

Using MACC-II Products as Boundary Conditions for Street-Scale Air Quality Forecasting Services

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Outline of presentation

CERC: Who we are and what we do

Air quality forecasting

How the MACC-II/Copernicus Atmosphere Service benefits CERC Services

Cambridge Environmental Research Consultants (CERC)

What is CERC?

- CERC is a privately-owned SME, founded in 1985

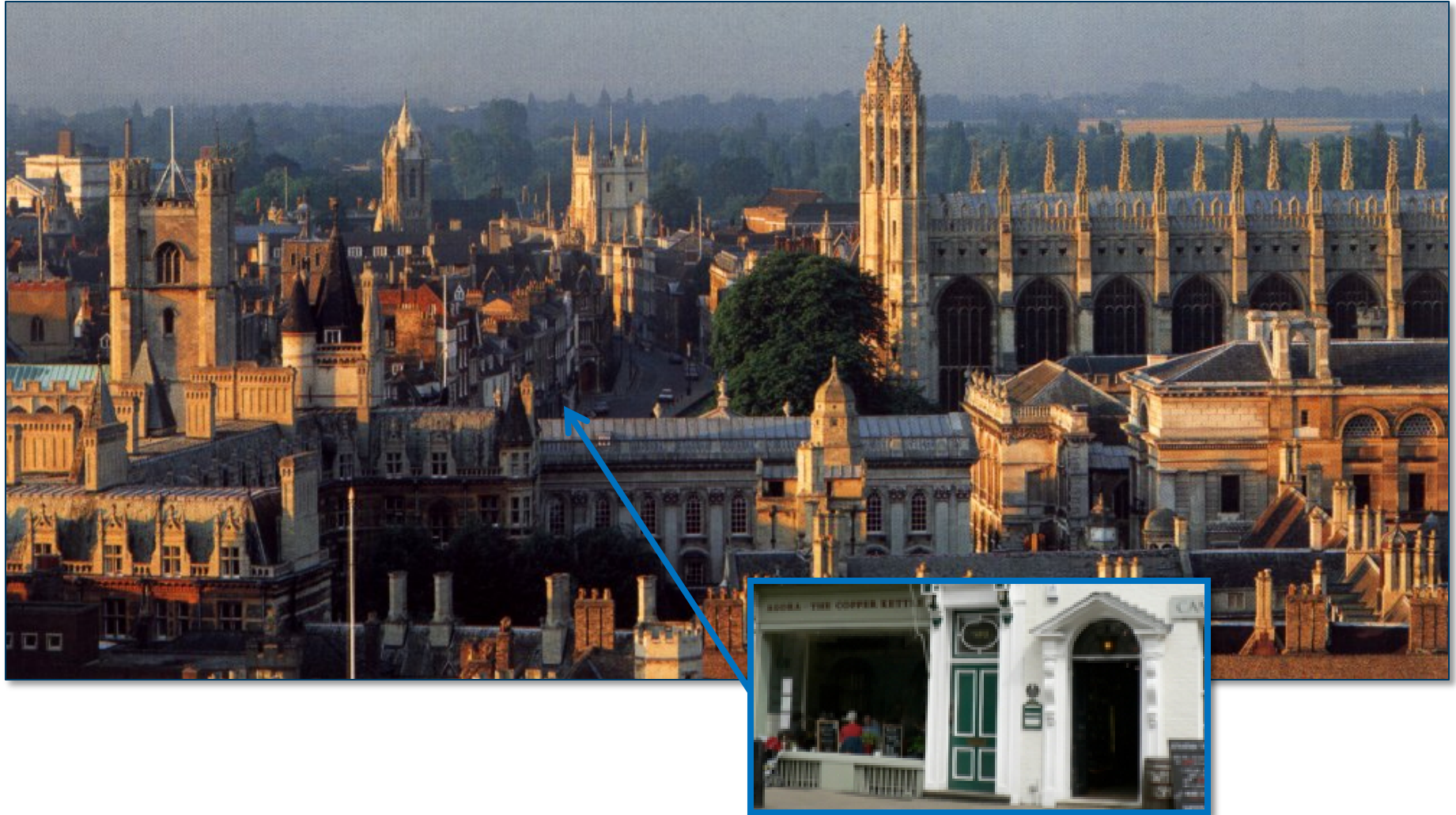
What do we do?

- Main business is in **local air quality**: air pollution dispersion software design and development, research, consultancy and training

Who uses CERC software?

- Leading software in the UK, also users across Europe and internationally
- Industry and consultants for permit applications and environmental impact assessments
- Local government for local air quality management
- Universities for teaching and research

Cambridge Environmental Research Consultants (CERC)



CERC Software



ADMS 5

- Models dispersion of industrial emissions for permit applications and environmental impact assessments



ADMS-Urban



ADMS-Roads



ADMS-Airport



EMIT



FLOWSTAR



ADMS-STAR



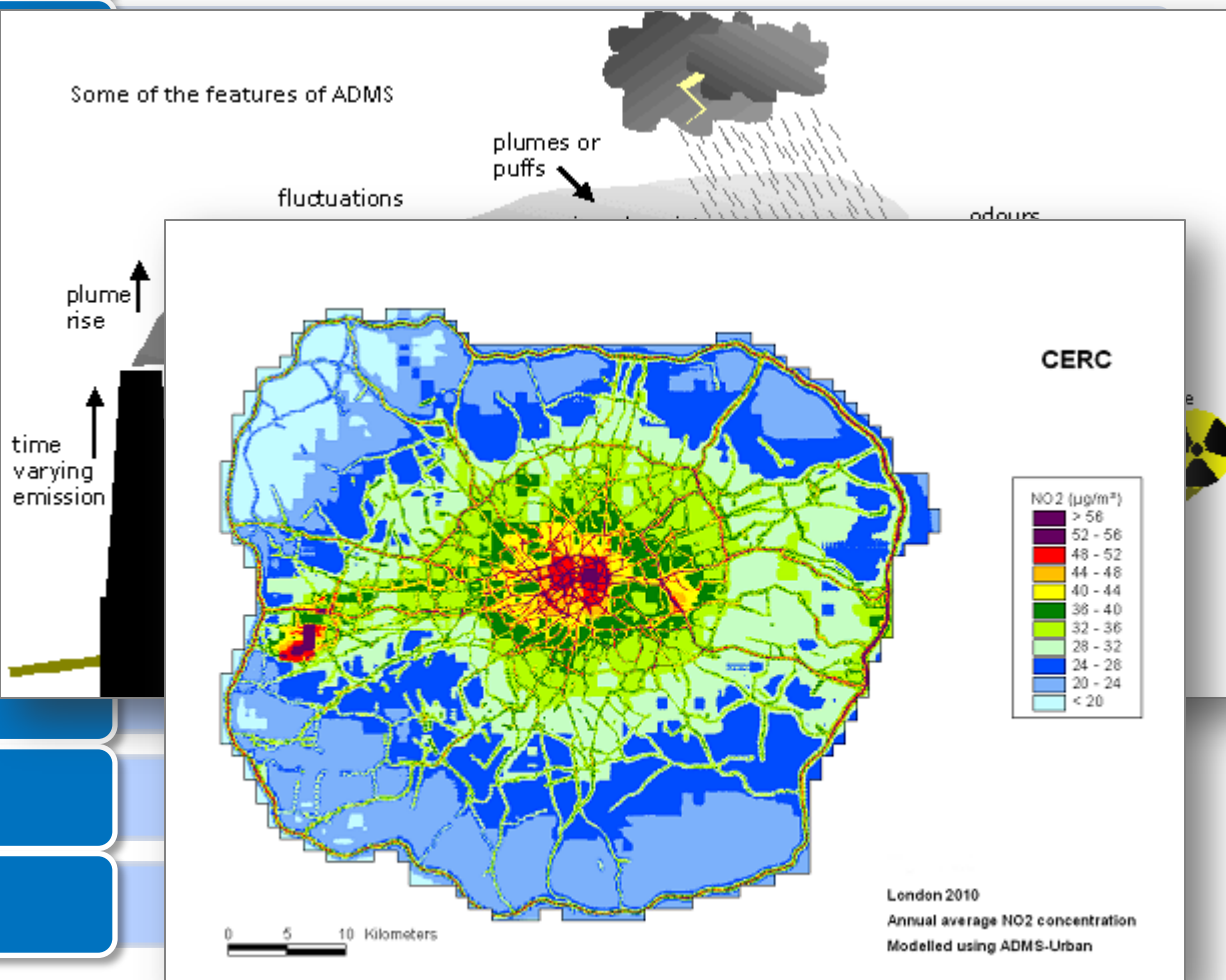
ADMS-Screen



GASTAR



Run Manager



Air quality forecasting

Why?

- Advance warning of air pollution ‘episodes’ – periods where air quality deteriorates to the extent that it causes harm to human health

Who for?

- Sensitive individuals, for example those with asthma, heart and/or lung disease, or COPD
- Policy makers
- Media
- Interested members of the public

What are the technical challenges?

- Meteorology
- Emissions
- “Background” pollution levels

airTEXT



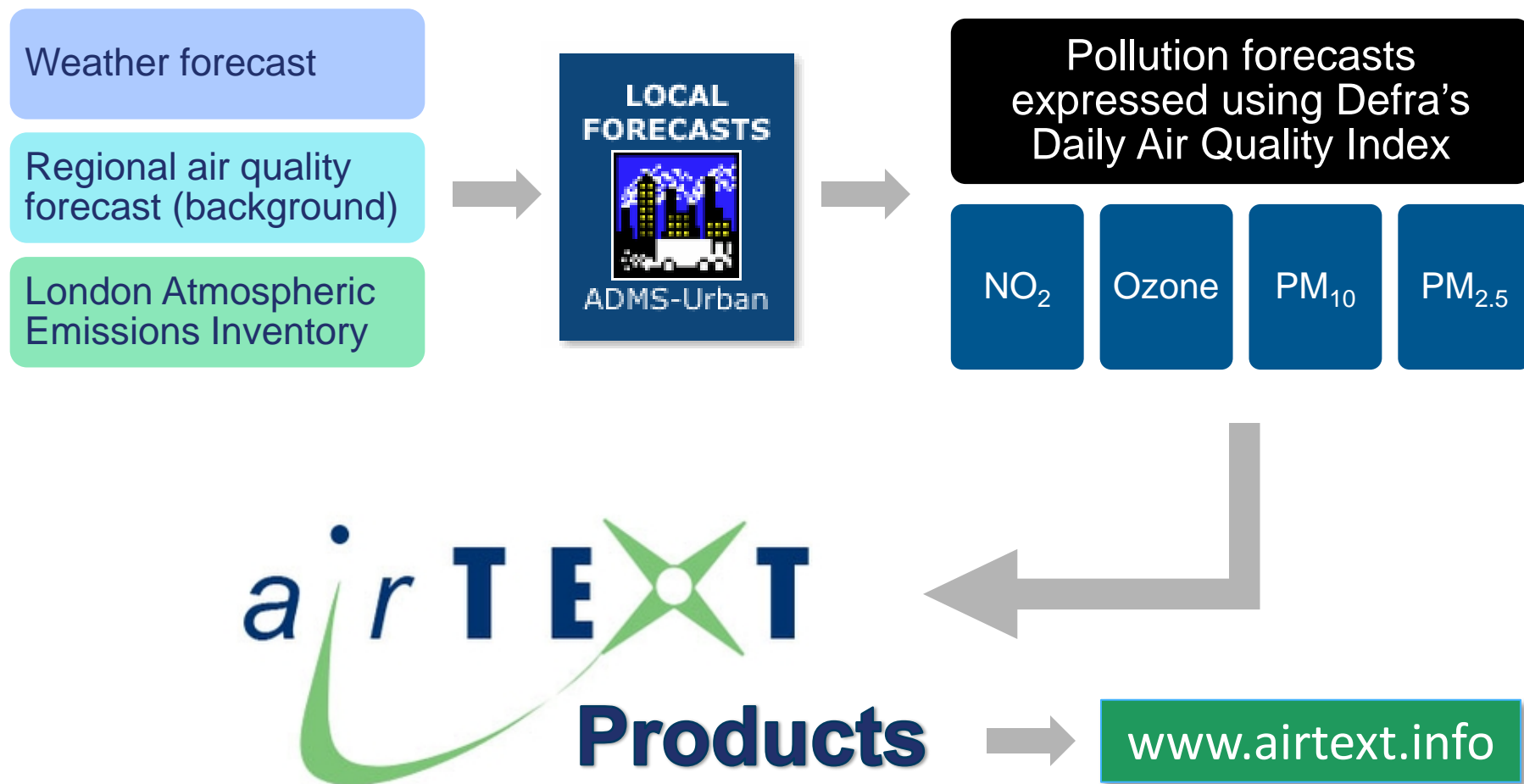
MAYOR OF LONDON



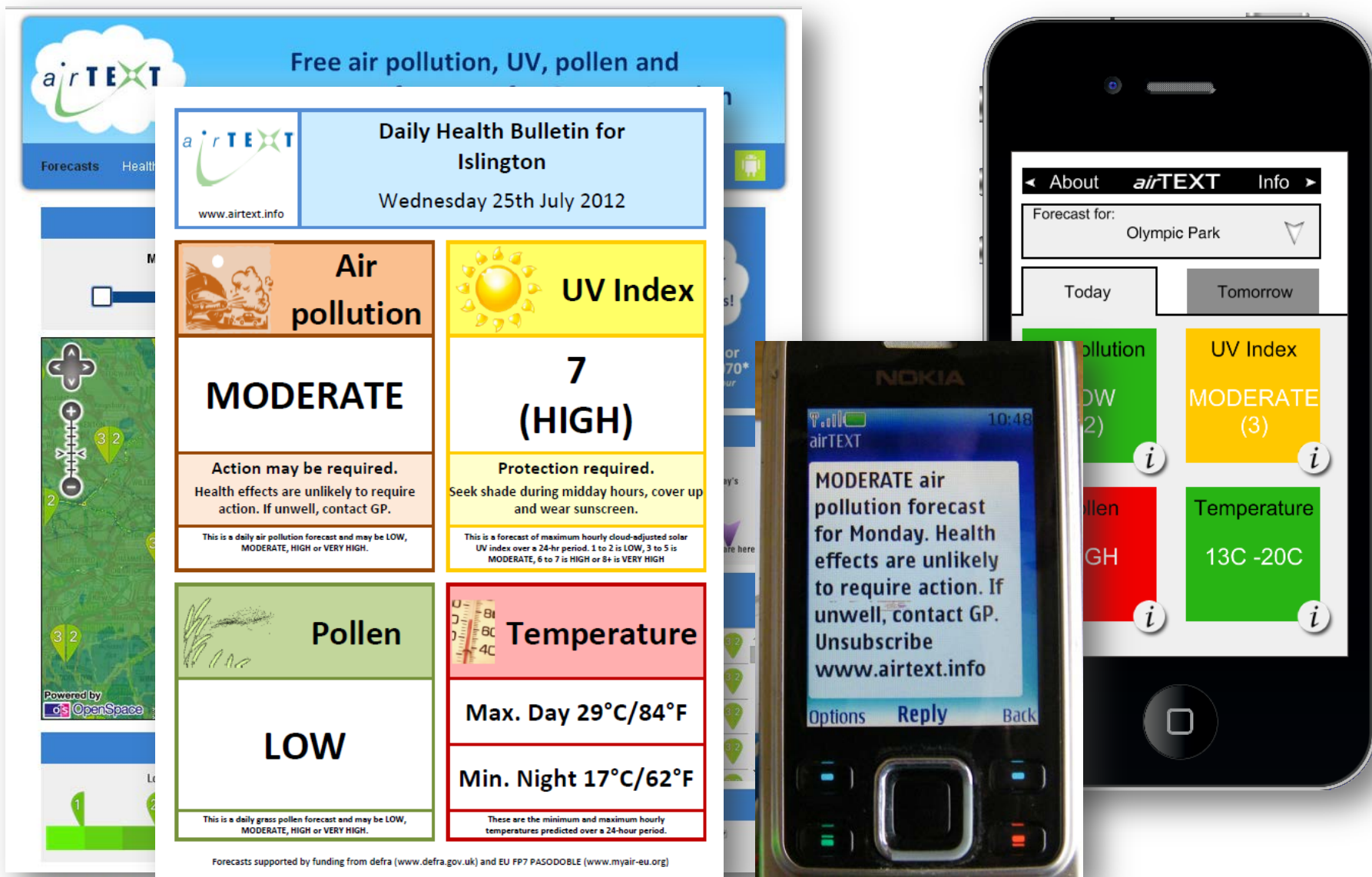
Free air pollution, UV, pollen and temperature forecasts for Greater London

**Currently providing free air quality alerts to
more than 7000 subscribers**

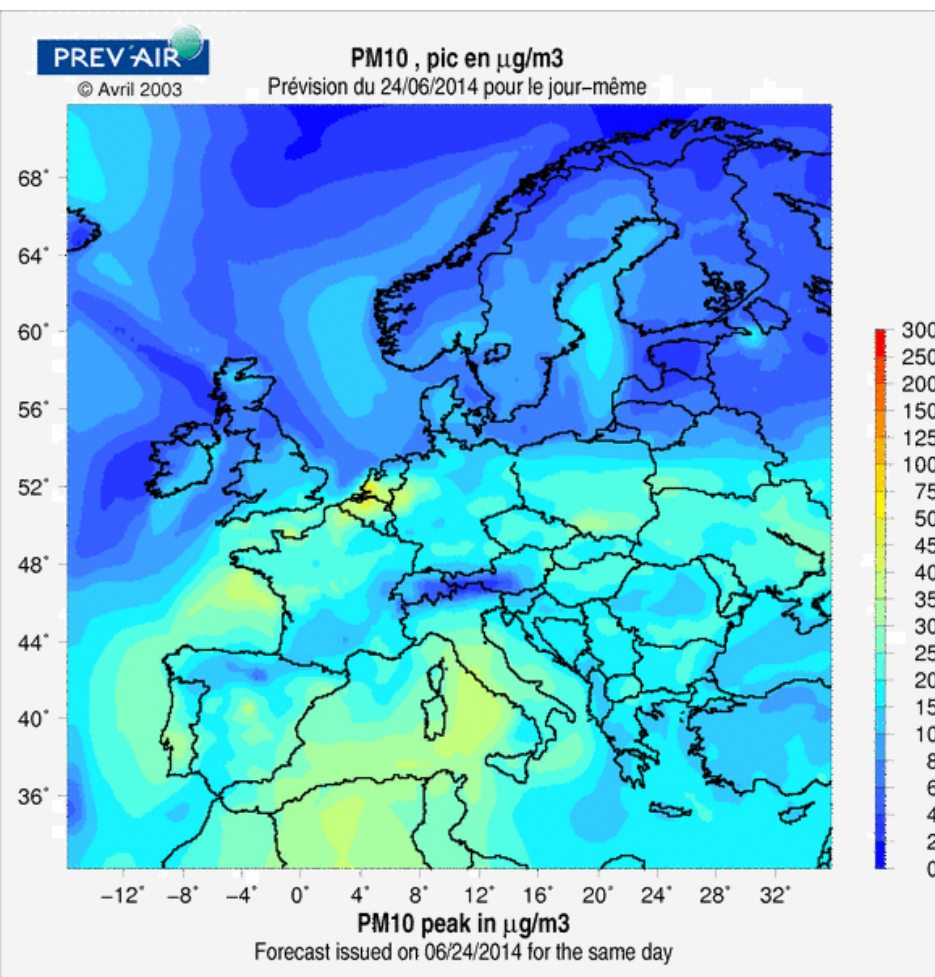
CERC's *airTEXT* system



airTEXT products: all available at www.airtext.info



How is satellite data involved in airTEXT?



Regional air pollution forecasts predict **trans-boundary transport** of pollutants

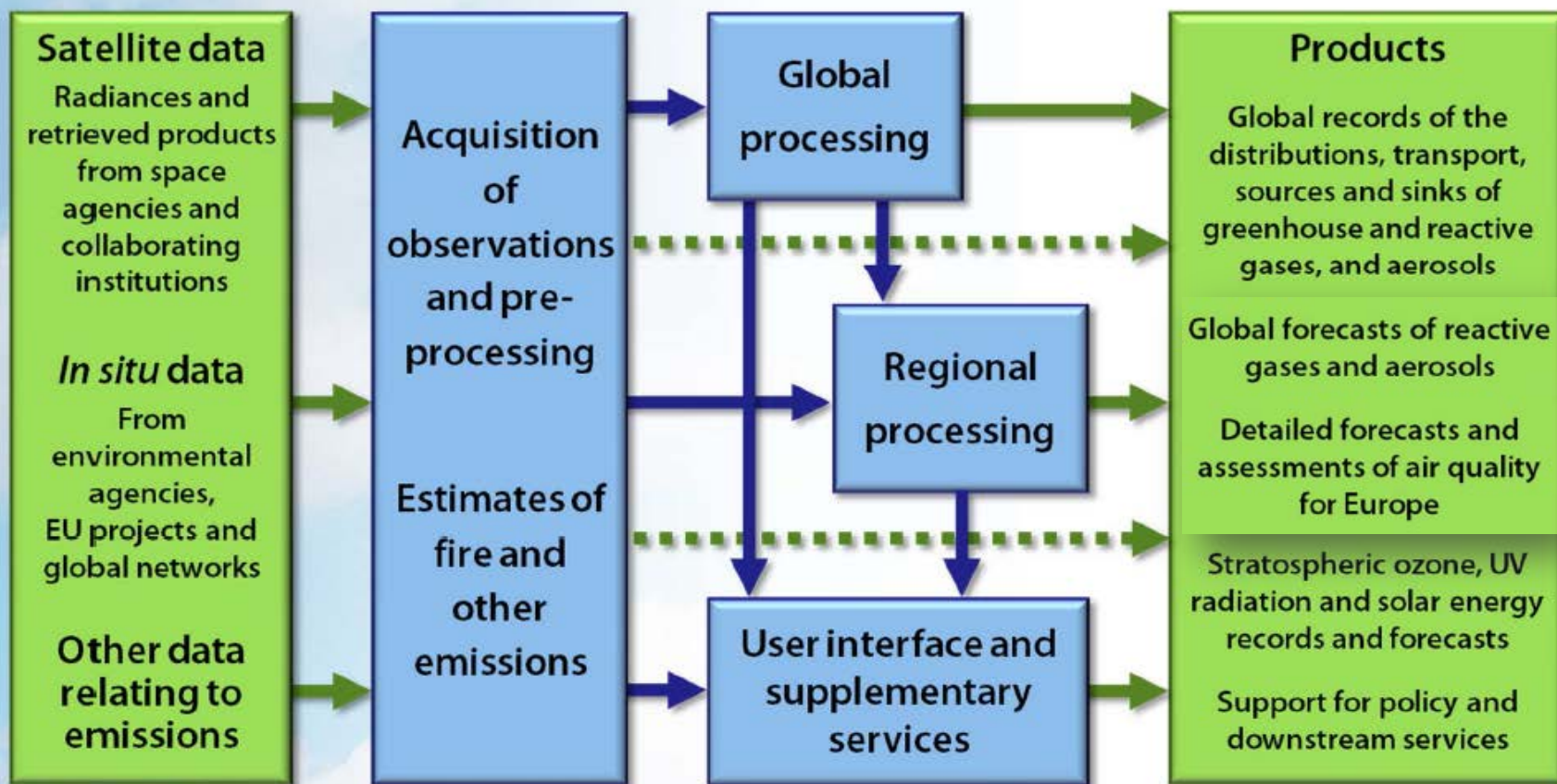
Now: Prev'Air CHIMERE forecasts, which contribute to regional ensemble forecast of GMES/Copernicus Atmosphere Service (MACC and MACC-II)

Near future: Migrate to GMES/Copernicus regional ensemble: higher resolution, more sustainable, recent upgrade added more species – now a suitable candidate

These regional models **assimilate satellite observations to improve their forecast**

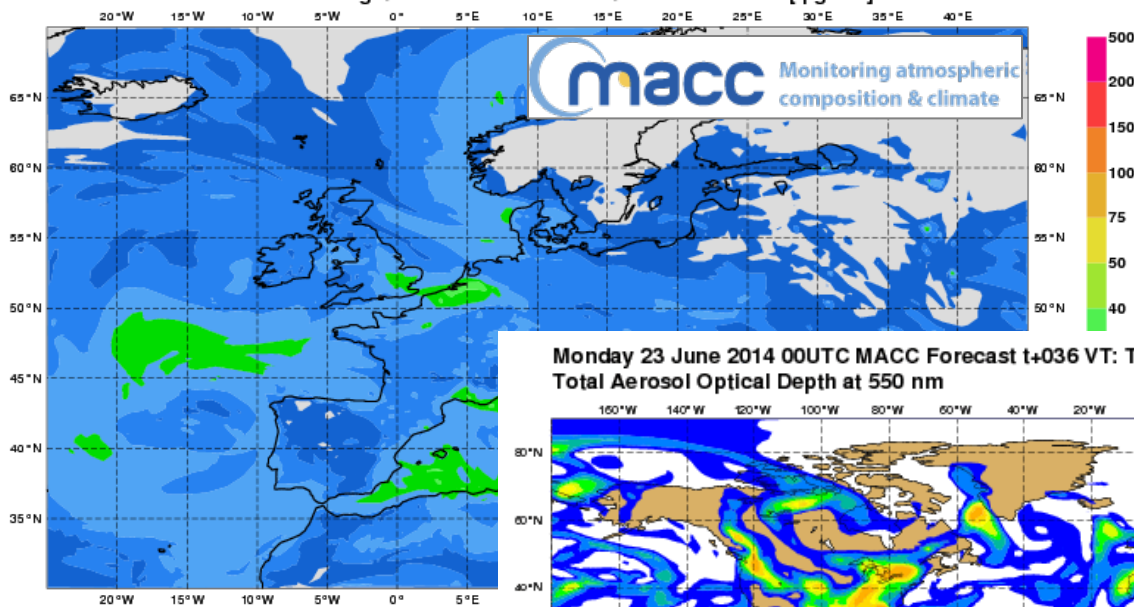
MACC-II/Copernicus Atmosphere Service

High-level architecture



MACC-II/Copernicus Atmosphere Service

Sunday 22 June 2014 00UTC MACC-RAQ Forecast t+000 VT: Sunday 22 June 2014 00UTC
Model: ENSEMBLE MEDIAN Height level: Surface Parameter: PM10 Aerosol [$\mu\text{g}/\text{m}^3$]

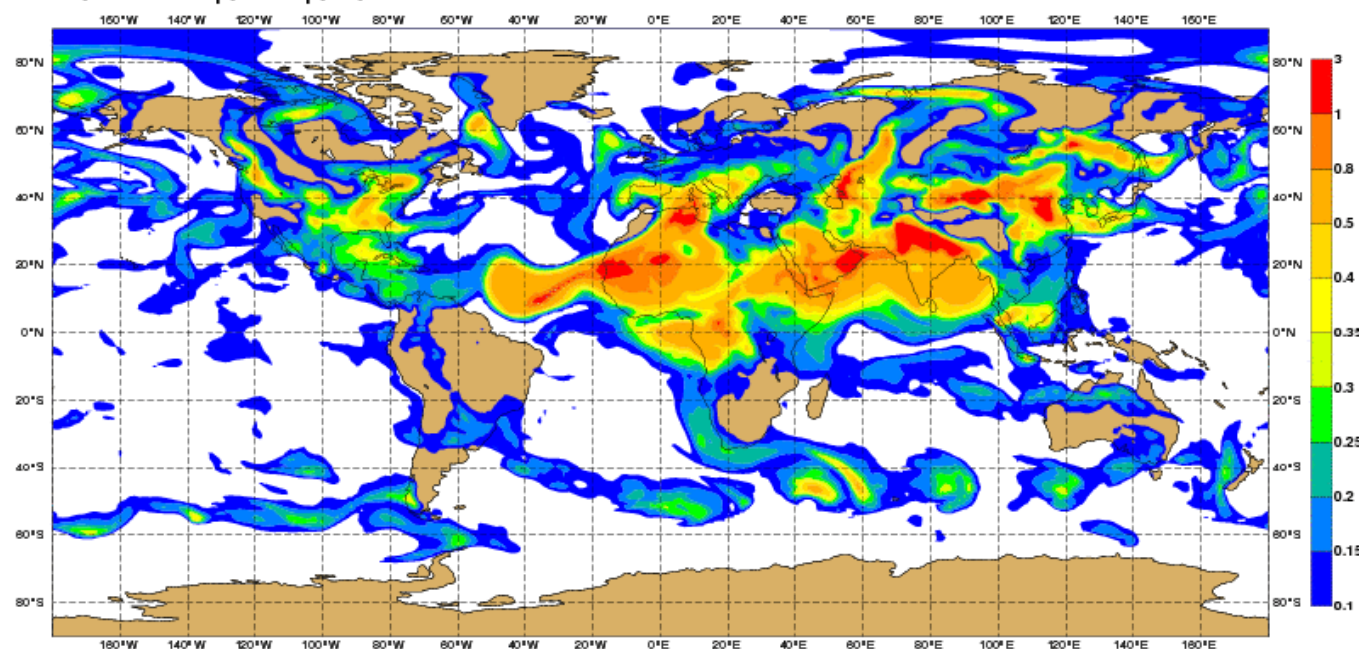


Regional forecast ideal for
airTEXT and other ADMS-
Forecast systems in Europe

Global forecast
means we can
implement ADMS-
Forecast anywhere

CERC

Monday 23 June 2014 00UTC MACC Forecast t+036 VT: Tuesday 24 June 2014 12UTC
Total Aerosol Optical Depth at 550 nm



NCEO/CEOI-ST Joint Science Conference, Sheffield University, 26th June 2014

CERC in China

- CERC China based in Beijing
- ADMS-Urban and ADMS-EIA (special version of ADMS-Urban) approved for use in China by Chinese authorities
- Both models have a Chinese language GUI
- Around 100 institutes across China use ADMS-Urban or ADMS-EIA



Forecasting air quality in Beijing

- In August 2012, CERC and CERC China were jointly awarded the contract to provide Beijing Municipal Environmental Monitoring Centre (BMEMC) with an air quality forecasting system
- In September 2012 a team from CERC and CERC China installed the forecasting system at BMEMC and delivered a week-long training course in ADMS-Urban, EMIT and the other components of the system



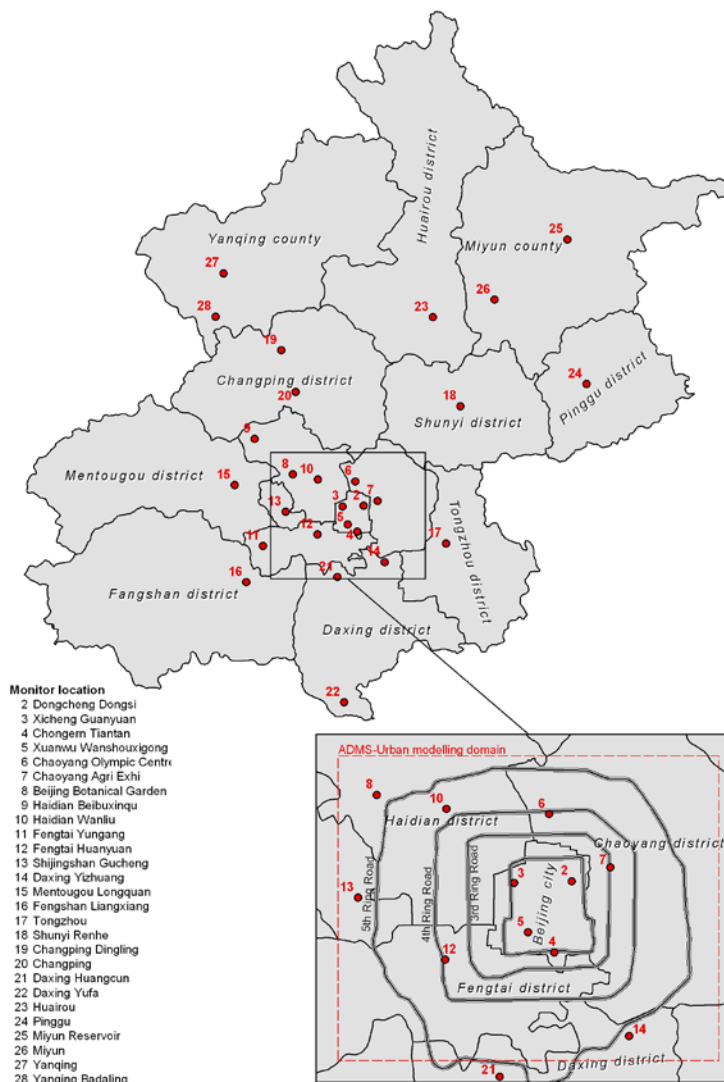
Using MACC-II global product as background

- Beijing system uses the MACC-II web coverage service (WCS) to extract data for the Beijing region



This system in our experience is quick and efficient, allowing us to only download the data we require

- Our own NO₂, PM₁₀ validation of individual MACC-II grid points against nearby BMEMC *in situ* data showed good agreement; SO₂ overestimated – maybe due to outdated emissions – raised with MACC-II team
- Beijing system is not yet running with real local emissions data; we expect BMEMC to implement local emissions this year



Concluding remarks

Local air quality forecasting systems like *airTEXT* can deliver services that reduce the harmful impacts of poor air quality on human health

Local air quality forecasting services need regional or global air quality forecasting services to provide boundary conditions

MACC-II/Copernicus Atmosphere Service, which assimilates broad range of satellite data, provides sustainable global and regional air quality services

Thank you for your attention