Atmosphere monitoring Service (MACC/-II)
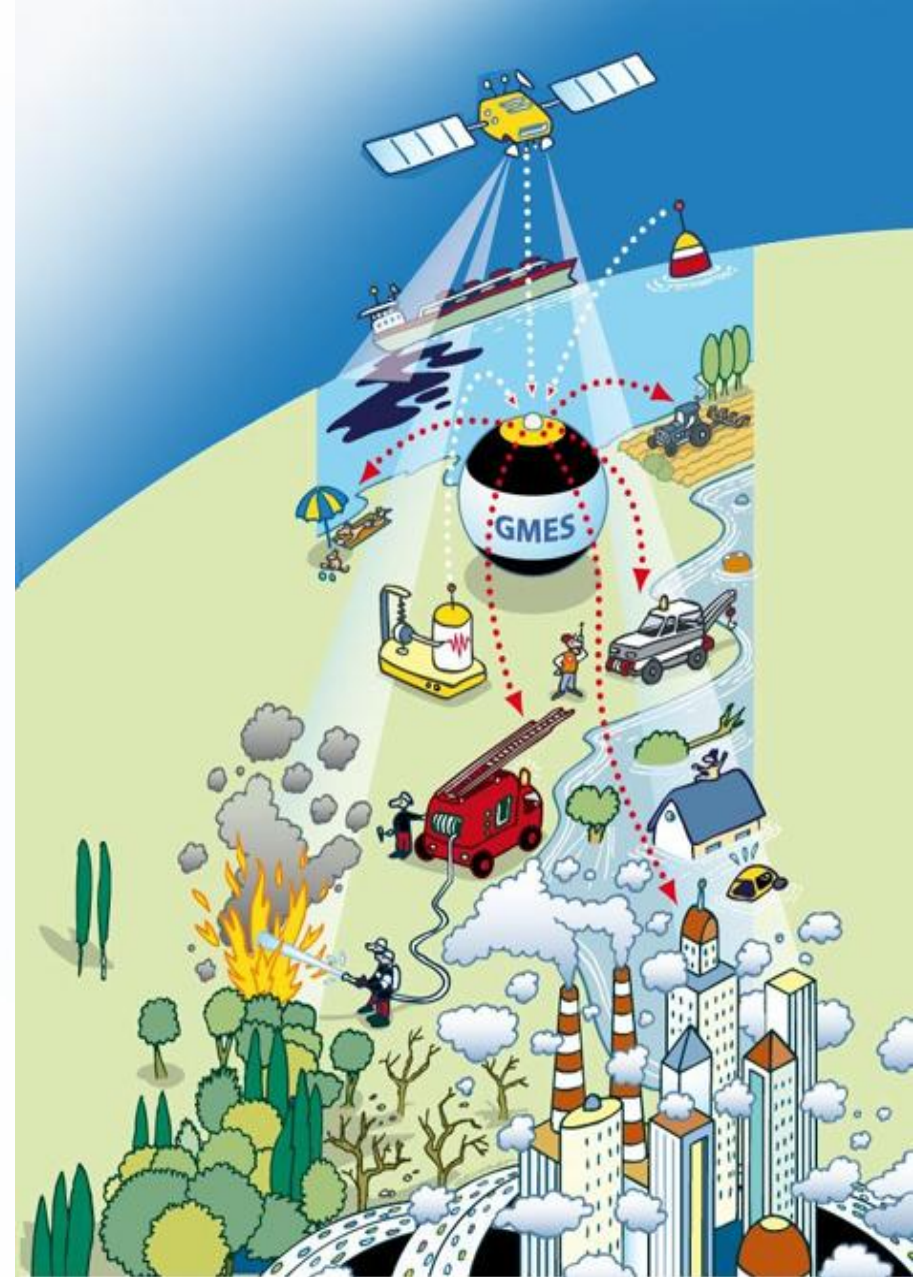
Access to GMES services

Vincent-Henri Peuch, ECMWF
MACC-II co-ordinator
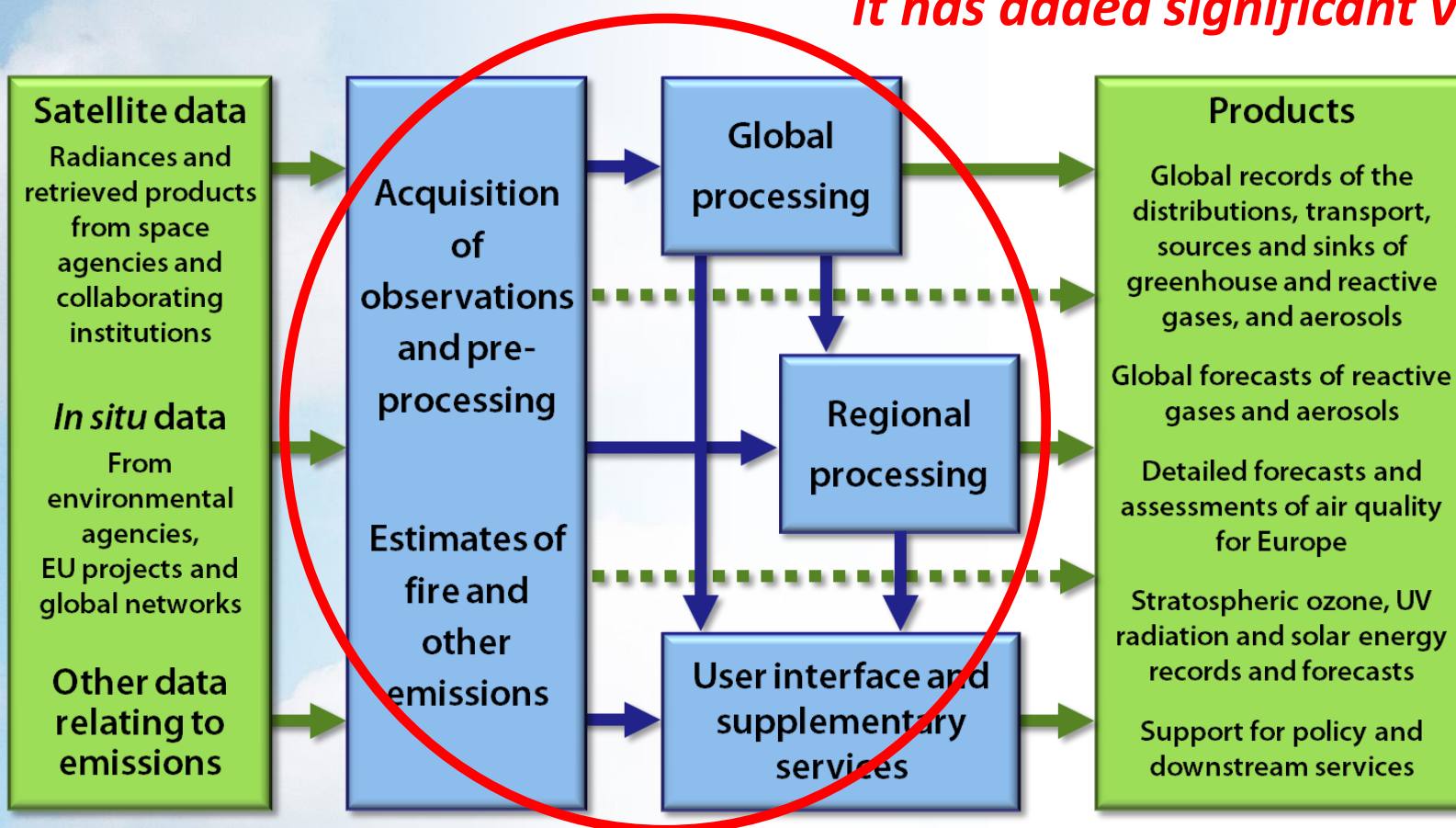
Helping Europe respond to **climate change** and **poor air quality**

- **MACC/MACC-II (Monitoring Atmospheric Composition and Climate) is a component of GMES program focusing on atmospheric composition**

- **As for the other thematic areas, the atmospheric programme comprises**

  - developing operational space-based observation of constituents (Sentinels 5P, 4 and 5)
  - strengthening the provision of *in situ* observations (GISC)
  - developing and operating associated data and information services (MACC, MACC-II)
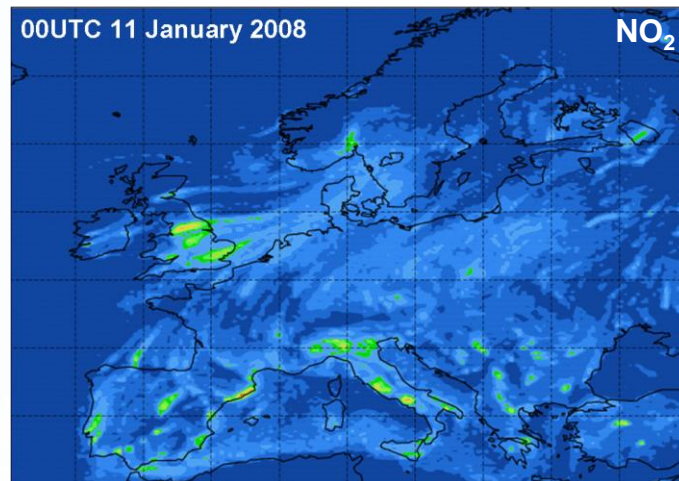 - downstream (PASODOBLE, ENDORSE, OBSAIRVE…) and supporting projects (NORSE….)

Project structure and main products

MACC/MACC-II only distributes data and information for which it has added significant value.

Satellite data — Radiances and retrieved products from space agencies and collaborating institutions

In situ data — From environmental agencies, EU projects and global networks

Other data relating to emissions

Acquisition of observations and pre-processing

Estimates of fire and other emissions

Global processing

Regional processing

User interface and supplementary services

Products — Global records of the distributions, transport, sources and sinks of greenhouse and reactive gases, and aerosols

Global forecasts of reactive gases and aerosols

Detailed forecasts and assessments of air quality for Europe

Stratospheric ozone, UV radiation and solar energy records and forecasts

Support for policy and downstream services
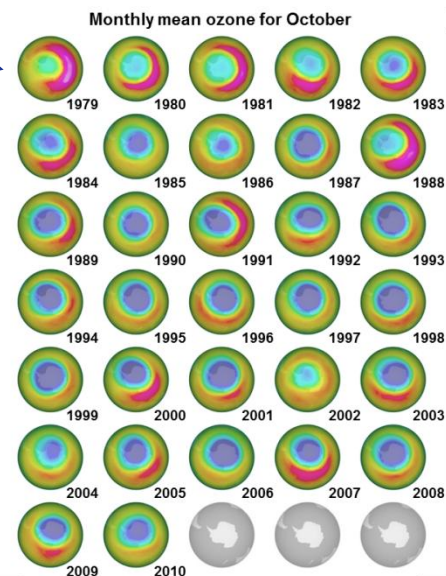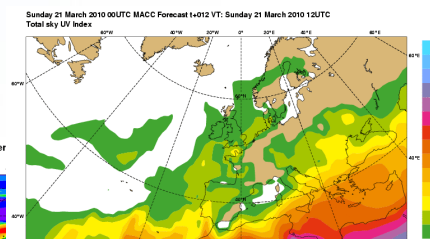
http://www.gmes-atmosphere.eu
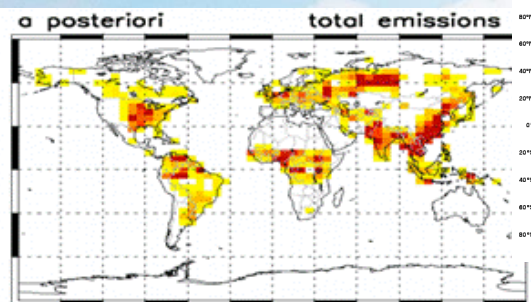

Air-quality forecast

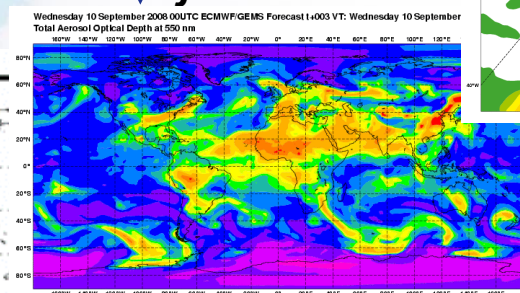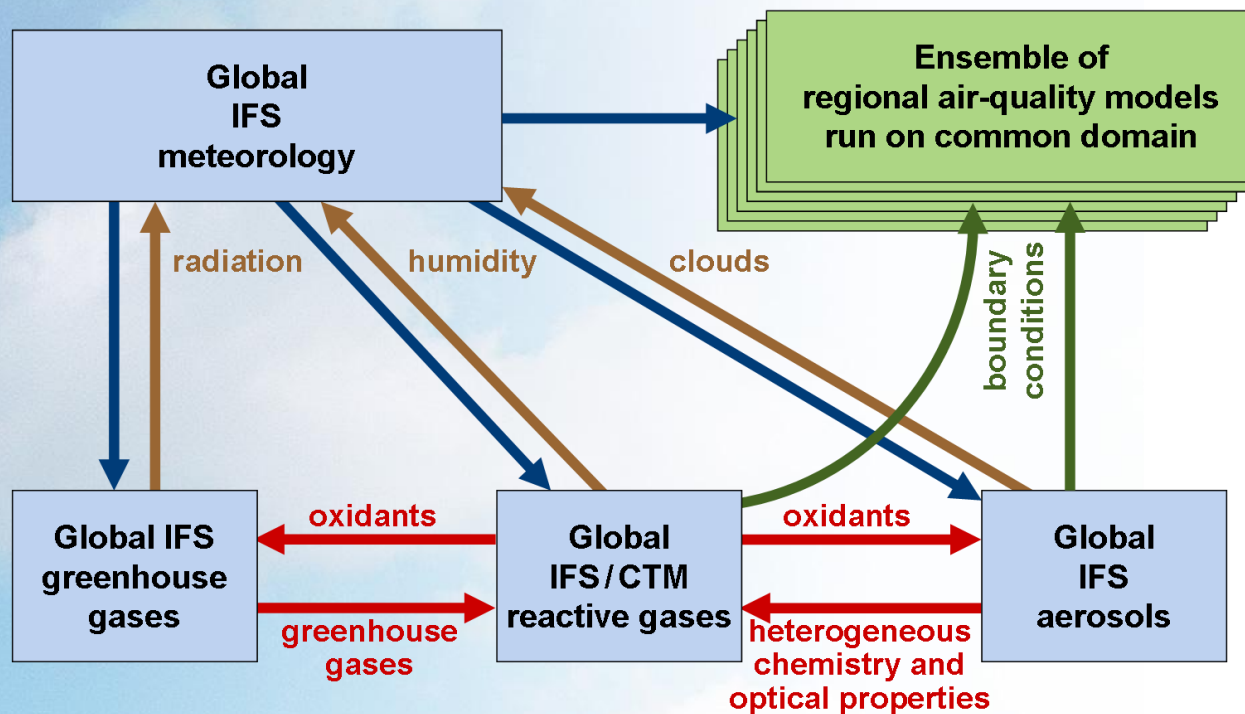**Stratospheric ozone records**

UV index

Monthly methane emissions

Aerosol forecast

A multi-model ensemble of regional chemistry and transport models distributed in 6 European countries.

3 streams :
- NRT analyses and forecasts
- Delayed mode (6m-1y) analyses
- Re-analyses 2003-…

A global integrated system based on ECMWF meteorological model and including composition.

Worldwide users
(ECMWF servers access by institutions, Nov. 2011)

Country		Country		Country		Country	
China	103	Portugal	10	Austria	3	Cameroon	1
Germany	67	Australia	9	Chile	3	Congo DR	1
UK	64	Norway	9	Colombia	3	Czech R	1
France	57	Turkey	9	Ghana	3	Estonia	1
USA	52	Belgium	8	Malta	3	Hong Kong	1
Italy	24	Canada	7	Morocco	3	Iraq	1
Spain	24	Lithuania	7	New Zealand	3	Jordan	1
India	23	Taiwan	7	Slovakia	3	Kenya	1
Japan	18	Ukraine	7	South Africa	3	Latvia	1
Netherlands	18	Poland	6	Bangladesh	2	Malaysia	1
Brazil	16	South Korea	6	Ethiopia	2	Mexico	1
Russia	13	Denmark	5	Israel	2	Niger	1
Romania	12	Viet Nam	5	Pakistan	2	North Korea	1
Greece	11	Bulgaria	4	Slovenia	2	Panama	1
Indonesia	11	Finland	4	Thailand	2	Peru	1
Sweden	11	Ireland	4	Albania	1	Singapore	1
Switzerland	11	Saudi Arabia	4	Algeria	1	Tunisia	1
Iran	10	Argentina	3	Armenia	1	Venezuela	1
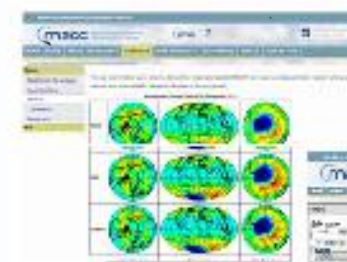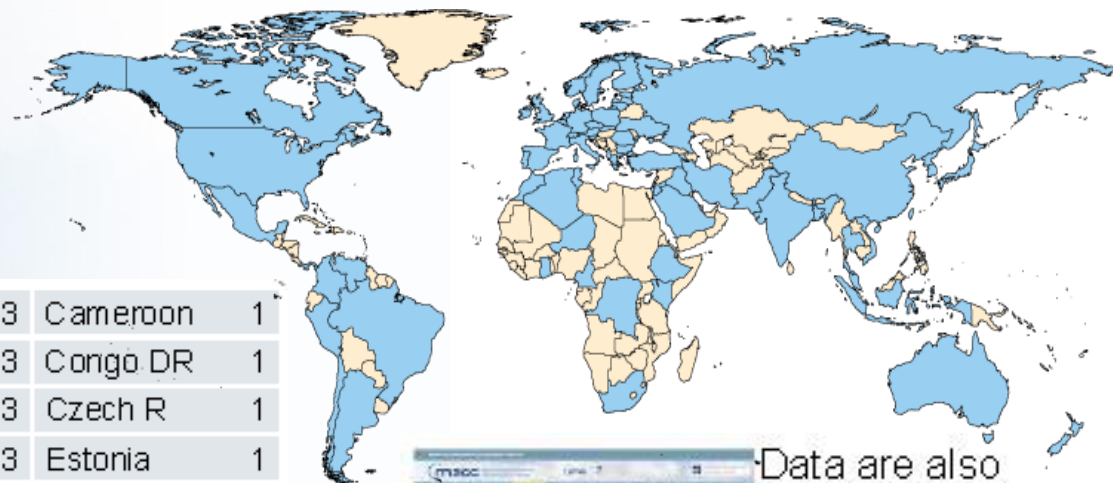
Data are also served by other project partners

~25 Service Level Agreements

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SEVENTH FRAMEWORK PROGRAMME

Environmental "events" and MACC users

MACC Eyjafjallajökull Plume Forecast for Friday 23 April 2010 00 UTC
Current London VAAC estimate of injection height

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2010	818	1621	18750	98077	2.84 GB
Feb 2010	999	1837	14756	82108	3.90 GB
Mar 2010	1161	2317	15767	114744	2.39 GB
Apr 2010	4806	7951	38474	396396	101.12 GB
May 2010	10165	15377	101606	1192177	41.86 GB
Jun 2010	1397	2580	11102	111254	5.01 GB
Jul 2010	1206	2210	14792	101979	3.41 GB
Aug 2010	1290	3068	28753	161290	9.44 GB
Sep 2010	1197	2839	26084	133639	5.10 GB
Oct 2010	1284	2536	18732	118653	4.34 GB
Nov 2010	1662	3292	22209	129719	7.18 GB
Dec 2010	1287	2387	16671	89938	4.54 GB
Total	27272	48015	327696	2729974	191.13 GB

MACC information pages for the Eyjafjoll (Island-mountain) eruption drew a lot of interest with more than 10,000 unique visitors in May 2010.

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Users and data policy

Caveat: FP6 or FP7 (RTD or CP/CSA) projects are not an ideal context for addressing fully these aspects. In particular, it is not possible to commit beyond the time span of each individual project and significant latitude is only available when submitting a new project. Yet, it makes some aspects simpler.

Two types of user interaction:

- Interaction through **Service Level Agreements**, where a user and a service line leader agree terms and conditions, including quality insurance (within the framework of free and open access to data produced by GMES services, and using as much as possible a standard "template"). The primary goal is to set up and maintain feedback loops, not at all to restrain access in any way.

- **Open data server**, with minimal "questionnaire" for registration (e-mail, name, affiliation and purpose of use of the data) . An internal agreement loop initially set-up has been removed (criteria?). It is requested (but not enforced) that MACC/MACC-II, EC/FP7 and GMES are referenced in communication of any form.

Atmospheric composition data and meteorological data

Meteorological data (forecasts, analyses, re-analyses) is out of the scope and funding of GMES. Thus, different data policy apply to atmospheric composition (or related) "GMES Service" data and to meteorological data:

- **GMES services data** are free and open. Most products are available in graphical form on the atmosphere Service website. Numerical data are available mainly on three data servers/archives: one at ECMWF (global products and back-up for regional products, ftp server), one at Météo-France (regional products, ftp server) and one at Jülich Research Centre (additional global products, OGC server).

- Access to **meteorological data** follows the data policy of each provider. Data policies and views on the economical model for meteorology are diverse throughout Europe and, in particular, the data policy of ECMWF results from the decisions of its Council (composed of its Member States).

Users and data policy

- **'Full' access**
  - National Met Services of Member and Co-operating States
  - Those licensed by the NMSs (private sector service providers and end users)
  - Those licensed directly by ECMWF (outside Europe)
- **Restricted or time-limited access**
  - By license to WMO NMHSs for 'Official Duty' use
  - Subsets labelled "WMO-additional" (to NMHSs worldwide) and "WMO-essential" (freely available)
  - Disasters / humanitarian needs / developing countries
- **Graphical products available via www.ecmwf.int**
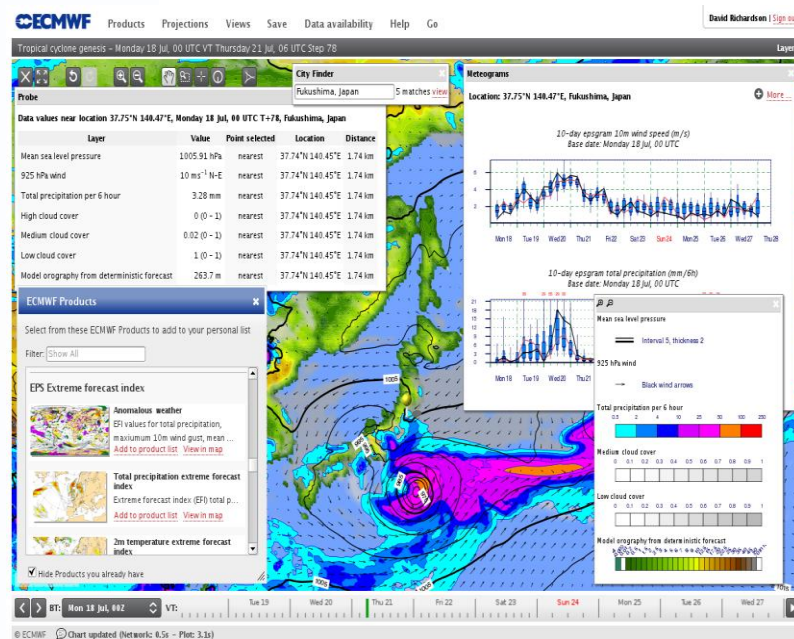
Conclusions

- MACC and its successor project MACC-II (until July 2014) **deliver products** on the regional and global scales and is already in readiness for the operational phase of GMES atmospheric services.

- MACC is the effort of an **entire consortium**. Only a limited number of partners actually run pre-operational systems and deliver products to users, but we rely on wider research activities (developments, algorithms, validation…) that are essential to maintain at the best international level, very much like it is the case for operational NWP. The concept of "service chain" is important.

- MACC/MACC-II have implemented a **free and open data policy** for the products developed and operated in their context, though FP European funding requires co-investing by projects' beneficiaries.

- There is a **grey zone** between "atmosphere services" and "meteorology", making it sometimes difficult to understand for users in need of elements from both.

- The lack of visibility and associated uncertainty on the **sustainable funding** phase is a major to issue to really go forward with the GMES Data Policy.

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Website:
http://www.gmes-atmosphere.eu

Contact:
info@gmes-atmosphere.eu

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The MACC-II Portfolio

Stream	Scale	Category	Product
NRT and forecast	Global	GHG	**Forecasts of key global greenhouse gases**
		RG	**NRT analyses and forecasts of global reactive gases**
			SACADA assimilated NRT global stratospheric ozone
			BASCOE assimilated NRT global stratospheric ozone, HNO_3, H_2O, HCl, N_2O, CH_5
			TM3DAM global total ozone monitoring and forecast
			NRT ozone & NO_2 data from OMI, SCIAMACHY, GOME & GOME-2
		Aerosol	**NRT analyses and forecasts of global aerosol**
			SYNAER NRT aerosol & PM data
			ATSR-DV global aerosol
			SEVIRI aerosol data
		Emissions	**NRT Biomass burning emissions based on observed Fire Radiative Power (FRP), GFASv0 and v1.0**
		Solar	**Global solar UV index monitoring and forecast**
	Regional	Aerosol	**Dust NRT regional monitoring based on satellites & the Aeronet network**
			ATSR-DV NRT aerosol over Europe
		AQ	**European-scale ensemble hourly AQ analyses of the previous day and forecast up to 72h ahead**
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (CHIMERE)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (EMEP)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (EURAD)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (LOTOS-EUROS)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (MATCH)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (MOCAGE)
			European-scale hourly AQ analyses of the previous day and forecast up to 72h ahead (SILAM)
			Web-oriented warning & information system about health impacts of poor AQ (preoperational)
			Origin of forecasted pollution episodes (graphic presentation)
			Regional AQ forecasts with source-allocation capabilities (web-based)

Main products, Obs. products, *Additional products*

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SEVENTH FRAMEWORK PROGRAMME

The MACC-II Portfolio (continued)

Stream	Scale	Category	Product
Delayed	Global	GHG	**Reprocessed analyses of global GHG, RG & aerosol**
			Global CH$_4$ source & sink inversions
			Global CO$_2$ source & sink inversions
			Stand-alone CO$_2$ & CH$_4$ retrievals from AIRS & IASI over 2003-2010
		Aerosol	**Reprocessed analyses of global aerosol**
			SYANER aerosol & PM data record
		Emissions	**Updated inventory of global emissions based on RETRO**
			Biomass burning emissions based on observed Burnt Area for 2010 (GFED3.1)
		Solar	**HELIOCLIM archive of surface solar irradiance**
			SOLEMI archive of surface solar irradiance
	Regional	AQ	**Library of test cases for AQ emergency scenarios**
		Emissions	**Updated inventory of European emissions by TNO**
Reanalysis	Global	GHG	**Extension of GEMS global GHG reanalysis to 2009**
			Global GHG reanalysis over 2003-2010
		RG	**Extension of GEMS global RG reanalysis to 2009**
			Global RG reanalysis over 2003-2010
			SACADA, BASCOE, TM3DAM assimilated historical global stratospheric ozone and other species
		Aerosol	**Extension of GEMS global aerosol reanalysis to 2009**
			Global aerosol reanalysis over 2003-2010
		Emissions	**Biomass burning emissions based on observed Burnt Area (BA) for 1997-2009 (GFED3.1)**
			Biomass burning emissions based on assimilated Fire Radiative Power (FRP) since 2003 (GFASv1.0)
	Regional	AQ	**Ensemble regional AQ reanalysis (hourly) for Years 2007, 2008 & 2009**
			Regional AQ reanalysis for Years 2007, 2008 & 2009 with CHIMERE, EMEP, EURAD, LOTOS-EUROS, MATCH, MOCAGE, SILAM
Other	G. + Reg.	Technical	*Web-based graphical display and supply of data from global MACC production, monitoring and validation*
	Regional	AQ	**Toolbox for AQ emergency scenarios (via web)**

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SEVENTH FRAMEWORK PROGRAMME