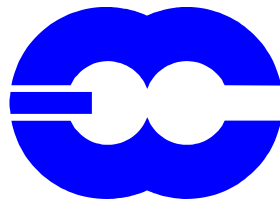


# Status of the HALO

Harmonised coordination of Atmosphere,  
Land and Ocean integrated projects of the  
GMES backbone

Johannes Flemming & Tony Hollingsworth

ECMWF



# Talk Outline

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- HALO objectives and scope
- HALO thematic analysis
  - Satellite data
  - Data infrastructure
  - Carbon Theme
- Encourage workshop discussions



# HALO is a GMES Specific Support Action (SSA)

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- GMES emphasises
  - Implementation of operational services (2007/8)
  - Use of satellite data and in-situ observations
  - Data integration and information management
  - Policy advise at government and local level
- "SSA aim to contribute actively to
  - the implementation of activities of the FP project,
  - the analysis and dissemination of results or the preparation of future activities ... "



# HALO-Objectives

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'Optimising the efficiency of interaction of the **Atmosphere**, **Land** and **Ocean** segments by formulating **agreed recommendations** to the IPs and GMES steering groups in areas of:

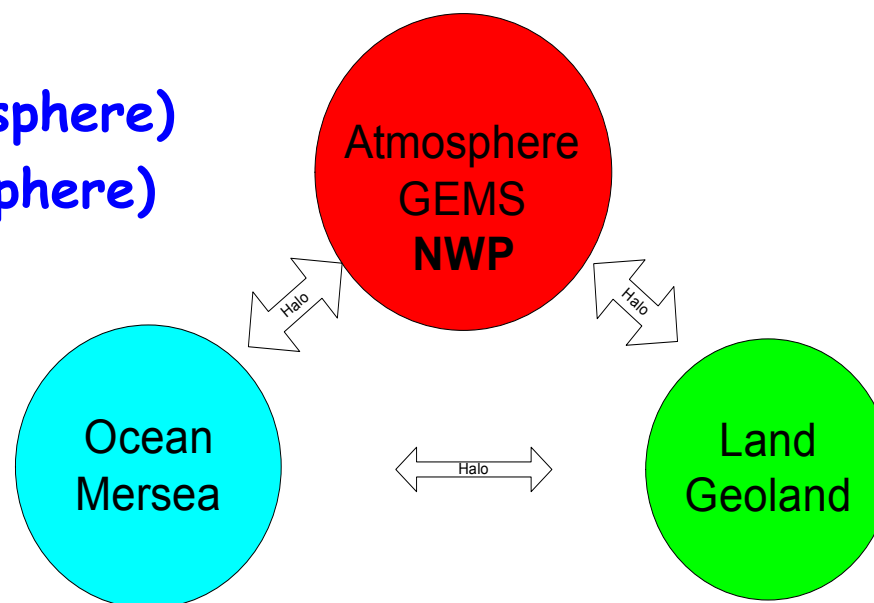
- Scientific thematic analysis and coordination
- Coordinated solutions to shared problems
- Recommendations to the transition to operational status '



# HALO-Partners

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- **GMES Integrated Projects**
  - ECMWF (lead + GEMS + Meteorology )
  - Infoterra (geoland)
  - IFREMER (MERSEA)
- **Industrial partners**
  - Alcatel (Ocean - Atmosphere)
  - Astrium (Land - Atmosphere)



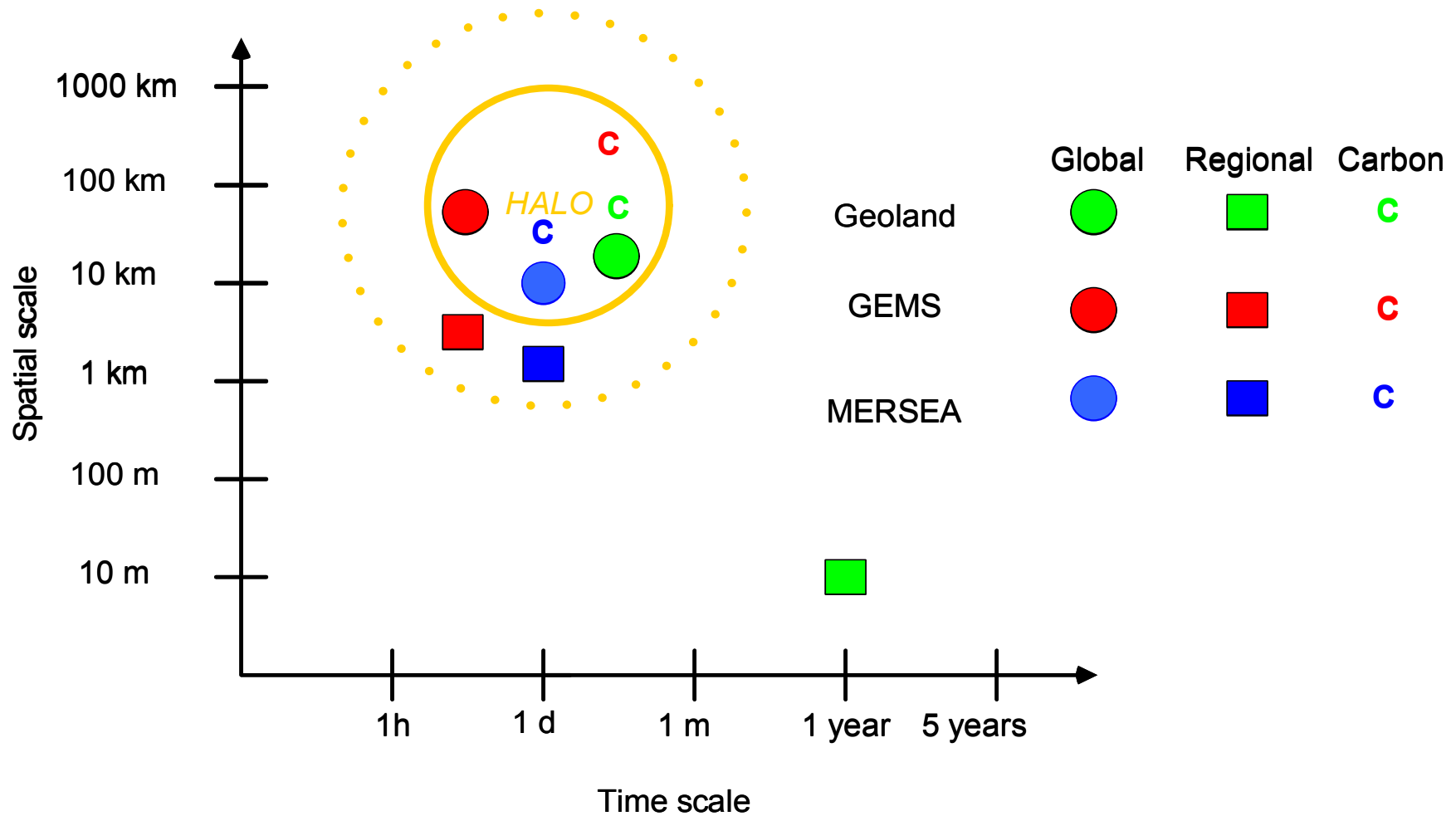
# The Proposal: HALO-study Logic

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- 1. Thematic analysis (ECMWF, IFREMER, infoterra)**
  - Scientific requirements (Common data and interface identification)
  - Scientific improvements (Model enhancement)
- 2. Candidate solution on data acquisition, sharing & dissemination**
  - Ocean - Atmosphere (Alcatel)
  - Land - Atmosphere (Astrium)
- 3. Assessment, consolidation, validation & HALO progress dissemination (ECMWF)**
- 4. Recommendation & Implementation Plan**



# Spatial and Temporal Scales of HALO IPs



# Thematic Analysis: Scope of HALO Work

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- Geolands - ONC and CSP
- MERSEA global and ocean scale models
- GEMS global production system
- Regional activities not covered so far
- Focus on demands of **operational** global modelling and data assimilation activities
  - Data and product needs and exchange
  - Infra-structure for data transfer
  - Future developments





# Common Features of IPs Covered by HALO

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- Dynamic models and data assimilation (global & nested)
  - ONC and GEMS systems integrated in ECMWFs model
- Operational production chain
  - Forecasts and re-analysis (ONC and GEMS)
  - Update frequencies from days to weeks
- Use of satellite data
  - MODIS, SEVIRI, AVHRR, MERIS, AATSR, SMOS
- Use of in-situ data
  - Mainly validation, Assimilation in Mersea (Argos, VOS ...)
- Use of meteorological forcing
- Contributions to carbon theme



# Thematic Analysis: Data needs - Examples

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- Direct product exchange
  - ONCs Carbon fluxes for GEMS
  - GEMS Aerosol for atmospheric corrections (all) and iron intake (Mersea)
  - MERSEAs SST for NWP
  - Seasonal atmospheric forecast for geolands OFM (crops yield forecast)
- Unaccomplished data needs
  - River input data for MERSEA
  - Aerosol emissions (sea spray, fires, wind blown) for GEMS
- Common data
  - Meteorological forcing fields (from ECMWF, UK met office)
  - Satellite data
  - In situ (CO<sub>2</sub> and carbon fluxes)
- When is data available and what is its quality ?



# Thematic Analysis - Satellite data

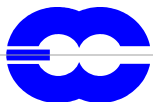
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- Commonly used instruments
  - MODIS, SEVIRI, AVHRR, MERIS, AATSR, SPOT, SMOS, ...
- Different strategies in satellite data handling
  - Dedicated retrieval centres & product assimilation in model centres (MERSEA)
  - Assimilation of radiances & independent retrieval (GEMS)
  - One product centre (core service) & assimilation of products (ONC geoland), and analysis techniques (OFM, OLF)
- Satellite missions in GEMS operational phase (after 2007/8)
  - Large data volumes to be transferred (600 MB/day Modis)
  - Envisat, Aqua, Terra, Aura, Jason-1 ... at end of lifetime
- Use of long term Meteo-Missions
  - MetOp (2005 - ), MSG (2002 - ), NPP (2006 - ), NPOESS



# Example: Availability of Satellite Vegetation Products

Instrument	1981-5	1986-90	1991-95	1996-00	2001-5	2006-10	2011-5	2016-20	2021-5	2026-30	2031-5	
AVHRR	NDVI -NOAA series											
AVHRR							Possible NDVI- METOP / EUMETSAT					
VEGETATION Spot					SPOT							
MERIS-Envisat					MGVI							
MODIS- TERRA					LAI							
MODIS-AQUA					LAI							
VIIRS NPP & NPOESS						NDVI						
VIIRS NPP & NPOESS						LAI						



# Infrastructure Analysis - Industrial Partners

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- Are links between IP well established for data exchange ?
  - Access to GTS or other network solutions
  - Live access servers (opendap protocol) from ocean community useful for the rest
- Are IPs able to handle large data volumes from satellite streams in a timely manner ?
  - GEMS will be able since it is connected to ECMWF resources
- Common operational access to in-situ data from many streams ?
  - GEMS air pollution data
  - CO<sub>2</sub>-flux data for Geoland and GEMS



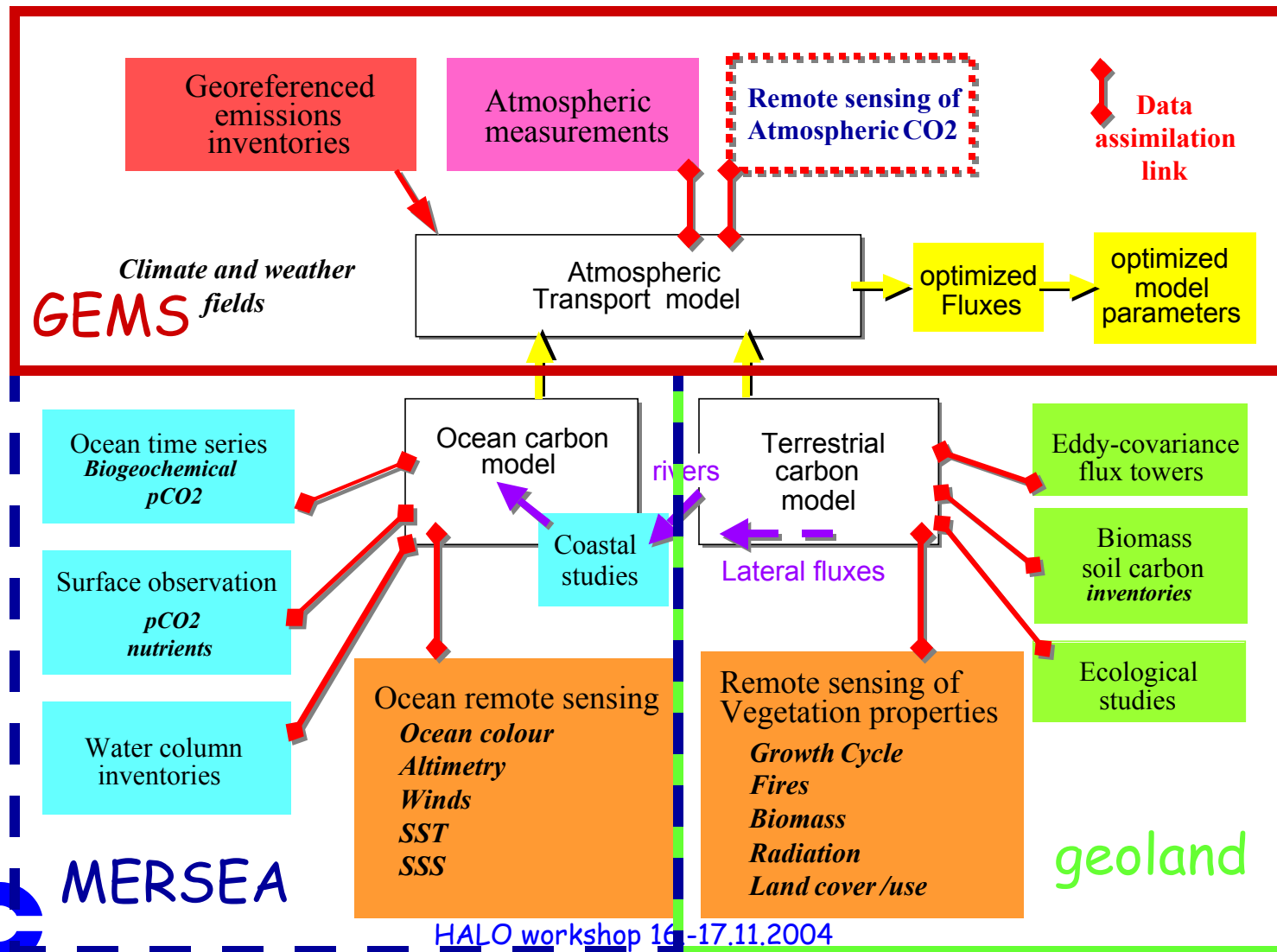
# Thematic Analysis: Scientific Improvements

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- **Model enhancement due to new data available**
  - Aerosol from GEMS - retrievals, iron input
  - Emissions from biomass burning
  - Wave status from ECMWF for air sea exchange
- **Common retrieval of satellite products**
  - Aerosol, clouds, precipitation for atmospheric corrections
- **Common use of Meteo-missions (MetOp, MSG)**
- **Assembly of Global Carbon data assimilation system**
- **Links to other projects (FP5 and FP6)**



# IGOS Carbon theme report: A Global Carbon Cycle Data Assimilation System



# Carbon Theme in GMES

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- Contributions from **Geoland** (ONC), **GEMS** and **MERSEA** and **PROMOTE**
- **Global full natural carbon accounting modelling system at ECMWF**
  - Analysis of global biospheric  $CO_2$  fluxes, globally at  $1/2^\circ$  resolution, released every 3 or 6 months
- **Operational DA system to monitor  $CO_2$  concentrations from remote sensing at ECMWF**
  - 7 -  $15^\circ$  resolution in a tropospheric column for tropics and mid-latitudes.
- **An operational system to estimate surface carbon sources and sinks, by atmospheric inversions based on  $CO_2$  fields and observation.**
- **A Carbon Cycle Data Assimilation System (CCDAS) to attribute land carbon sources and sinks to causes.**
- **Biogeochemical modelling in global and basin scale models**
- **Ocean colour retrieval and assimilation**
- **No operational commitment due to missing validation**





# Topic Matrix for Working groups

	MERSEA	GEMS	Geoland
<b>Aerosol:</b>	<ul style="list-style-type: none"><li>• Atmospheric corrections</li><li>• Natural emissions (Fires and Wind blown dust)</li></ul>		
<b>Satellite-Data</b>	<ul style="list-style-type: none"><li>• Common use of instruments</li><li>• Available missions beyond 2007</li></ul>		
<b>Data infra-structure</b>	<ul style="list-style-type: none"><li>• Assessment of links between IP</li><li>• Implications of INSPIRE</li><li>• Data formats</li></ul>		
<b>Carbon - Cycle</b>	<ul style="list-style-type: none"><li>• Assemble building blocks of carbon assimilation system according to IGOS</li></ul>		

- „Working group - Potential Topics“ in your WS pack



# Conclusion

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- HALO is a specific **support** action
- HALO reports & discussion papers ready:
  - GEMS, MESREA, geoland, ECMWF, Carbon cycle
- Encourage workshop discussions
  - Data demands and infrastructure
  - Contributions from Alcatel and Astrium
  - Carbon Data Assimilation System
  - Aerosol (corrections and natural emissions)
  - Next steps for HALO
  - Future extension of GMES
- Looking forward to workshop outcome



# Example:

## Common satellite instruments

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### Common (data - user) Matrix

Data Type	Atmosphere	Ocean	Land
VIS & NIR multi spectral Imagers (Modis, Meris, AVHRR)	Aerosol	Ocean colour	Land cover NDVI fAPAR
Radar Altimeter (JASON, ENVISAT)	Ocean Surface Winds	Sea level	Ice cover
SAR	Ocean Winds	Ocean Waves	High resolution Land cover



# Deliverables (11/2004)

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- **Draft reports & papers**
  - ECMWF, MERSEA, GEOLAND, GEMS
  - Project overview
  - Thematic analysis of Data and products
  - Contribution to the carbon theme
- **Main focus on**
  - Thematic analysis and cross cutting
  - Products access
- **Less focus so far on**
  - Data quality, availability schedules, data exchange
- **HALO web site, all documents are there**
- **Workshop 2004**
  - Discussion among HALO partners
  - First statement of task for industrial partners



*Thank you!*

[http://www.ecmwf.int/research/EU\\_projects/HALO](http://www.ecmwf.int/research/EU_projects/HALO)

