



P R O M O T E
P R O T O C O L M O N I T O R I N G
F O R T H E G E M E S S E R V I C E E L E M E N T
A T M O S P H E R E

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PROMOTE: A project of the European Space Agency

- EC and ESA developed **GMES** - European contribution to GEO
 - ◆ GMES: Global Monitoring for Environment and Security

- ESA: GMES Service Element (GSE) Programme
 - ◆ GMES-applicable capabilities in Europe already exist
 - ❖ target operational & sustainable information services
 - ❖ respond directly to the needs of users, primarily in support of policies

 - ◆ focus on services using mainly Earth Observation sources
 - ❖ draw on results obtained from past and present EO satellites
 - ❖ provide recommendations for future EO systems

Background on PROMOTE

- PROMOTE Stage 1: Consolidation 20 months (2004 – 2006)
 - ◆ 1 of 13 GSE projects dealing with the atmosphere

- PROMOTE Stage 2: Scaling-up 36 months (KO: July 2006)
 - ◆ Include more services and expanded geographic coverage

- PROMOTE Service Portfolio Themes
 - ◆ Greenhouse and Reactive Gases
 - ◆ Stratospheric Ozone and Surface UV Radiation
 - ◆ Air Quality

www.gse-promote.org

User Focus in GSEs

- All GSE services have formal annual evaluations
 - ◆ ESA funding from year-to-year dependent upon user satisfaction
- All services provided in GSE projects must have formally named user organisations as recipient
 - ◆ Formal mechanism is a Service Level Agreement (SLA): defines service delivery
 - ◆ Users obligated to provide formal evaluations each year
- All GSE projects have an official User Federation task and a User Executive Board

58 Service Level Agreements (SLAs)

- Local, regional and national public agencies
 - ◆ Environmental agencies (D, A, IR, UK, F, B, NL, I, CH, FI, E)
 - ◆ Meteorological Institutes (D, P)
- International Organizations
 - ◆ WMO
 - ◆ ECMWF
 - ◆ NILU/EMEP
- User Federating Groups
 - ◆ European Environmental Agency
 - ◆ Professional Society of German Dermatologists
 - ◆ SPARC-CCMVal: Climate Modelling Validation

Greenhouse and Reactive Gas Service

➤ Products

- ◆ Global **methane & carbon dioxide** records from satellite data
 - ❖ Partially delivered records with extensions in years 2 & 3
- ◆ Records of **stratospheric methane & water vapor**
 - ❖ Years 2 & 3
- ◆ **Volcanic activity** indicator via detection of high levels of **sulfur dioxide**

➤ Applications

- ◆ Inputs to and optimizations of Climate Change models
- ◆ Source and sink apportionment for Greenhouse Gases
- ◆ Commercial aviation

➤ Users

- ◆ typically research users using retrieved values for assimilation into models

Stratospheric Ozone and Surface UV Radiation Service

➤ Products

- ◆ **Global ozone columns** (record, NRT, forecasts) and **profile** (record)
- ◆ **Global Surface UV** Radiation record
- ◆ On-demand **personalized sunburn-time information**

➤ Applications

- ◆ Monitoring of the recovery of the stratospheric ozone layer
- ◆ Improvements in weather forecasting
- ◆ Health of European Citizens regarding skin cancer

➤ Users

- ◆ Full range of users: international, national, local, citizens

Air Quality Service

➤ Products

- ◆ **Global Air Quality records**
- ◆ **European-scale Air Quality analyses and forecasts (daily)**
- ◆ **Local-scale Air Quality forecasts, assessments, and scenarios**
- ◆ **Particulate Matter:** desert dust, volcanic ash, pollen, ground-level PM

➤ Users:

- ◆ Full range of users: international, national, local, citizens

➤ Applications

- ◆ monitoring of levels and changes in global pollutant levels
- ◆ improvement and optimization of climate change models
- ◆ assessments of European and national air quality
- ◆ minimization of health impacts to European citizens, especially those with heart or respiratory illnesses

Air Quality Records

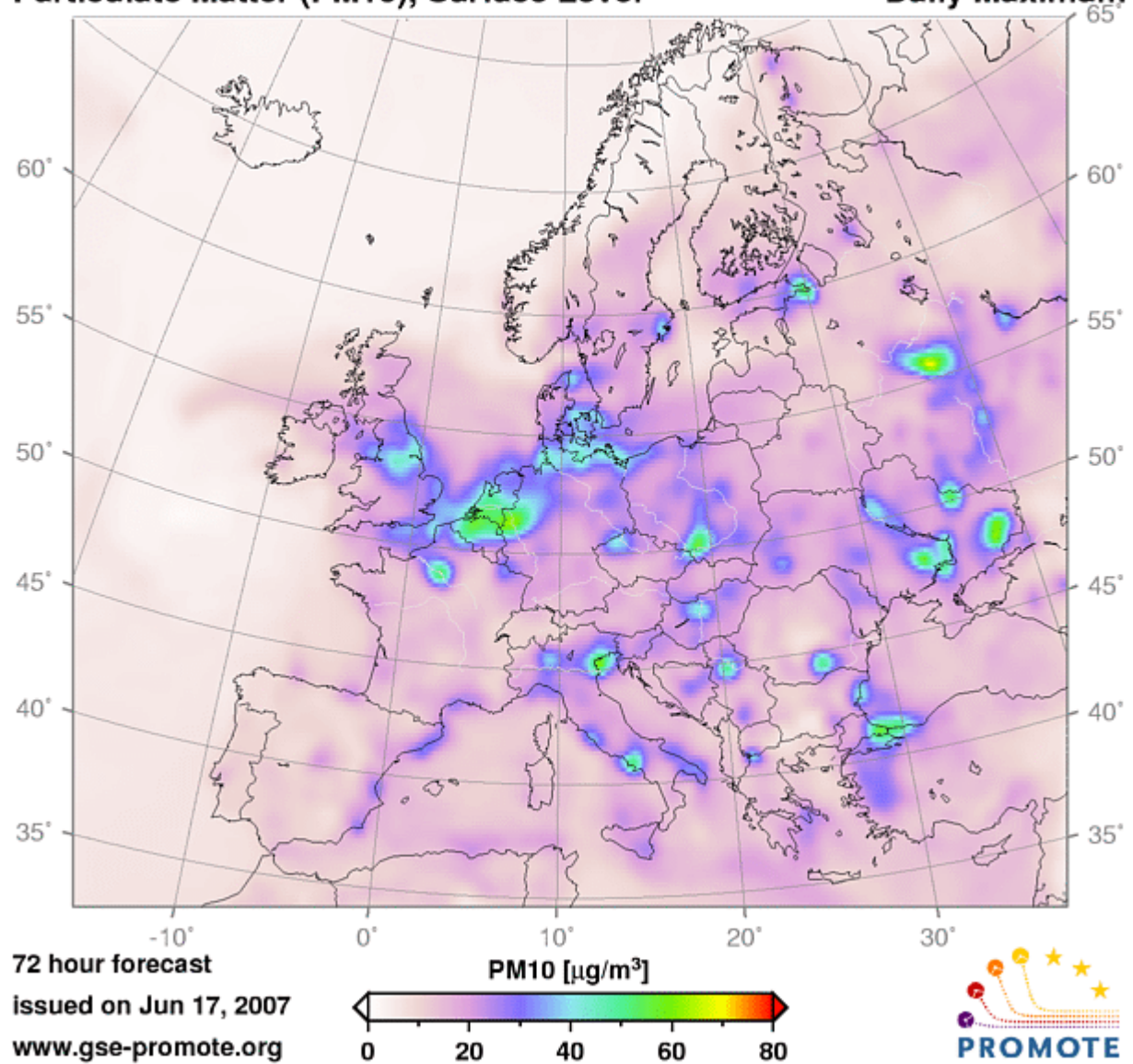
- Analyzed model records based on satellite and ground measurements (3Dvar assimilation into EURAD model system)
 - ◆ Global NO₂ and HCHO (1995-2008)
 - ◆ Europe (45km²) NO₂, CO, PM10, SO₂, HCHO, O₃ (2002-8)
- Satellite data
 - ◆ tropospheric NO₂ from GOME, SCIAMACHY, OMI
 - ◆ O₃ profiles from GOME
 - ◆ CO profiles from MOPPIT
 - ◆ Aerosol data from SYNEAR system
- In situ data: ground stations (EEA) and MOZAIC

Integrated Forecasts

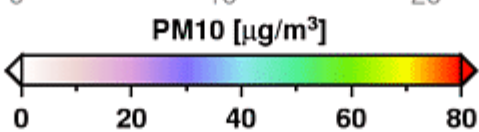
- 50km*50km resolution
- ozone, NO_x and PM
 - ◆ maps and numerical fields provided to the users
- 3 models/systems at start – 5 models at project end
 - ◆ CHIMERE, MOCAGE, EURAD, LOTOS-EUROS, SILAM
- poor-man's ensemble:
 - ◆ recognizes strengths of each model/system: heterogeneous inputs
 - ◆ integration based on comparisons of separate model results and uncertainty analysis

**Integrated Air Quality Ensemble
Particulate Matter (PM10), Surface Level**

**Jun 19, 2007
Daily Maximum**



72 hour forecast
issued on Jun 17, 2007
www.gse-promote.org

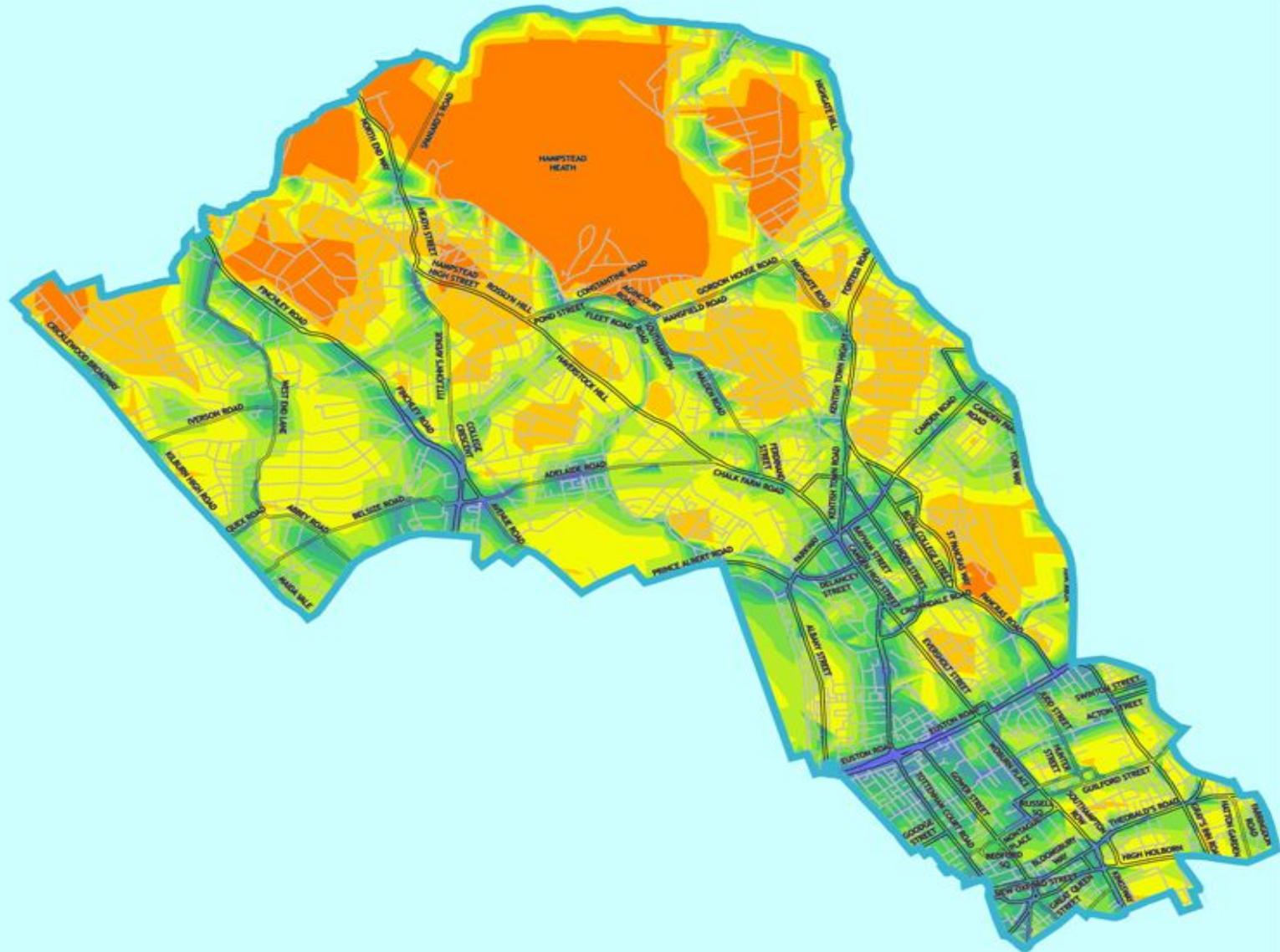
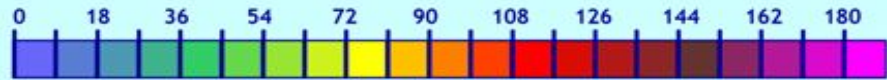


Example Usage Local AQ

- Health application example: **The AirTEXT Project**
 - ◆ *AirTEXT* is based on PROMOTE delivery of local AQ forecast of London

YourAir pollution forecast for Camden, London

Ozone Concentration, June 24
Highest daily concentrations in $\mu\text{g}/\text{m}^3$.
Major roads shown in black, side streets in grey.



Example Usage Local AQ

- Health application example: **The AirTEXT Project**
 - ◆ *AirTEXT* is based on PROMOTE delivery of local AQ forecast of London
 - ◆ send air pollution alerts to vulnerable individuals via SMS text message based on air quality forecasts
 - ◆ Expected benefits: reduction in resource implications on National Health Service by enabling patients to self-manage their symptoms
- Greater London local air quality – growth in interest
 - ◆ PROMOTE Stage 1: 1 Borough was interested and participated
 - ◆ PROMOTE Stage 2: More than 20 Burroughs are now using the service

Summary

- PROMOTE represents a significant contribution by ESA to providing operational services related to the atmosphere
 - ◆ Ozone/UV, greenhouse gases, Air Quality
- PROMOTE leverages off of contribution of satellite data to gathering information on atmospheric composition and its complementarity to modelling and in-situ data
- PROMOTE contributes to GEO via European GMES initiative