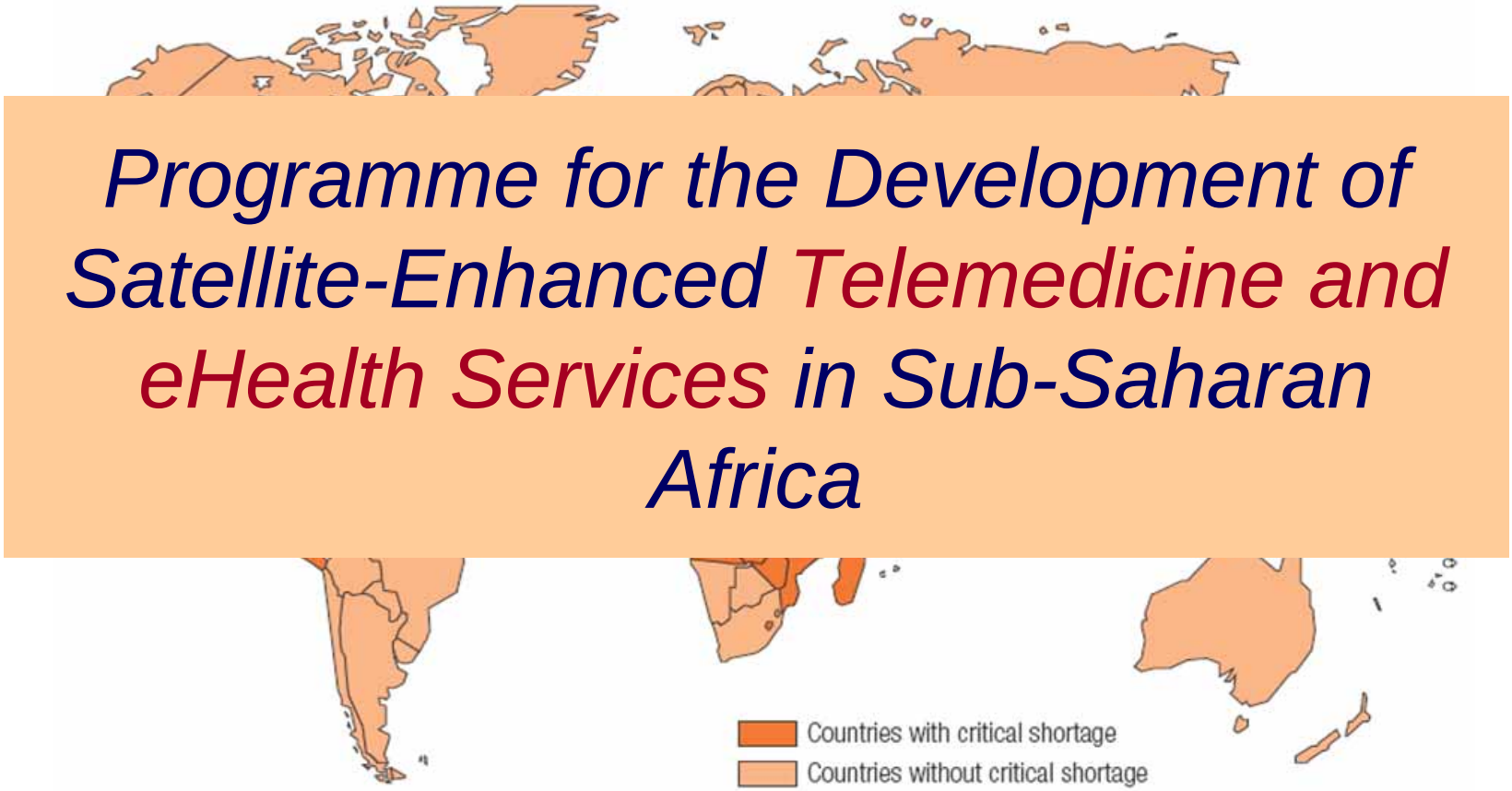
- **Background:**
  - **The UN estimates that approximately 110 million land mines are presently scattered in about 70 countries;**
  - **Mines claim between 15,000 and 20,000 new victims in countries that suffered war recently.**
  - **Resources (arable land, infrastructure, water, etc) located within areas suspected of mine contamination cannot be exploited**





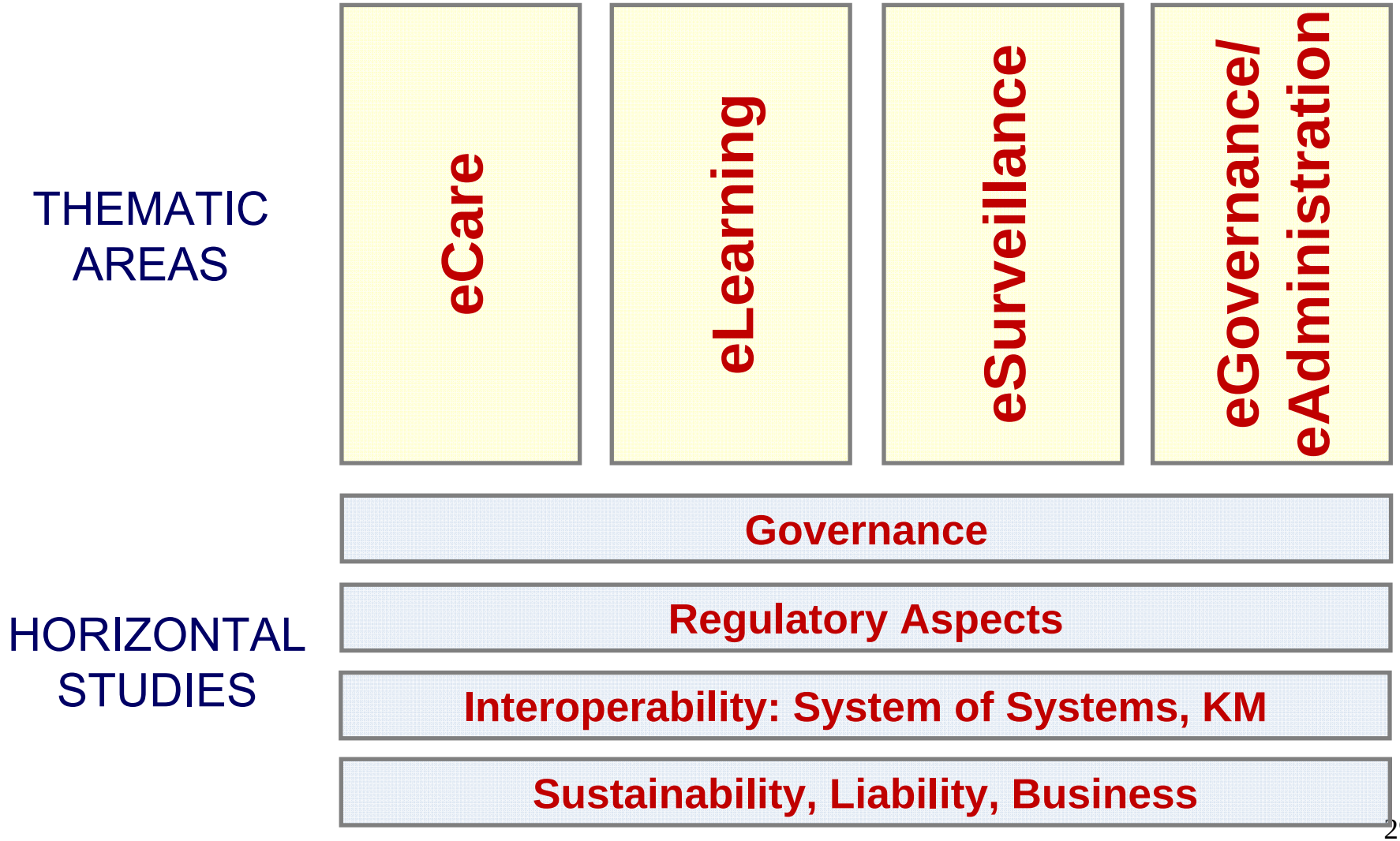
- ***Added-value of meteorological information:*** **Conditions such as soil moisture, humidity or temperature derived from meteorological satellites help to find out what tool/methodology is the most appropriate and where to use it.**
- ***Other space assets:***
  - **GNSS is used for field survey work, precise ground referencing and tools positioning.**
  - **Satcom will be of help if the area under survey is located in a remote region**

Countries with a critical shortage of health workers (doctors, nurses and midwives)



Programme for the Development of Satellite-Enhanced Telemedicine and eHealth Services in Sub-Saharan Africa

Millennium Development Goals (MDGs) and counteracting Health workforce crisis


THEMATIC AREAS
eCare
eLearning
eSurveillance
eGovernance/ eAdministration
HORIZONTAL STUDIES
Governance
Regulatory Aspects
Interoperability: System of Systems, KM
Sustainability, Liability, Business

Flight Safety

GAF (1997-2004): 360 collisions strikes/year
FAF (1998-2005): 320 collisions strikes/year
RAF(<2004): 110 documented serious accidents

Estimated conservative cost due to damage and delays of commercial aircraft worldwide
1.2 billion USD per year

ARMÉE DE L'AIR

DEFENCE
PEACE OUR PRIORITY

Birds and Flight Safety

July 15 1996 a Belgian C-130 crashed at Eindhoven Air Base due to a bird strike. 34 people were killed and 7 people were seriously injured.

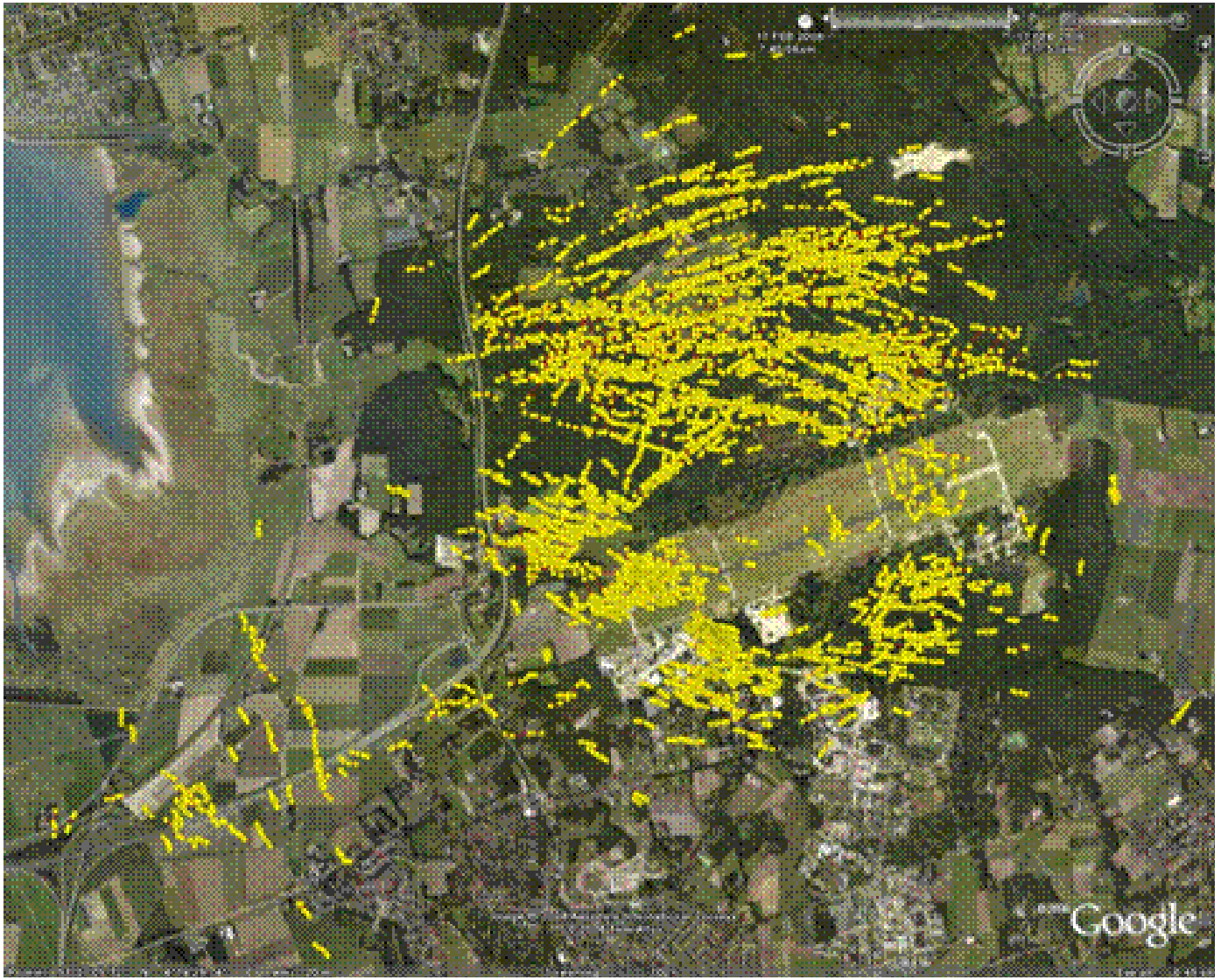
FlySafe Intermediate Results

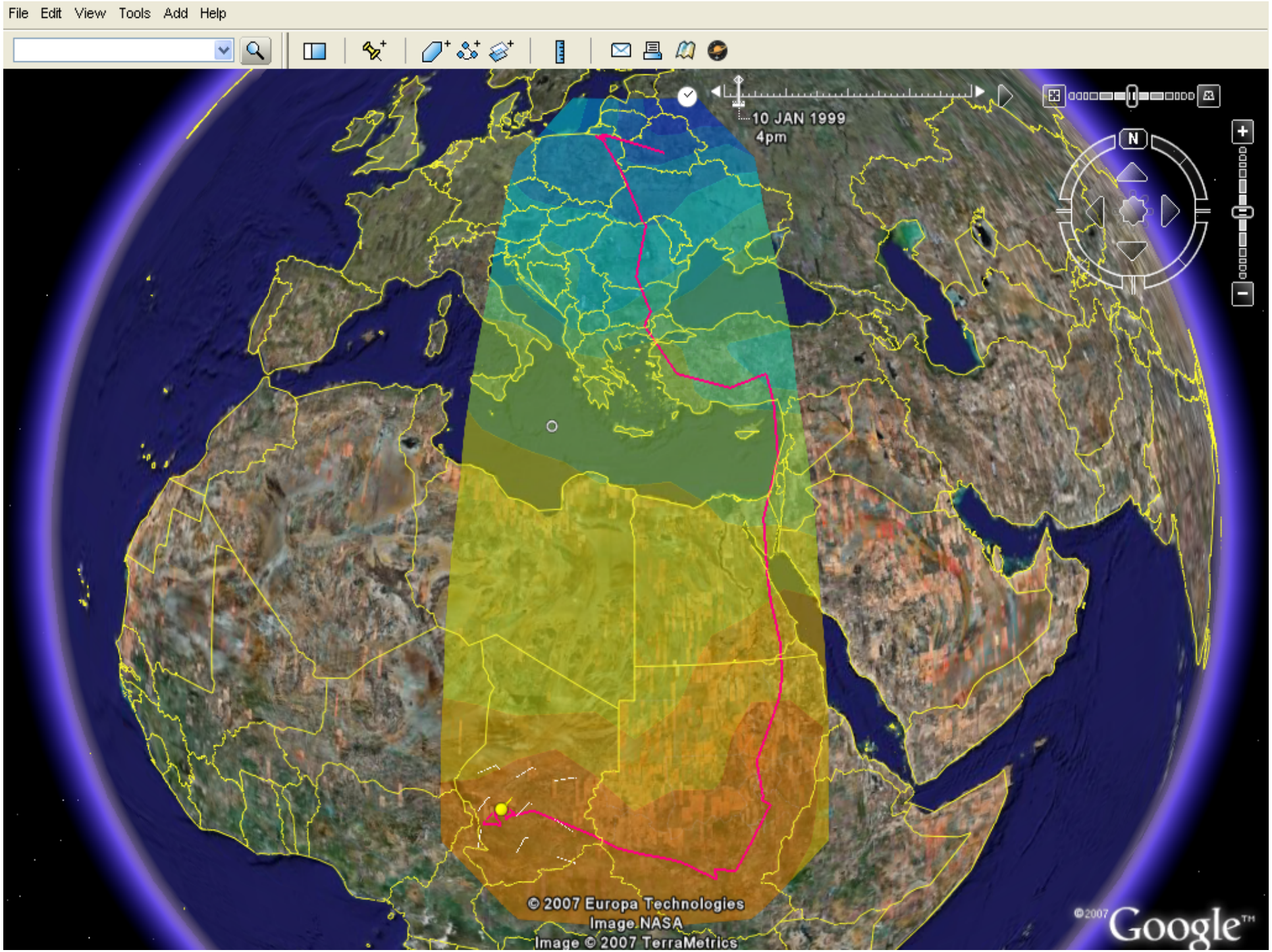
"It's just to let you all know that FlySafe is really able to do spectacular things"

Example: Gulls movement Woensdrecht Airbase, NL

Night of Feb.20th 2008

(photo RNLAF).

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FLYSAFE Web Service

The FlySafe Bird Avoidance Model - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://public.flysafe.sara.nl/bambas/migration/index.php?radar=glons&subwindow=nw

Web Search Bookmarks Settings Get IE8 now! Translate Page Mail My Yahoo! Answers Games Anti-Spy

esa **The FlySafe Bird Avoidance Model**

European Space Agency

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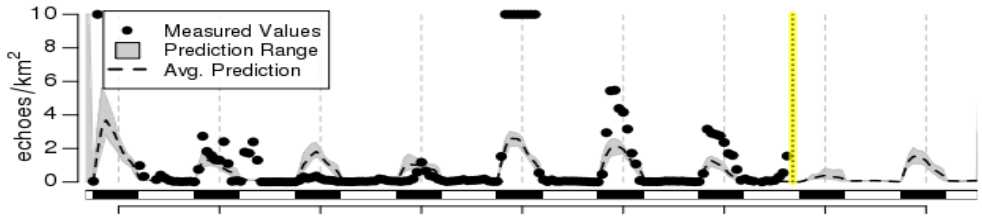
Welcome to the FlySafe bird migration prediction module

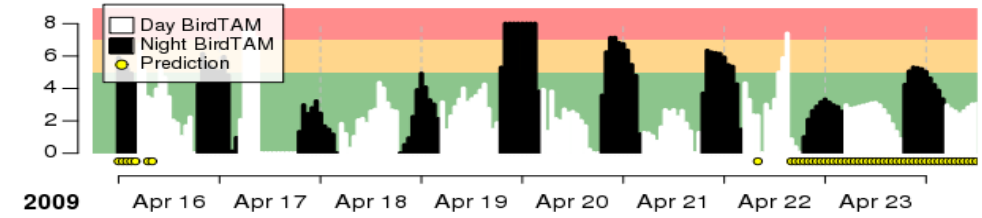
This page provides a 72-hour forecast of bird migration intensity for the **Central Belgium** location. The predictions are provided in two formats. The **Hourly predicted and measured migration intensity** plot shows the measured bird density values in bird echoes/km^2 (black dots) as well as the mean predicted bird density (dashed line) and prediction range (gray). The prediction range is produced by an ensemble forecast of ~50 models. The **Hourly BirdTAM Intensity** plot shows the bird densities converted to BirdTAM warning levels for pilots from seven days in the past and three days into the future. If the measured value is available, the BirdTAM intensity reflects that measured value. If no measurement is available, the mean bird migration density prediction is used (indicated by small yellow circle).

These predictions are made using the European Centre for Medium Range Weather Forecast Deterministic Model. The most important weather variables in the predictions are visualized in the plots on the right. Wind speed and direction at multiple pressure heights in the top plot. The tails point in the direction FROM which the wind is coming, and the barbs indicate the speed of the wind. Following plots are surface pressure (hPa), hourly precipitation (mm) as well as the percentage of cloud cover. Cloud cover is given in both a **lower** and **total** component. The final plot provides temperature (deg).

Hourly predicted and measured migration intensity

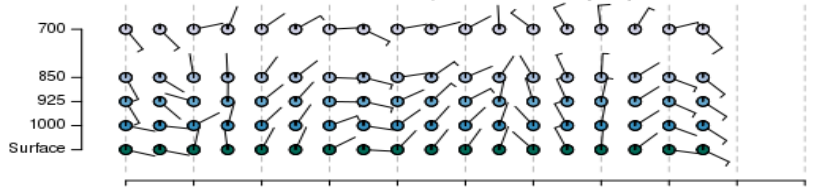


Hourly BirdTAM Intensity

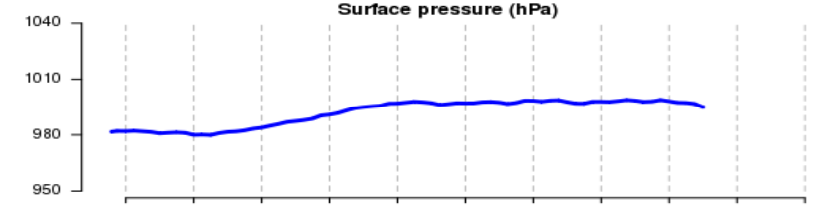


Location: Central Belgium,Last modified: Wed Apr 22 2009, 6:18 pm,Next run: Wed Apr 22 2009, 6:48 pm

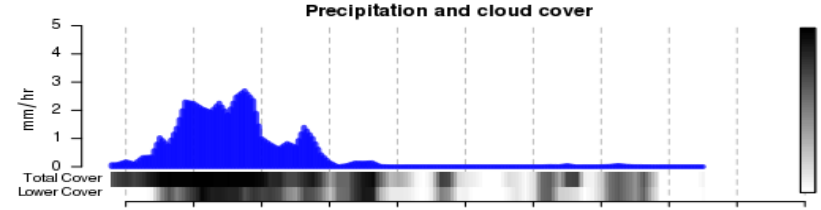
Wind at different pressure levels (hPa)



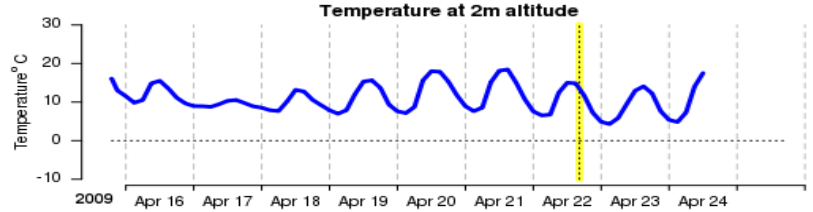
Surface pressure (hPa)



Precipitation and cloud cover



Temperature at 2m altitude



Last modified: Wed Apr 22 2009, 6:17 pm,Next run: Wed Apr 22 2009, 6:47 pm

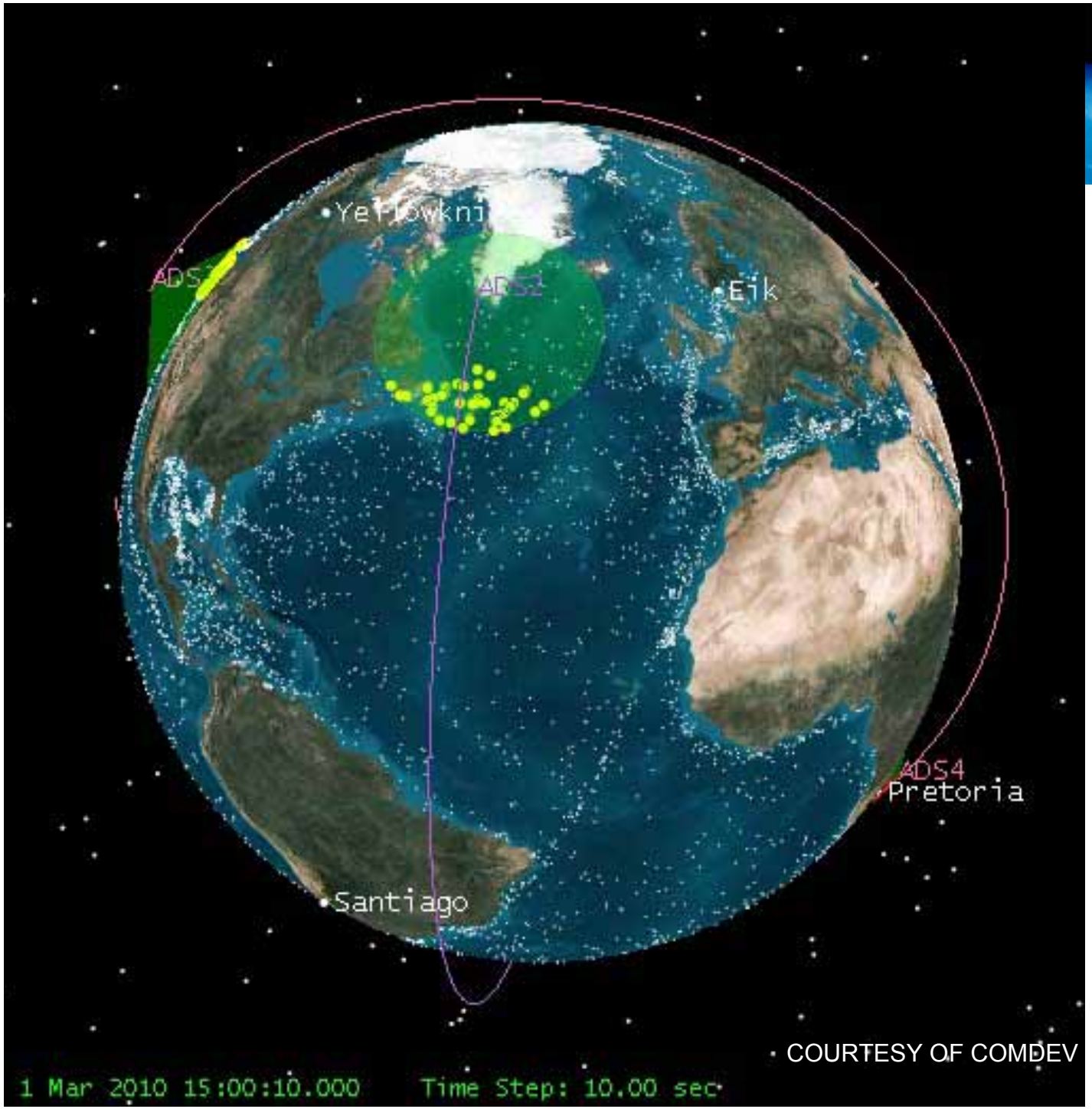
Koninklijke Luchtmacht

sara

Anticipation of Birds Crossing the Airport

Users Driven
European Satellite AIS Mission

Sour… …yman & McDaniel/Cargo… …com, International Salvage Union, 2003



SAT-AIS Programme

DG-MARE / ESA

Joint

Action Team

&

European

Steering group:

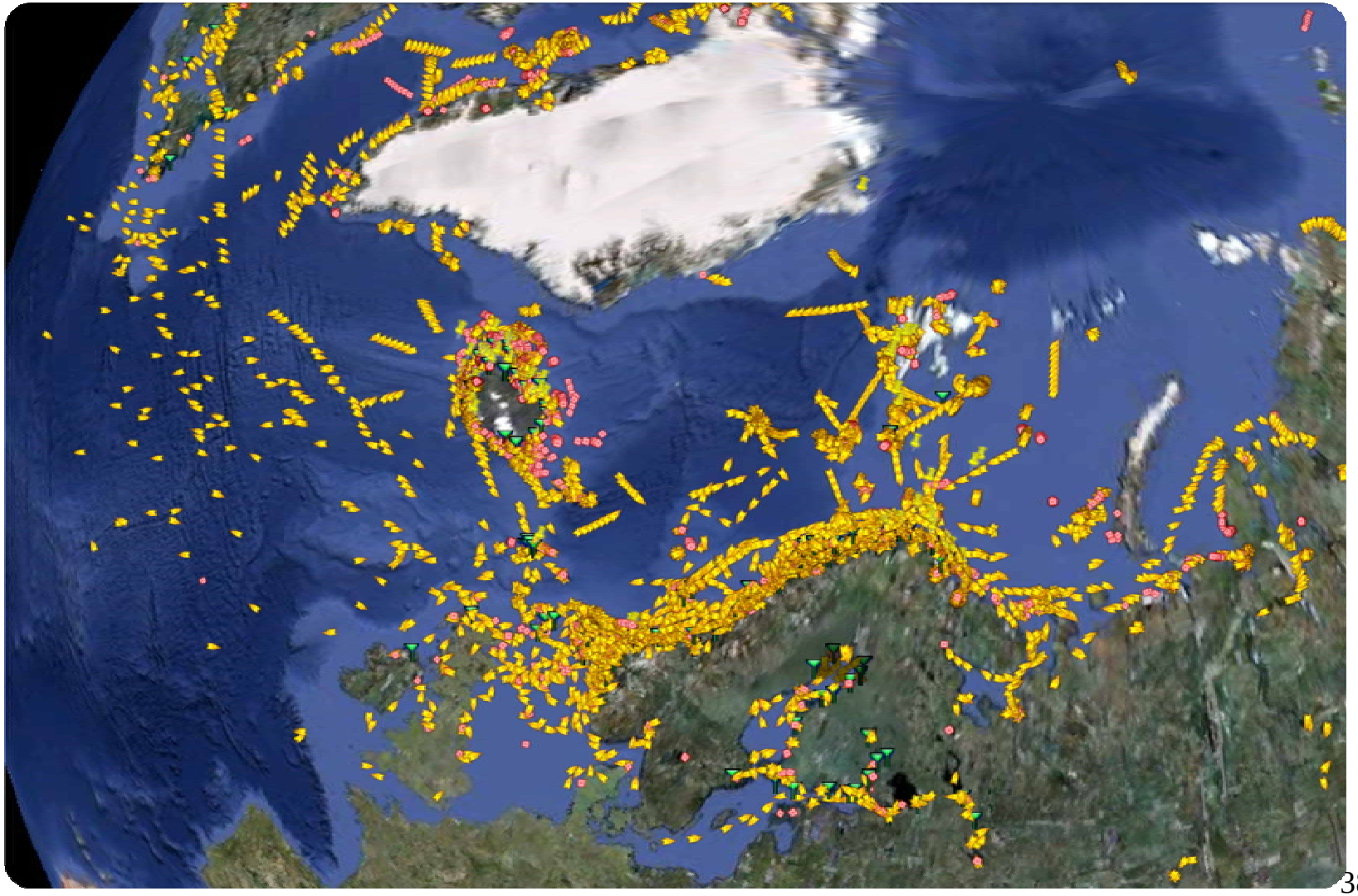
EC DGs (Mare, ENV, TREN, JLS, INFSO, TAXUD, ENTR, JRC) FRONTEX, EDA,

&

EMSA / ESA

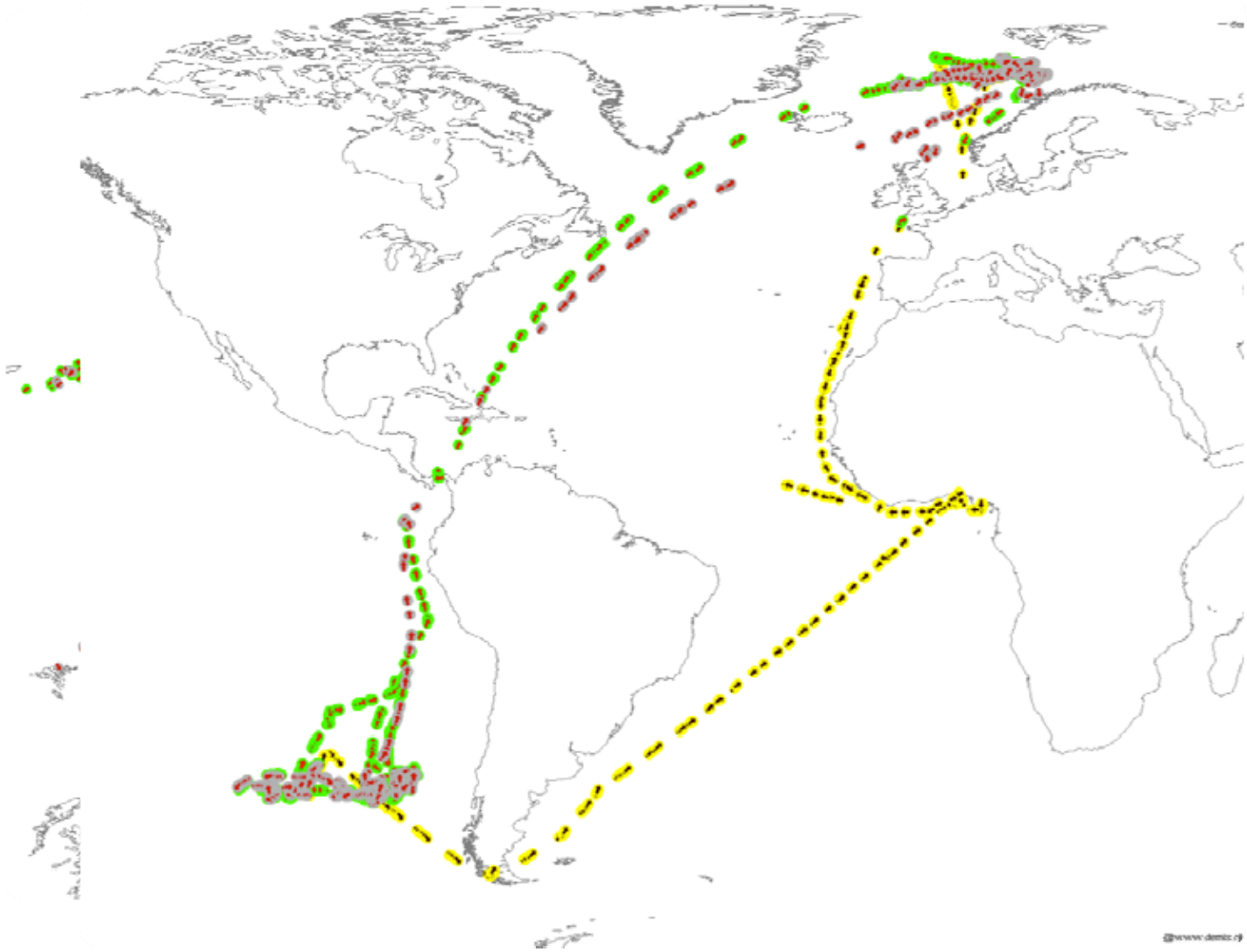
Partnership

AISSat-1 Data from 10 Consecutive Passes



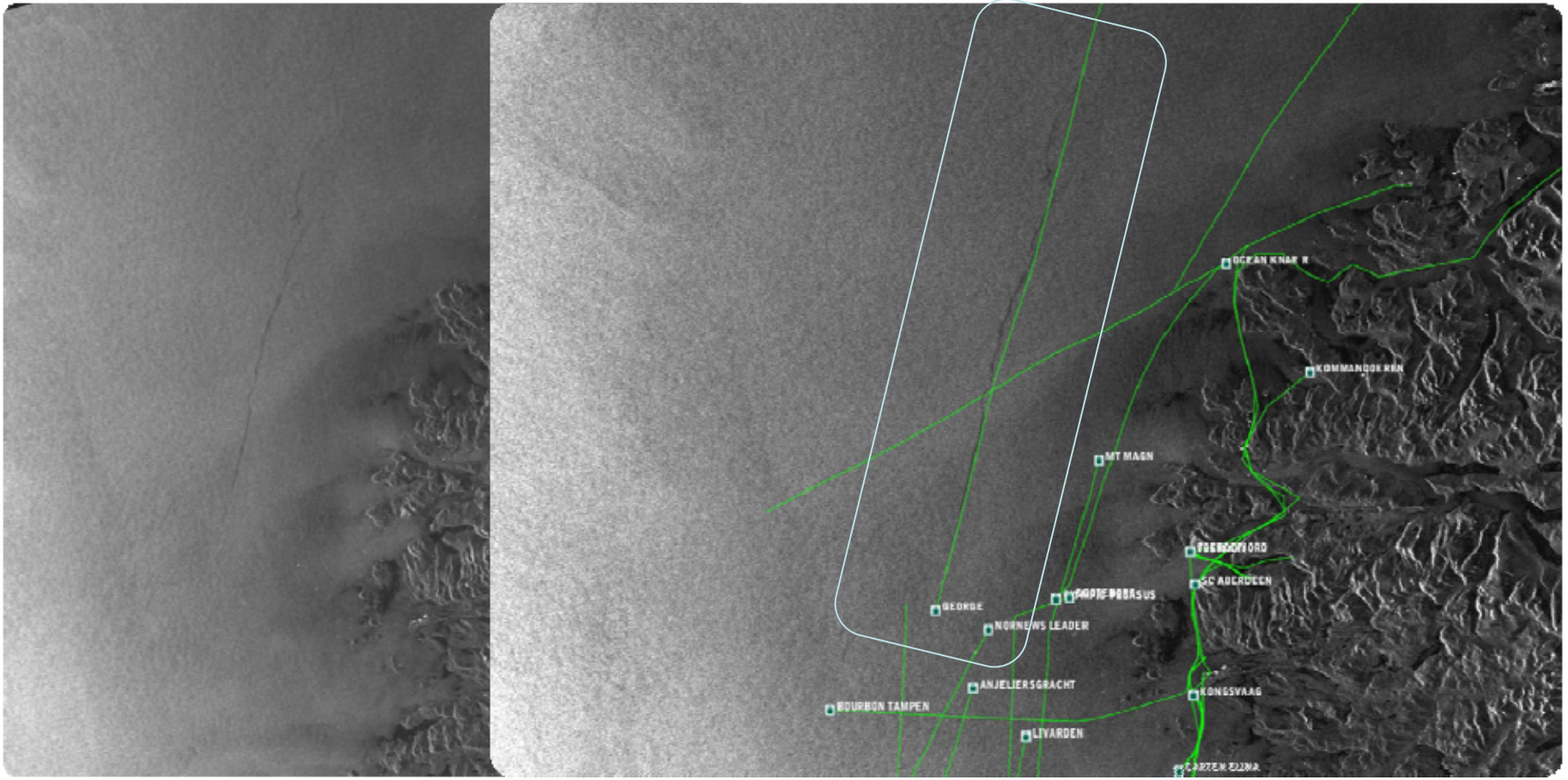
COURTESY OF Norwegian Space Centre

Ship tracking world wide

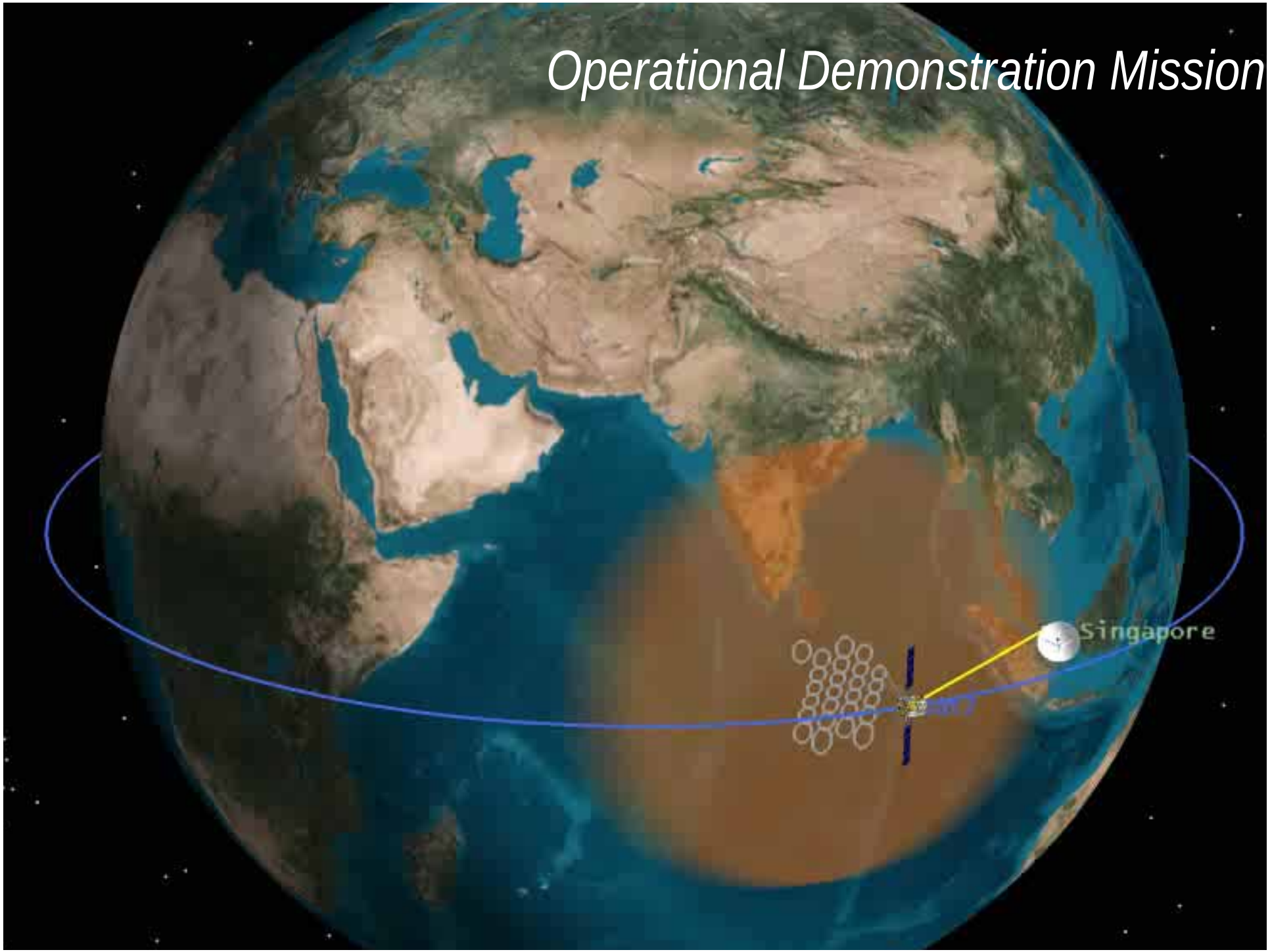


COURTESY OF Norwegian Space Centre

Integration: SAR, Sat-Nav & Satellite AIS data

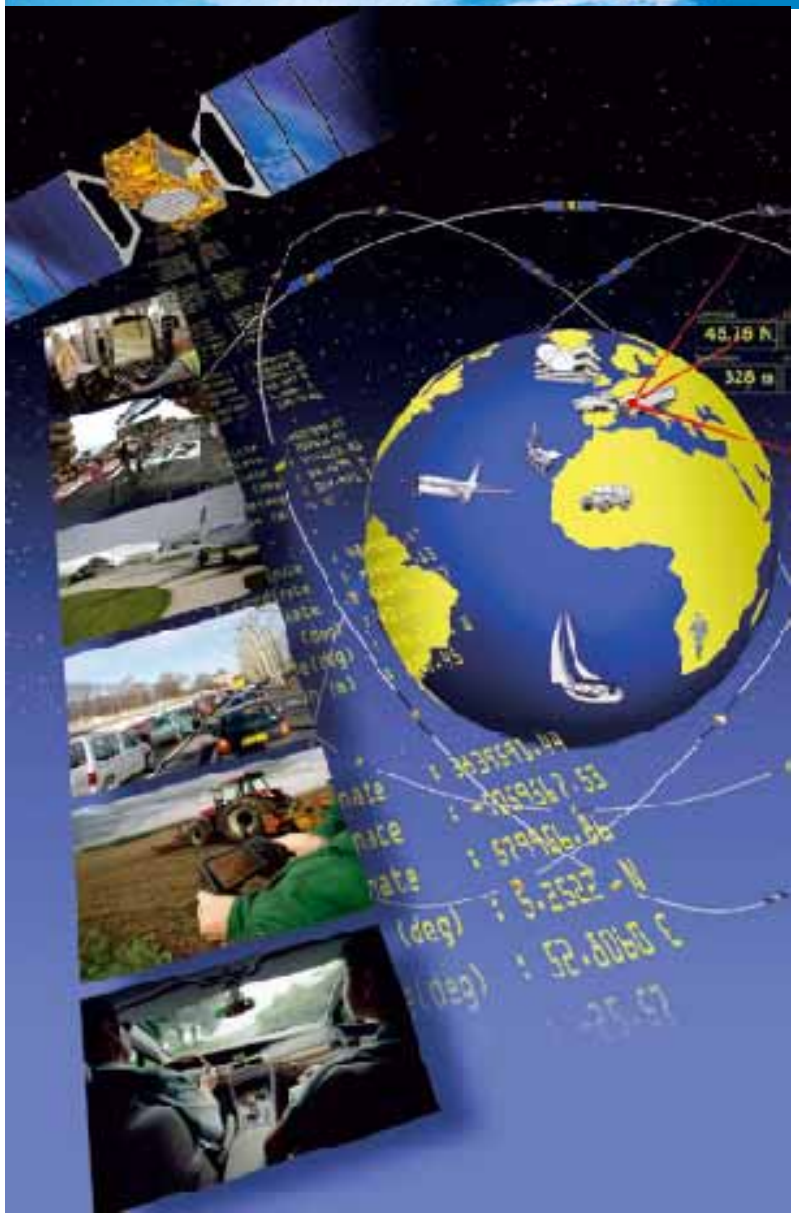


COURTESY OF Norwegian Space Centre


Operational Demonstration Mission
Singapore

Conclusions

- **Main growth in the value chain : Ground Systems and Applications**
- **Increase automation and distant management**
- **Support the development and optimization of infrastructure, logistics & resources**
- **Optimize reactivity in case of emergency**
- **Guarantee security of personnel and sensitive equipment, globally**



Open Call, June 15th 2009, IAP web portal: http://iap.esa.int

Thank you!