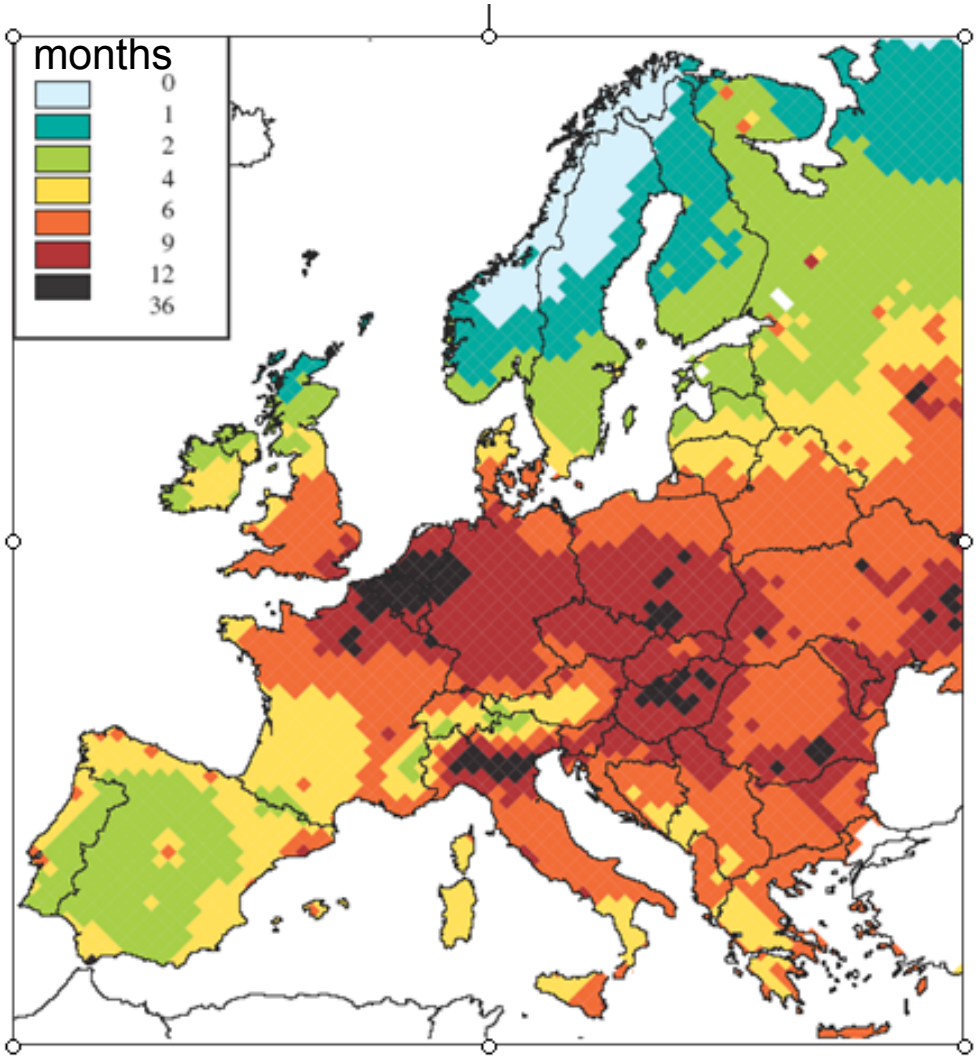
Major Achievements in Air Quality Service

الرئاسة العامة للأرصاد وحماية البيئة
PRESIDENCY OF METEOROLOGY AND ENVIRONMENT
(PME)

Air Quality Training at PME by DLR
November 2009

Loss in life expectancy due to particulate matter

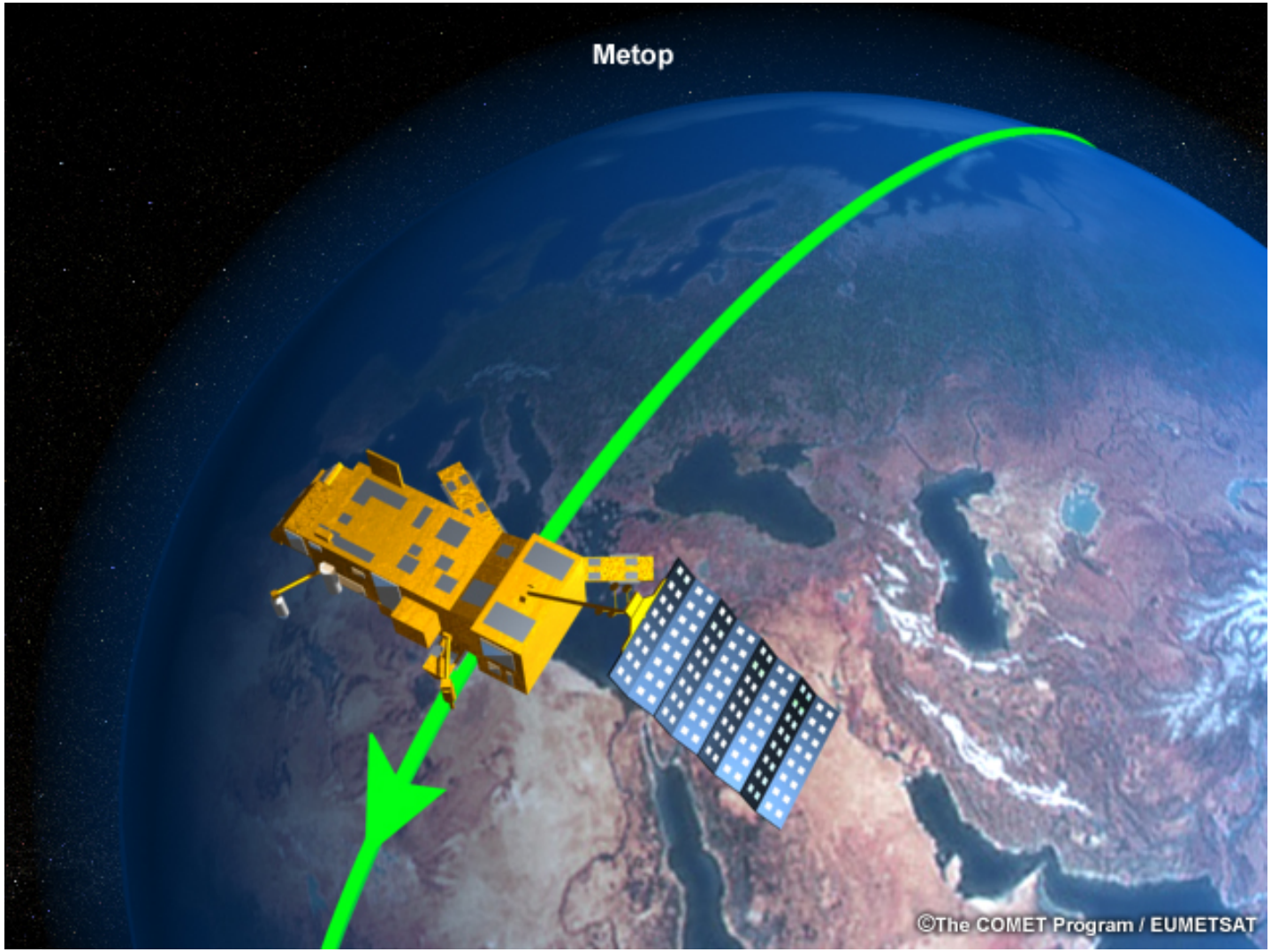


loss in life expectancy due to particulate matter in Europe in months (Source: M. Amann)

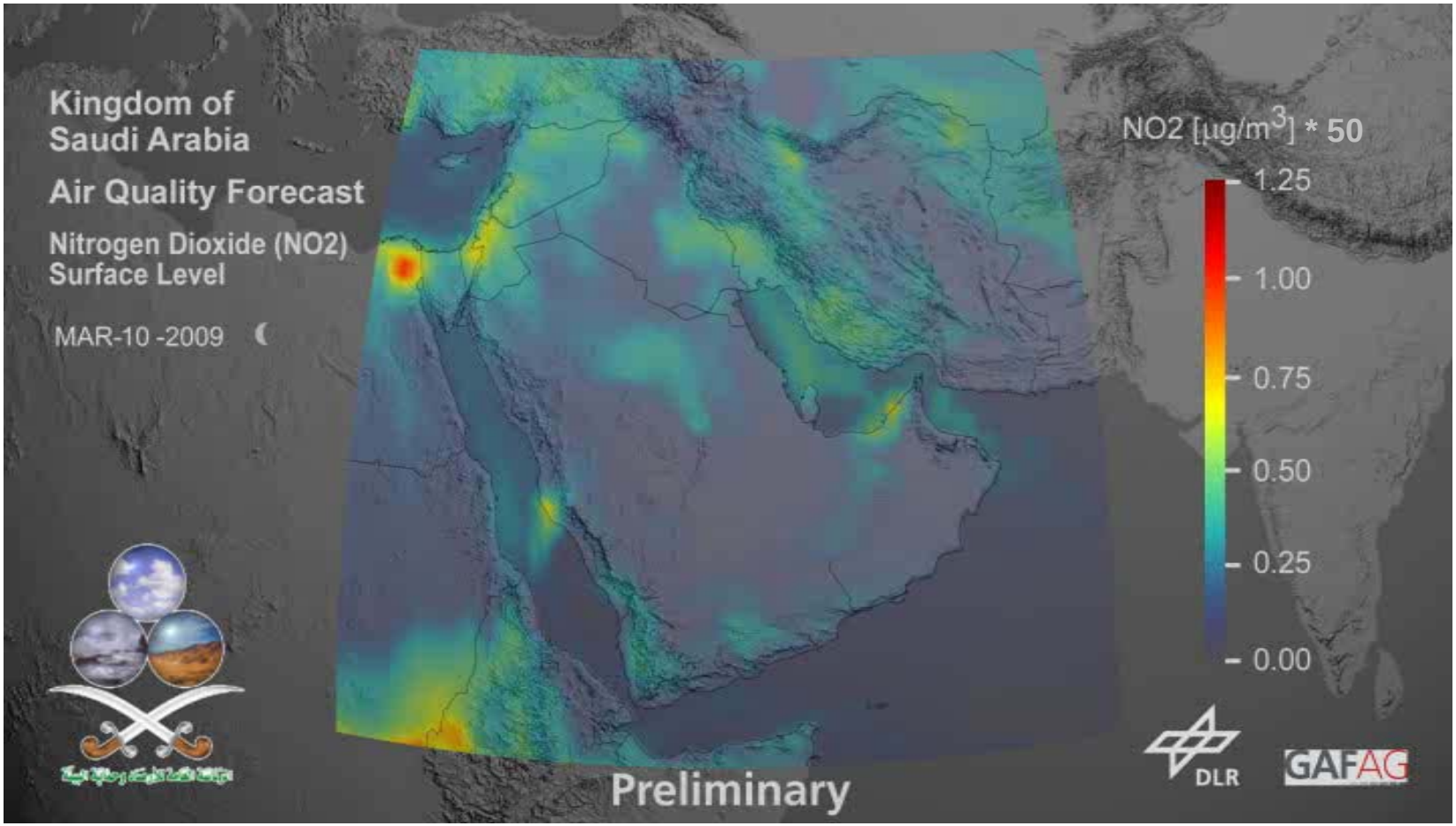
Major Achievements

- Development of a world-class system for PME for
  - Daily air quality monitoring from satellite for the Kingdom
  - Daily 72 hour air quality forecasting for the Kingdom by combining data and models
  - Demonstration of street-level air quality forecasting for Jeddah
  - All products in PME Geoportal http://eims.gaf.de

Use of best satellite data in near-real time



Air Quality Monitoring integrating observations

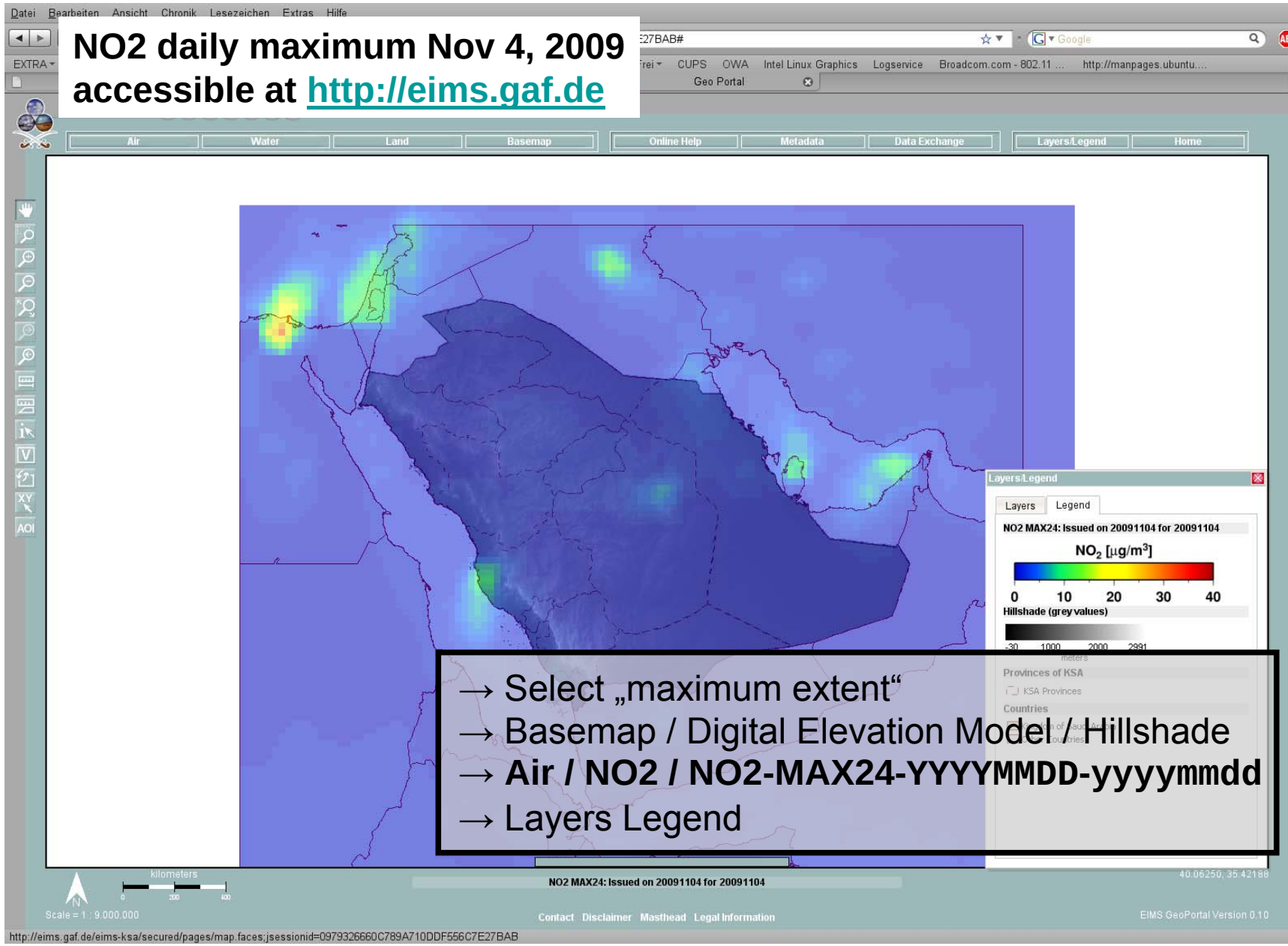


Portfolio

- nation wide – daily monitoring and forecasting – up to 72 hours
- Pollution maps of NO2, O3, SO2, CO, PM + AQ Index
- Daily maxima, 8 hour means
- Initially global, national, regional - then city level

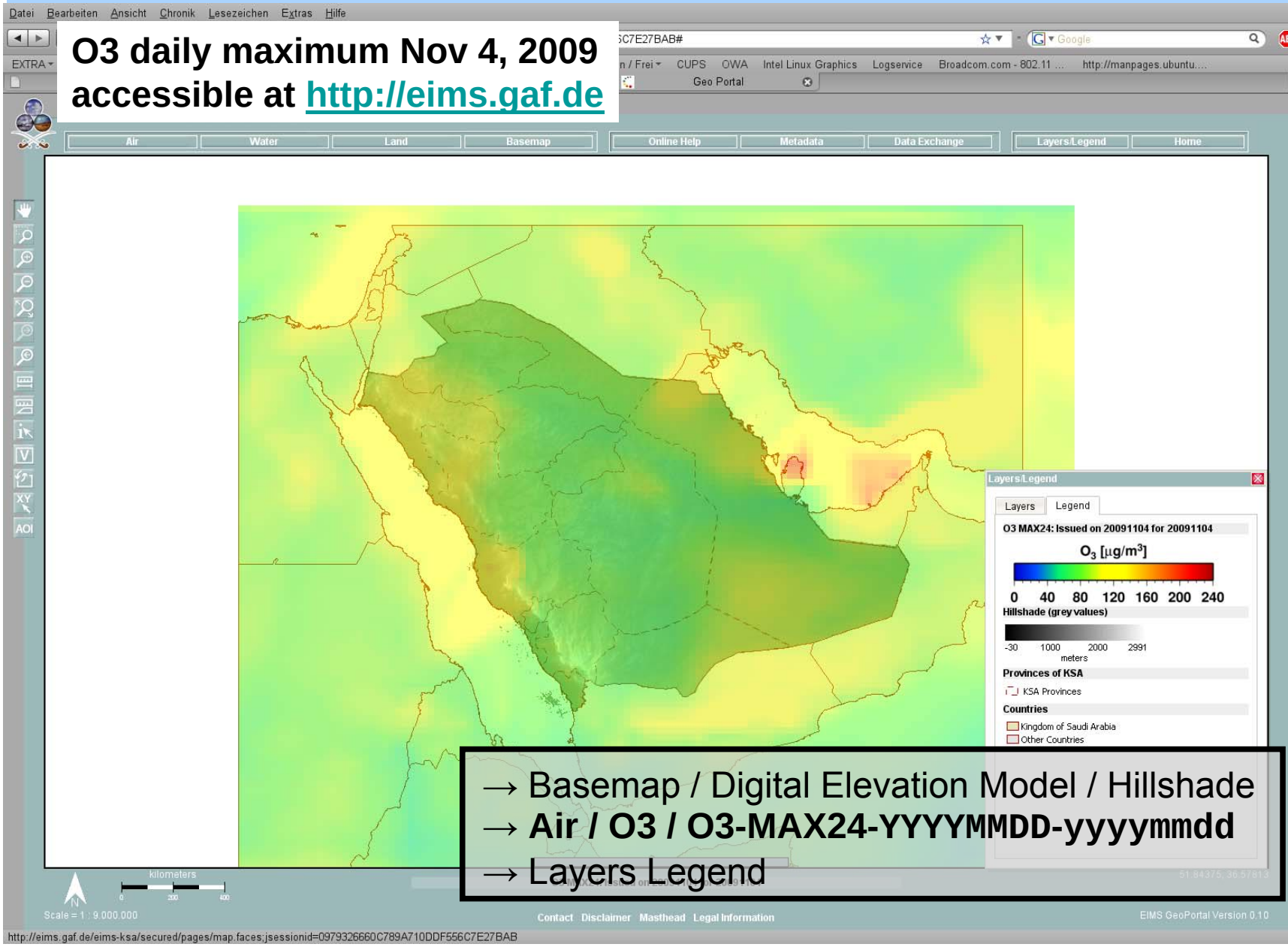
Summit GeoServices

NO2 daily maximum Nov 4, 2009 accessible at http://eims.gaf.de



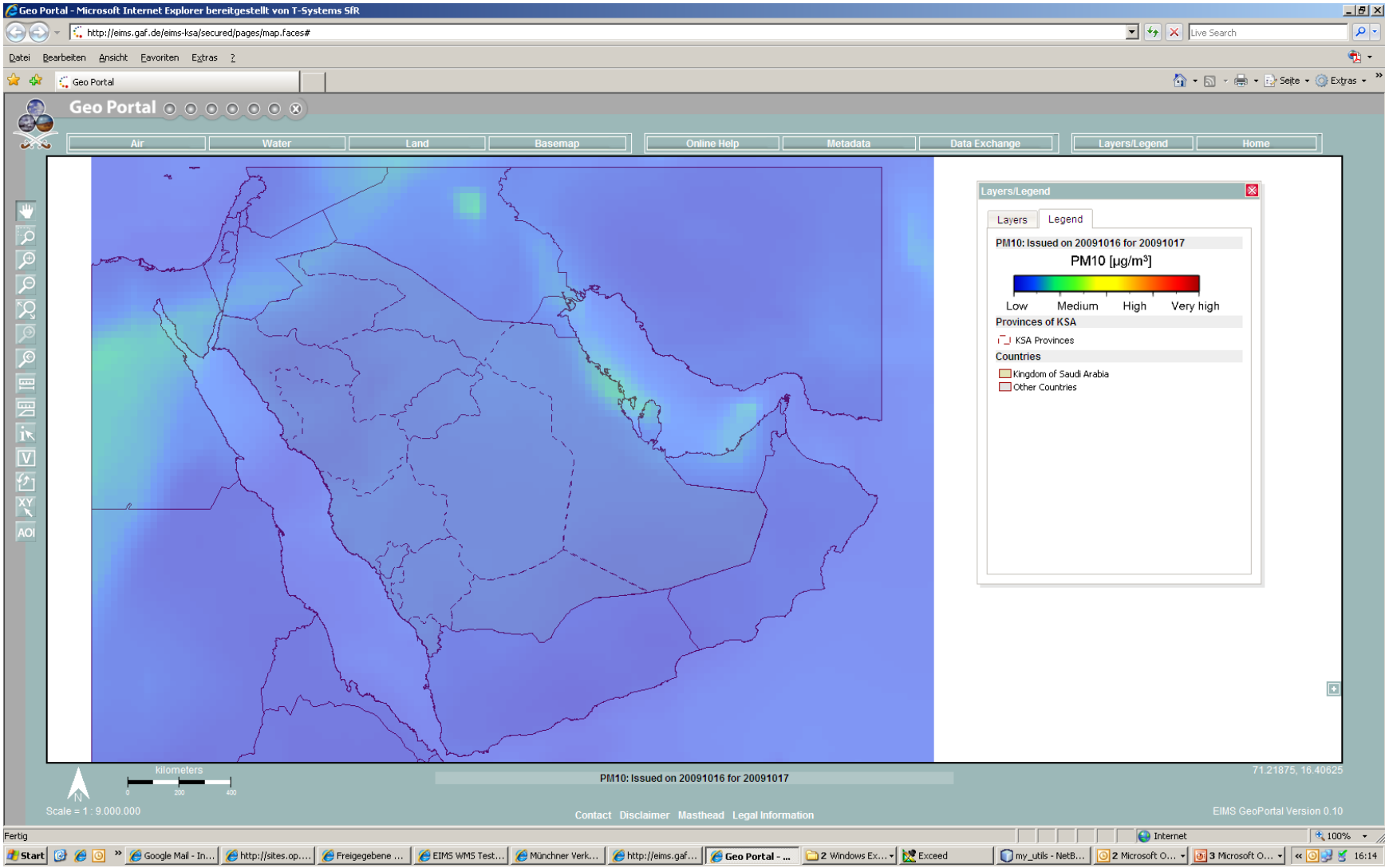
Summit GeoServices

O3 daily maximum Nov 4, 2009 accessible at http://eims.gaf.de



→ Basemap / Digital Elevation Model / Hillshade
→ **Air / O3 / O3-MAX24-YYYYMMDD-yyyymmdd**
→ Layers Legend

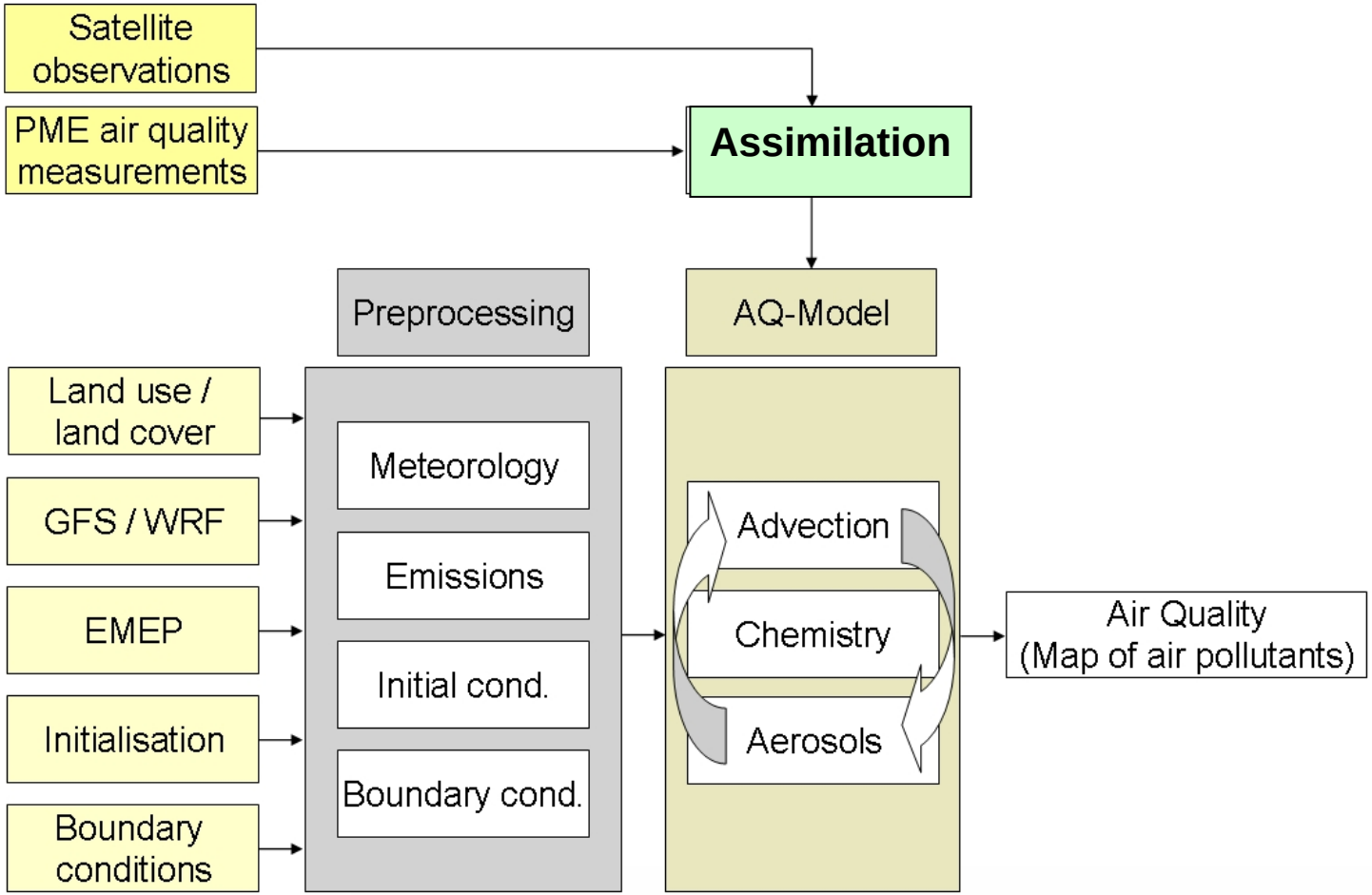
Daily PM10 daily mean Nov 4, 2009 accessible at http://eims.gaf.de



Monitoring of air quality is covered by satellite and ground based **measurements**

Forecasting of air quality by combining Satellite and ground based **measurements + models**

EIMS Air Quality Forecasting System

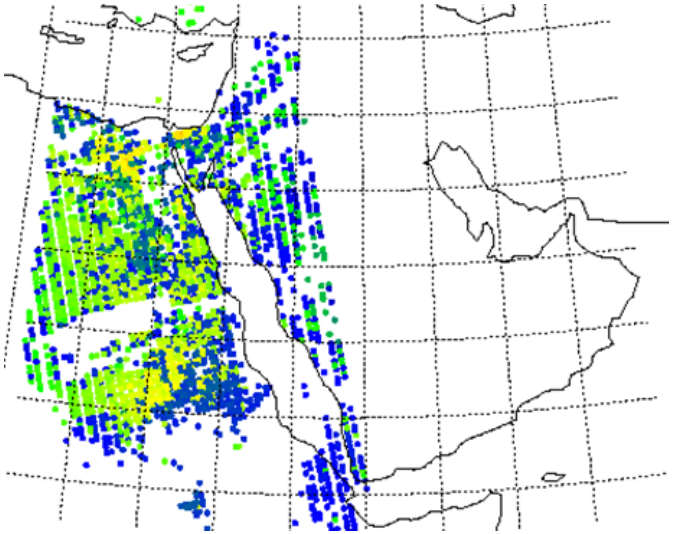


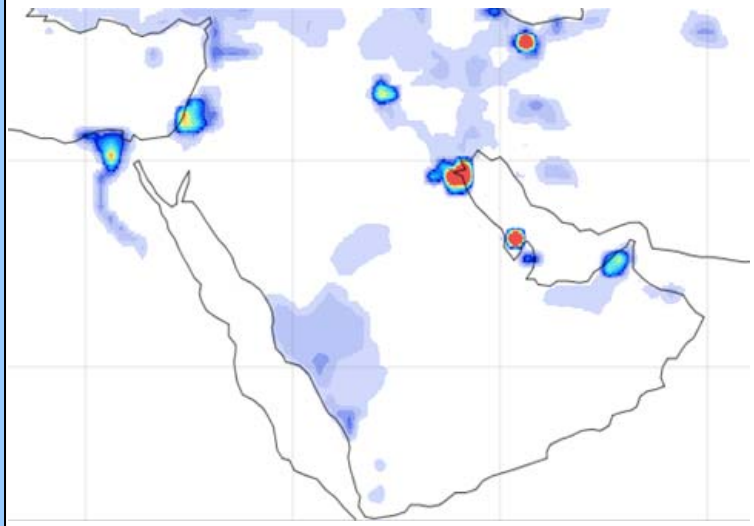
Different data sources, all relevant physics and chemistry inlcuded

Objective of data assimilation in Saudi Arabian air quality system is to combine all kinds of data into

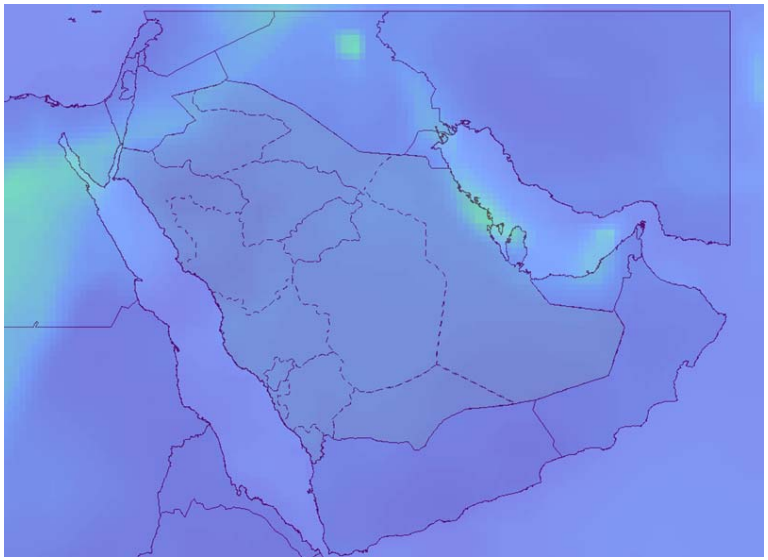
one product to facilitate your work.

How can we combine different measurements?

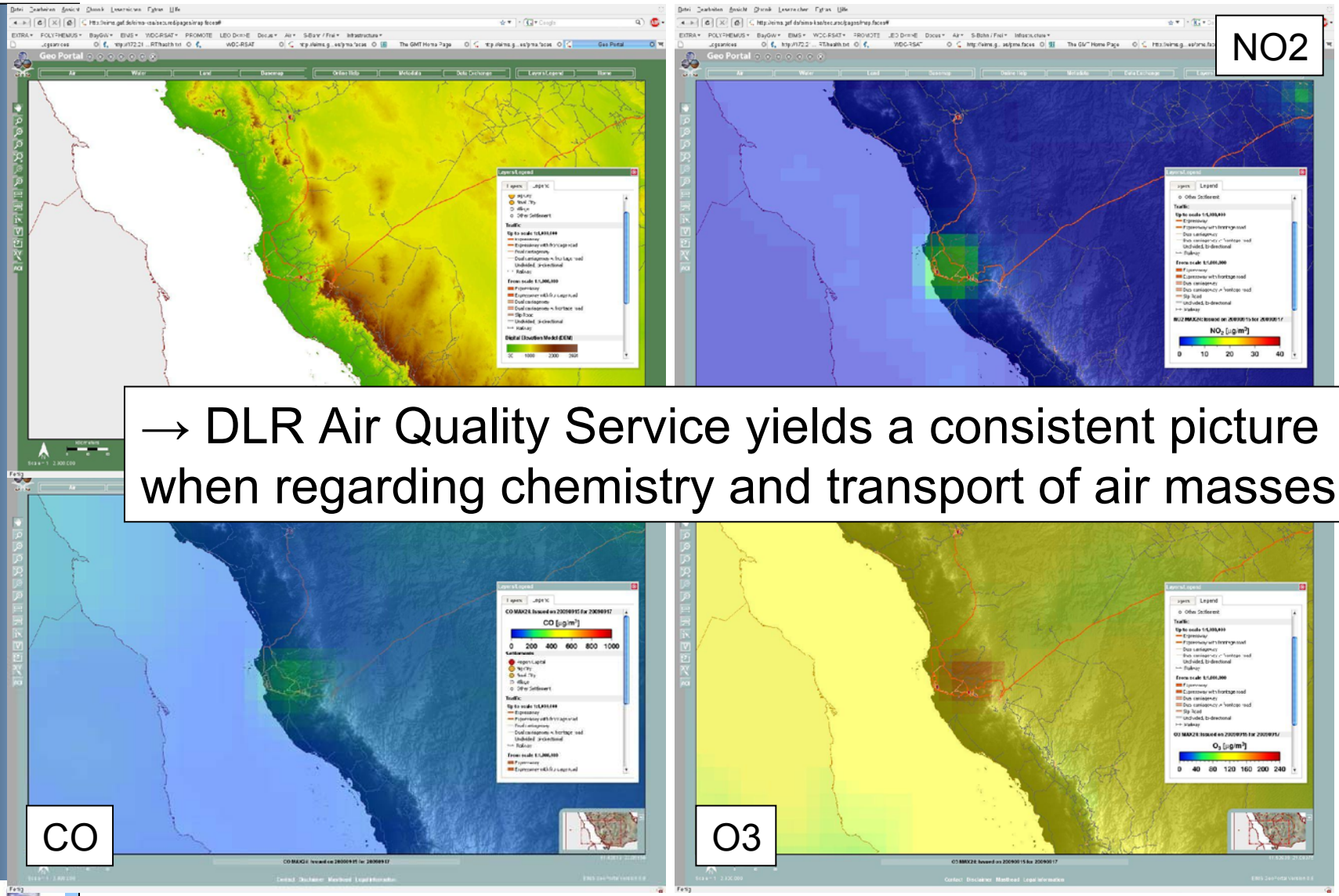




?



Answer: with data assimilation



→ DLR Air Quality Service yields a consistent picture when regarding chemistry and transport of air masses.

Demo for Jeddah street-level forecasting of Air Quality

O3

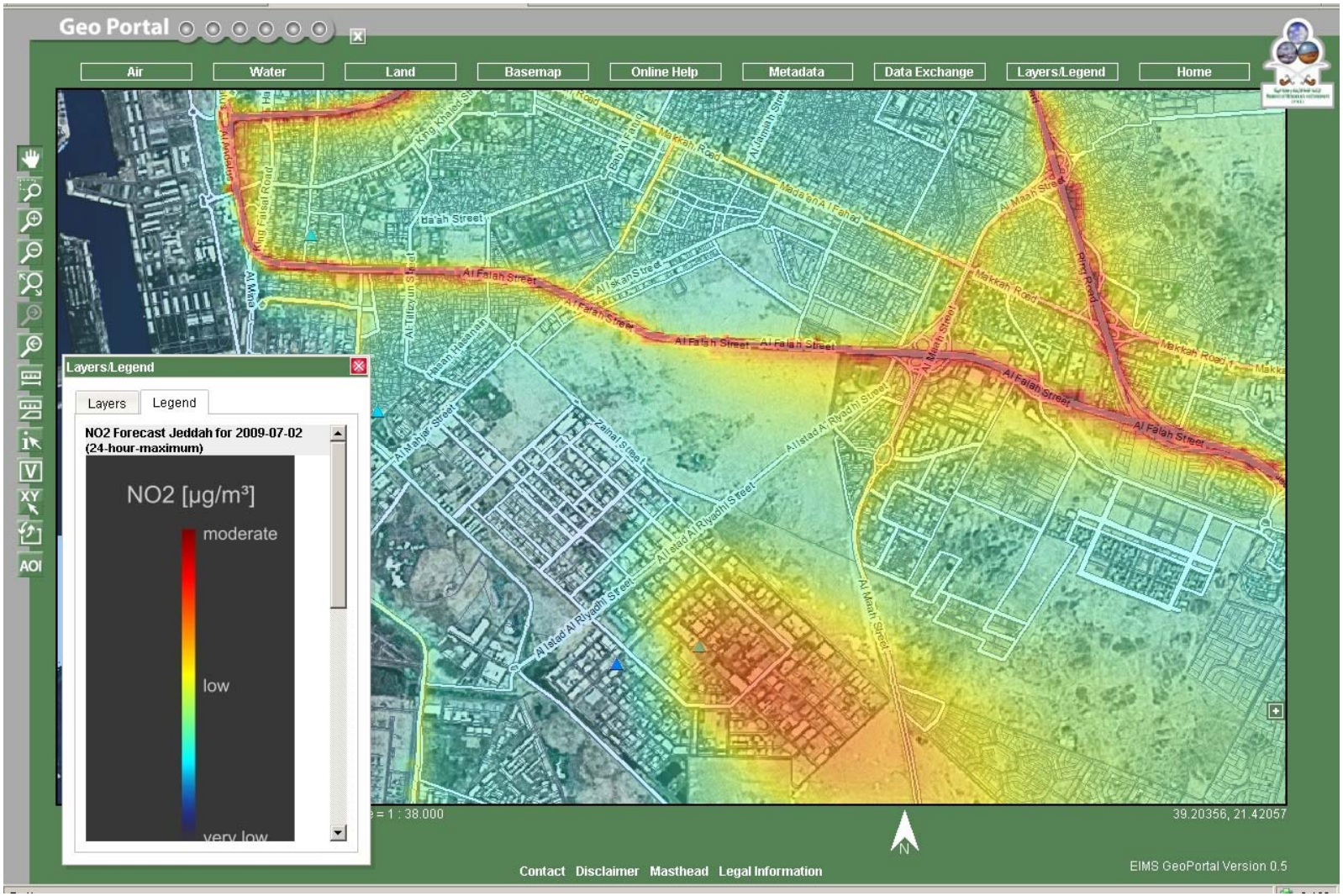
NO2

CO

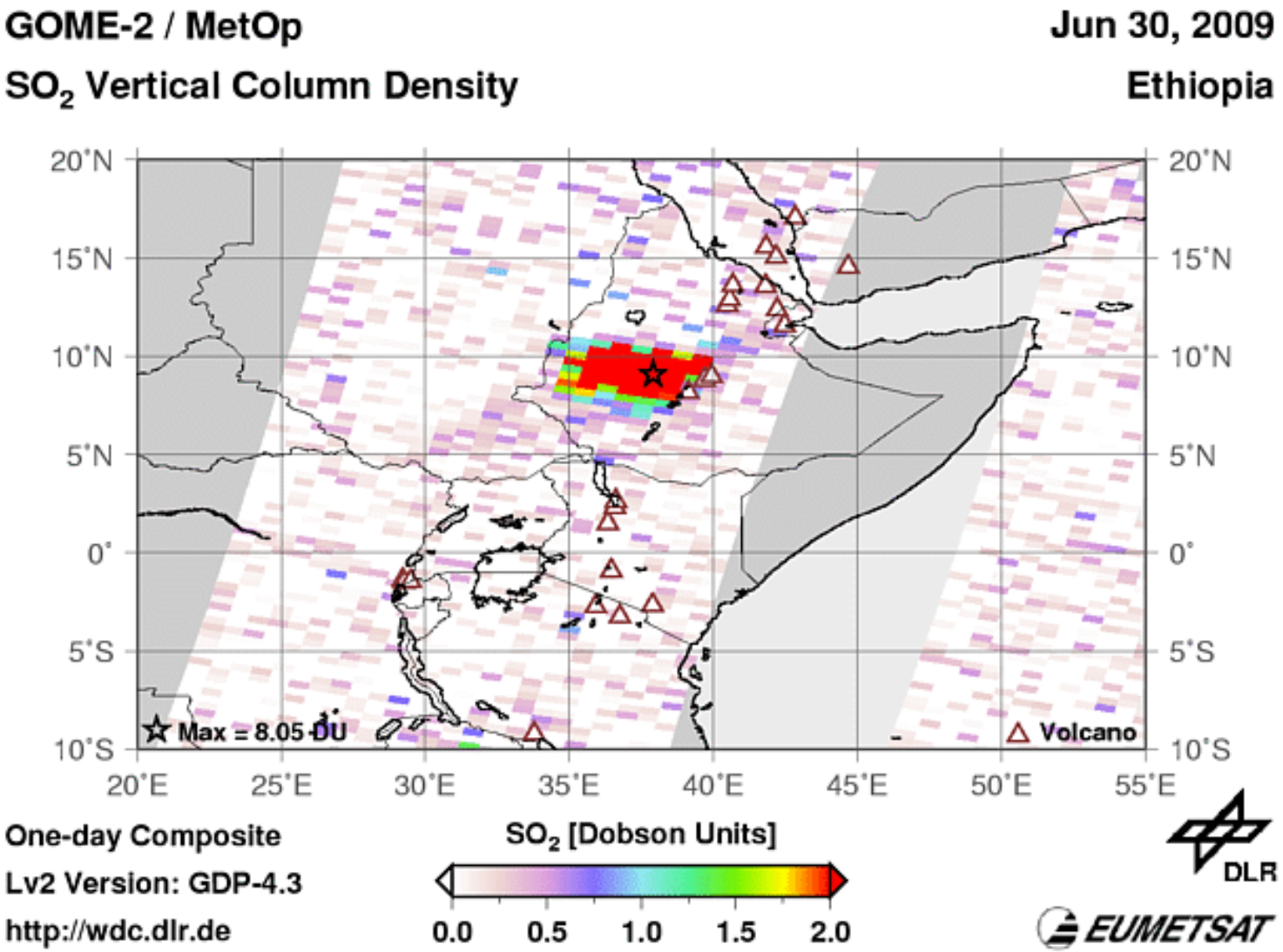
SO2

Spatial resolution of < 10m
72 hour forcasts

Demo for Jeddah street-level forecasting of Air Quality

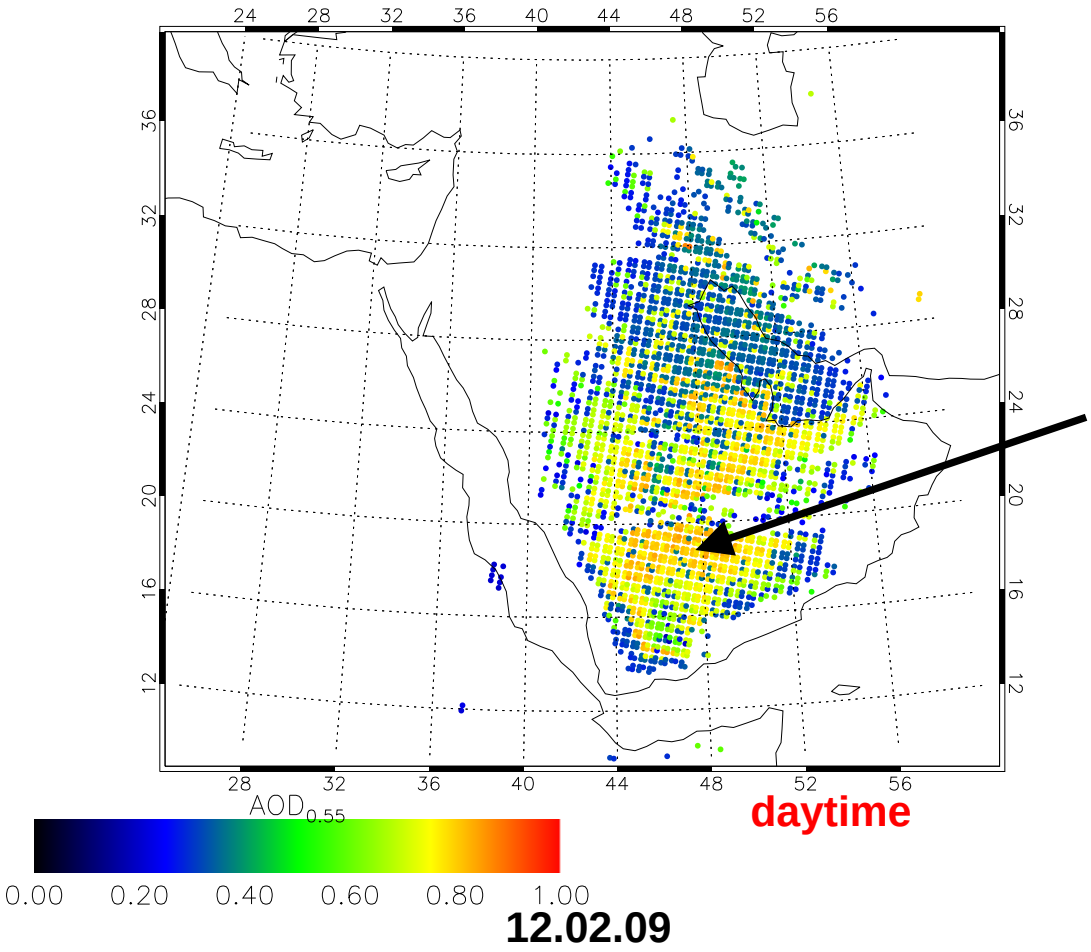


Volcanic Activity Monitoring in near-real time



Demo for new dust storm monitoring

eyery day - day and night - 25 years – MetOp/IASI



Benefits of service for PME

- Assures leading role in environmental technology and strengthens the Kingdom‘s international position in dealing with environmental issues
- Increases preparedness for short term actions
- Allows early warning and alerting of people at risk
- Supports health care community and hospitals
- Contribues to reporting on concentration levels
- Supports exceedance and compliance monitoring
- Contributes to implementation of AQ directives
- Builds prerequisite for modern environmental management of traffic, health etc.

Altogether 16 people

EIMS: Training on the Air Quality Service at DLR
September 28 – October 2, 2009

Training in Service Usage and Business Processes

- Health sector information services
- Personalised services for people at risk
- Public information services
- Support to national reporting
- (Dust storm warnings)

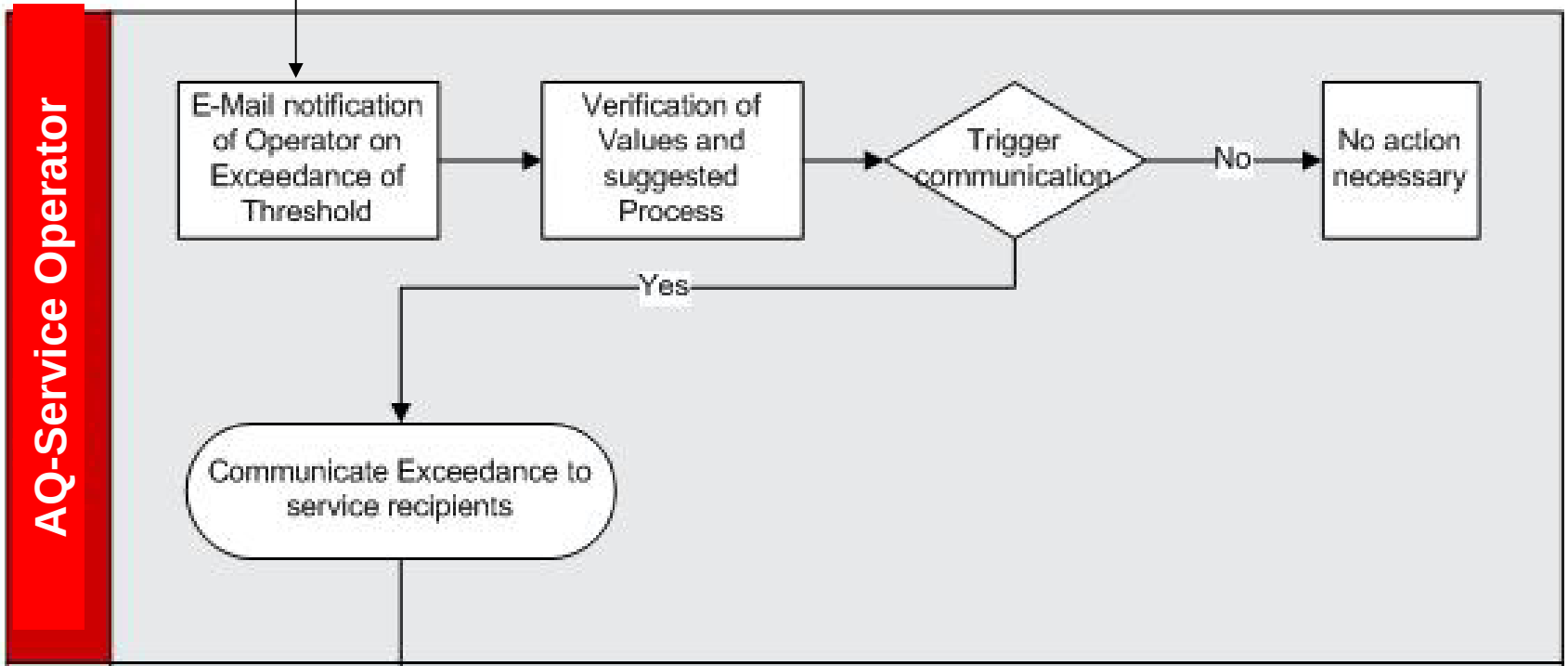
PME BP1: Health Sector Information Services

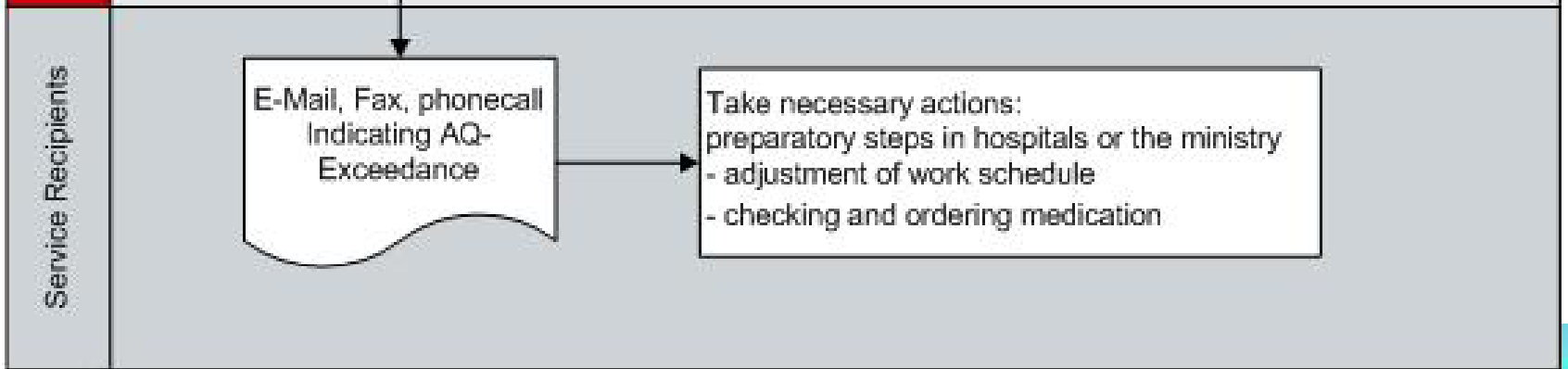
Aim:
- Provision of on time information and early warnings

Target:
- Ministry of Health, hospitals and other institutional actors in the health sector

Purpose:
- timely alerts for episodes with high air pollution
- raise awareness
- increase preparedness

Air Quality Index Forecast





PME BP1: Health Sector Information Services

Benefits:

- Reduces costs in health system
- reduces mortality and morbidity
- allows for any preparatory steps in hospitals
- allows for adjustment of work schedule
- allows for checking and ordering medication

Objectives:

- collaborate with health actors
- repackage information on high air pollution
- establish information exchange mechanisms
- forward relevant information in an agreed format

PME BP2: Services for people at risk

Increase of ozone, NO2 or PM10 causes
increased number of deaths

Increases of 50 µg/m3 in NO2
→ 1.3% increase

Increase of 50 µg/m3 in O3
→ 2.9% increase

(Hoek et al (2000). Touloumi et al (1997) and Katsouyanni et al (2001): data from 15 European cities.

PME BP2: Services for people at risk

Aim:

- Provision of early warnings and advice to people at risk.

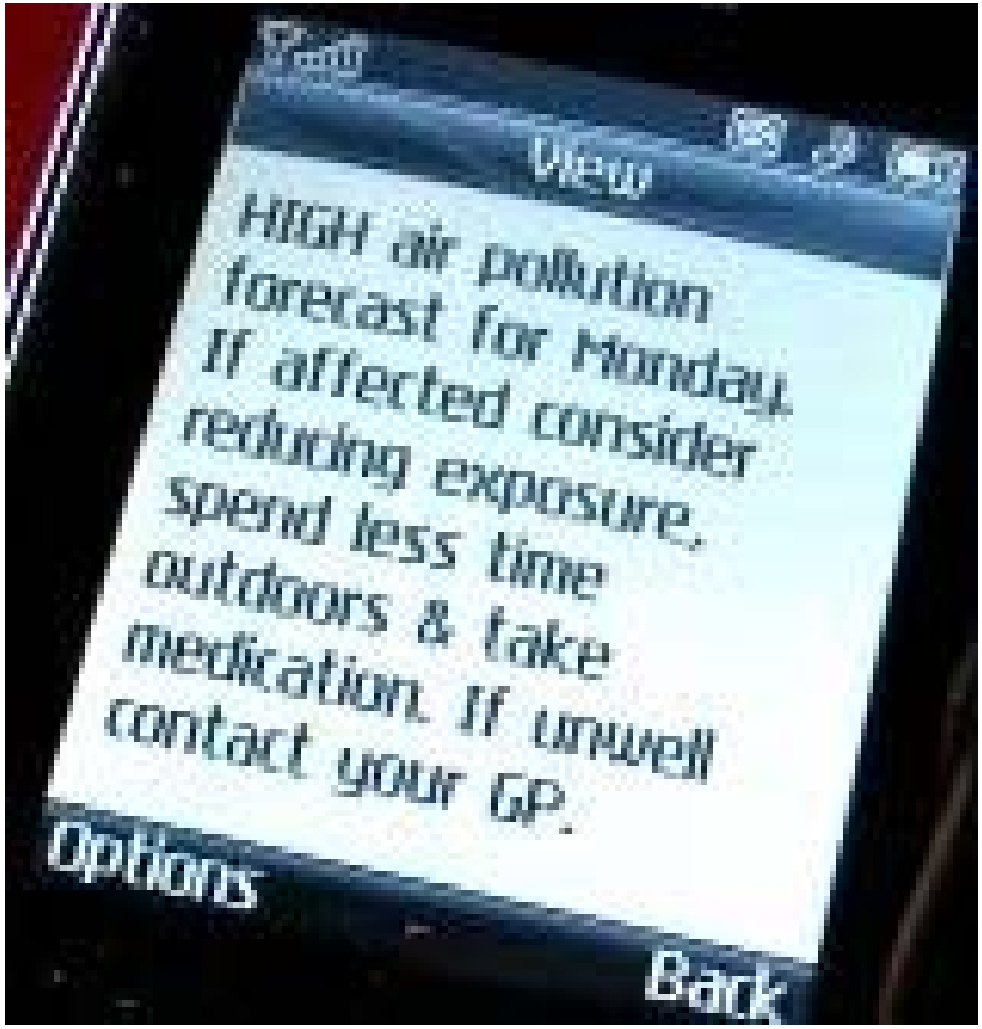
Target:

People at risk suffering from pulmonary or cardio-vascular diseases

Purpose:

- provide targeted and easy to understand alerts in due time regarding forecasted episodes with high air pollution
- raise awareness
- take action

PME BP2: Services for people at risk



PME BP3: Support Reporting

Aim:

- Support PME in reporting on the state of the environment

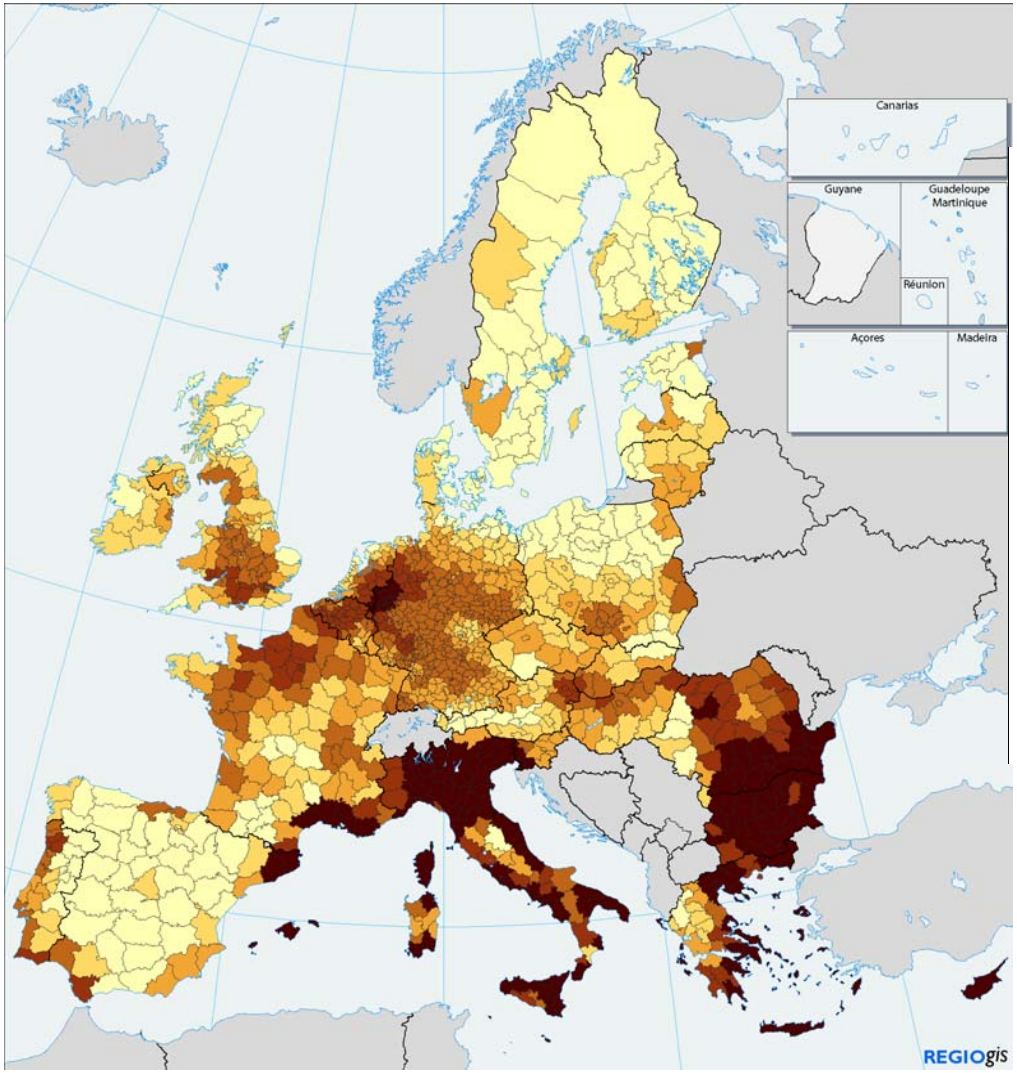
Target:

- Government of the Kingdom of Saudi Arabia

Purpose:

- support to reporting obligations
- delivery of information to national reports
- provision of detailed maps on exceedances and mean values

PME BP3: Support Reporting



Ozone concentration exceedances

Days with exceedance

- 0 - 3
- 3 - 5
- 5 - 7
- 7 - 10
- 10 - 15
- > 15

Status after 10 months

- Operational state-of-the-art system has been implemented
- Service up and running
- Daily forecasts and analyses of air pollutants for KSA available in PME Geoportal
- Service Design Document available
- 5 Use cases have been identified
- Additional monitoring of volcanic activity
- Demonstrator for Jeddah Street Level
- Demonstrator for Dust Storm Monitoring
- 2 Trainings

Training Feedback

- Air Quality Services found very useful
- High interest in nesting approach global →regional → local →streetlevel
- Continuation and further thematic integration of parameters
- Delivery of meteorological parameters to Geoportal
- Direct value extraction and improved archive section
- Improved report generation

Conclusions

- DLR world renowned center for satellite and environmental technology
- Honour to support in PME in remote sensing
- High commitment to support PME in their tasks and duties
- Air Quality Services to facilitate daily work in PME
- We are looking forward to further collaboration