RESEARCH DEPARTMENT MEMORANDUM

To:	3rd HALO Workshop Participants
Copy:	HR
From:	J.W. Kaiser
Date:	17 January 2007
Subject:	**Minutes of 3rd HALO Workshop**

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1 Introduction

The 3rd and final HALO workshop was held on 4 and 5 December 2006 at ECMWF in Reading, UK. The industrial partners in HALO presented the candidate solutions that they recommend for the data transfer infrastructure between the future global atmosphere, land, and ocean monitoring systems in GMES. The scientific partners in HALO identified scientific key developments that will be required at the interfaces of the three monitoring systems. The HALO findings were discussed intensively by the workshop participants, who represented the European Commission, European Space Agency, and interested scientific and commercial institutions. The results of the discussions will be incorporated in the final project documentation.

The HALO findings are summarised in draft versions of the documents "Recommendation Document, including Common Interface Candidate Solutions" and "Final Scientific Report". These documents and the presentations held at the workshop are publicly available on the HALO workshops web page <http://www.ecmwf.int/research/EU_projects/HALO/workshops.html>.

This document summarises the main contributions to the discussions at the workshop, slightly re-arranged to thematic order.

2 Minutes of the Discussions

(References to the participants are abbreviated by their initials; see Section 5 “List of Participants”.)

2.1 GMES Context

Framework Program 7 of the EU will become public on 22 December 2006.

A GSE co-location is planned by ESA for 6-8 March 2007 at ESRIN.

2.2 Infrastructure Candidate Solutions

2.2.1 Technical Aspects

BOSS4GMES uses the “Service Support Environment” (SSE) for data sharing. It provides service chaining and works with all data transfer systems. (HdG)

If GMES uses the WMO Informations System (WIS) and larger bandwidths have to be allocated due to this, then the additional cost will have to be accounted for. The cost sharing must then be discussed with the countries of the user community. The marginal costs of the GMES data transfer are not known yet. (DS)

WIS will be closer to the user than GTS, since data can be pushed directly to the user, while GTS allows only pushing to a national meteorological service, which has to forward the data to the user subsequently. (DS)

Satellite observations are being delivered in an approximately continuous data stream while model outputs become available in large chunks of data at a certain point in time. Therefore, model outputs require much larger data transfer bandwidths than satellite observations of similar volume per day. (BR)

Currently, MERSEA uses the internet for project-internal data transfer and the RMDCN (not GTS) to obtain meteorological data. If the marine core service is integrated in the WIS, then it should be a DCPC to be able to provide quality control. (YD)

Interoperability of WIS for atmospheric data and SEADATANET for oceanographic data can be achieved easily. Convergence of the systems would be more difficult because of the design choices incorporated in the systems. (GM)

WIN uses so-called “CIP”s to collect in-situ data. They are physically existing hardware and can exchange data amongst each other. The data providers need to install WIN service software. Thus WIN requires the data providers of in-situ observations to agree the use of a CIP. This is a specific issue for land monitoring data. (JMP/FL)

In-situ land data are currently not included in WIS. To be included the data provider and customer would need to register with the national centres. It would be helpful if GMES would federate the land data providers and users EU-wide before registration with the national centres. (DS)

The land community is represented via GTOS in IGOS. This would enable input to WIS. The EEA may also federate the land date requirements for the use of the WIS by EU institutions.

HdG stresses the importance of use cases for establishing whether the recommendations meet the requirements of the end applications. However, HALO is not focussing on the end users or even intermediate service providers but instead on the interaction between the core services. (AH)

The GEMS data policy needs to account for the commercial value of the data. (WC) The possibility for industry to earn money is essential for the sustainability of GMES. (CZ)

Comments on the presentation “Infrastructure Candidate Solutions”:

- page 63: interchange the first two bullets and mention the ESA study and the “Service Support Environment” (SSE). (AH)

- page 65: The IP HUMBOLDT is taking care of the first bullet, i.e. participation in INSPIRE and the OpenGis Consortium. (PB)

GMES should not do a parallel development to WIS but instead use WIS and/or other systems. (CZ)

The land monitoring community uses several data transfer systems. (MT) It concentrates on gridded fields and this aspect seems to be covered by WIS. (JCC)

Achieving convergence of the data models of the Environmental Sciences (ES; ocean & atmosphere) and Geographical Information Systems (GIS; land) is a big challenge, but it seems achievable in the future. (GM, cf. presentation "MERSEA Data Service")

A brief summary document on how WIS and SIMDAT could accommodate the GEMS and MERSEA data streams should be written by B. Raoult, D. Schiessl, and G. Manzella.

The "your room" facility at ECMWF is being demonstrated. It provides each user with his/her own selection of data products, of which the most current versions are being displayed. HdG would consider a similar facility to be ideal for the GMES end users.

The main concern for the marine service is the connection to atmospheric forcing fields. The marine core service can agree to dissemination in WIS, GEONETCast or even an IP-based system. (YD)

Building an information system (in terms of infrastructure implementation) is currently out of scope of GEOLAND 1. GEOLAND 1 stops at the analysis of infrastructure needs and assessment of requirements and a conceptual outline how to plug GEOLAND services into existing information systems (including some upgrading/enhancement). The aim is to make best use of existing elements. The implementation will be a key issue for GEOLAND 2. (MT) MERSEA and GEOLAND are currently building their own information systems, based on existing elements. HALO recommends that a dialogue on the meta data standards ensures interoperability of the systems. Common meta data standards seem feasible for the atmosphere and land monitoring systems. The land monitoring data appear to be still too diverse for agreeing common meta data standards with the atmosphere and ocean monitoring services. Carbon data, MOZAIC data, tall tower data, and others will be used by both the land and atmosphere monitoring systems. (AH)

2.2.2 Data Policy Aspects

The INSPIRE directive has passed through the reconciliation process between the European Parliament and Commission. It is expected to make a large impact on the technical side, but a small one on the current charges for data access. (HdG)

The WMO data policy for meteorological data distinguishes "essential" and "additional" data. The former is openly accessible, while the data providers of the latter may impose access restrictions. All data that satisfies one of the following conditions is freely available, except for a handling charge. (DS)

- "climatological" data, which is not valuable for real time weather prediction
- data used for research and education
- data used for emergency response.

Currently no GMES data policy exists. The GMES services will be operational, thus requiring data access beyond the one granted for research. The use for an emergency prediction should be free, too. However, this may encompass all monitoring and forecasting of the GMES core services. (PB)

GMES needs to establish access to the necessary data for its core and downstream services. (HdG)

The GMES data policy needs to be decided by senior decision makers from the EC and the national meteorological services, defining which data is being considered essential and which additional. EEA, GMES, and the weather community need to engage in the GAS Implementation Group to define a viable data policy. They need to identify which data is to be considered essential and additional in the WMO sense and which data are specific to GMES. (AH, PB)

WMO has the following mechanisms for introducing new data definitions and policies: (DS)

- The WMO Executive Council has set up a high-level group, involving the eight WMO technical commissions (spanning weather, climate and water), which is led by the Commission for Basic

Systems (CBS) and supported by the World Weather Watch (WWW) Department. This "Inter-programme Coordination Group" is a scientific/technical body, which also offers entry points to other relevant scientific communities, such as IOC through JCOMM and FAO through the Commission for Agromet, etc. It may have a meeting in March 2007, to which HALO/GMES could be invited.

- Any correspondence related to WIS should be addressed to the Secretary General.
- The Commission for Basic Systems (CBS) is a technical commission with subgroups, which look, amongst others, into meta data definitions and portal structures. It meets biannually and reports to the Executive Council (and the WMO Congress as appropriate). Congress meets quadrennially, with the next meeting in May 2007.

HdG comments that the policy for sharing data in GMES should be discussed at GEO level since GMES is the European contribution to GEO. Thus a duplication of the discussion would be avoided. Furthermore, the easy sharing of data from the data providers to the service providers and further to the end users is of key importance for the development of many downstream services and applications in GMES, and thus for the overall success of GMES.

AH stressed that a high-level approach on project level is required to make progress on a common data policy definition. The implementation group for the atmospheric service will comprise high-level representatives from the key players, including the EEA, the meteorological agencies, and the satellite agencies. The coordination with the ocean monitoring service is not thought to bear critical issues. The coordination with the land monitoring service seems to remain delicate in the near future.

HdG points out one feature of the GSE data policy, which should be avoided in the future: Only legal entities can sign a license for the usage of a product. Therefore, a project that uses the product may require all participants to sign individual licenses. PB replies that the data access project in FP7 will provide solutions to such issues.

2.3 Scientific Aspects of the Monitoring Systems' Interactions

The scientific analyses of the interactions between the integrated projects (IPs) performed by HALO have resulted in actions for the IPs, which have already been incorporated in their work plans, and in specific recommendations for the European Commission, which are being documented in the Final Scientific Report. (AH)

2.3.1 Fresh Water

Transport from land to oceans through rivers and in coastal areas has an important effect on the oceans. The water volume und its content matter. In particular, transport of fertilisers has a strong effect on the oceanic biosphere. It would have been very helpful for MERSEA if this interaction with a potential fresh water monitoring system could have been accounted for. (YD)

The fresh water also interacts strongly with the land vegetation. Therefore, GEOLAND would benefit from a fresh water monitoring service. Within GEOLAND, the soil moisture observations of SMOS are being investigated, but no use in operational monitoring is planned, since SMOS is a rearch mission. (JCC)

Reliable precipitation data over land is needed for seasonal weather forecasting, too. In particular, the availability of improved observation time series over the past decades would facilitate the improvement of the forecasting system calibration. (FM)

The European Commission would like to fund a water monitoring system but no successful proposal was submitted in FP6. The issue will be address again in the 2nd call of FP7. HALO should provide a statement of the requirements of the fast track services. (PB)

The Water Information System (WIS) of the EU water directive will make many relevant parameters available during the next 2 years. The EROSION database at EEA is already available and providing some of the requested data. (HdG)

2.3.2 Ocean – Atmosphere

The exchange of carbon dioxide and aerosols between atmosphere and ocean is a major interface. So is wave modelling, which also feeds back into the exchange of carbon dioxide and aerosols.

The aerosol products of GEMS have a twofold impact on the ocean monitoring system: They facilitate more accurate satellite product retrievals over the oceans and the washed out dust aerosols transport iron into the ocean, which is a major fertiliser driving the oceanic ecosystems. Models of the ecosystems are, however, expected to become fully validated only after 2013. (YD) Vice versa, whitecapping of the oceans is the dominating source process for atmospheric sea salt aerosols. The fact, that dust originating from Africa and transported through the atmosphere is the key fertiliser in the Amazon rain forest, also underpins the role of atmospheric dust aerosols in fertilising the oceanic biosphere. (AH)

Concerning the carbon cycle modelling in the ocean, the physical and biological pumps interact closely. pCO2, which is required for the physical pump and observed by marine systems, may also be used in GEMS. It is tied to pH, which is also related to the biological pump. Future marine biosphere models should treat the carbon cycle more explicitly than most of the current ones. (YD)

The outgassing during El Nino is probably rather caused by physical effects than biological ones. (YD)

ERA-40 has been very useful for MERSEA. Since the FP7 call for the ocean fast track service explicitly asks for an ocean reanalysis, the best possible atmospheric reanalysis will be needed by the ocean monitoring system in the future. Consequently, a new, extended atmospheric reanalysis, improving on ERA-40, should be funded. Currently, no funding is planned for this and a financial contribution by FP7 would be helpful. (YD, AS)

The seasonal weather forecasting has a potential to benefit from increased knowledge on the oceanic upwelling in the equatorial regions, which will be generated by MERSEA.

The seasonal weather forecasting at ECMWF would maximise use of the MERSEA products by using a higher resolution ocean model. (FM)

The ocean data produced by MERSEA could/should generally be used more by meteorological services. (YD) The key ocean forcing fields have an accuracy of about 10%. More accurate modelling of coupled surface interactions in (re)analyses would help. (TS) Such coupling is a research issue. (AS) There could be funding for it in FP7, but under a different heading than GMES. (HdG)

2.3.3 Land – Atmosphere

There was general agreement with the presented recommendations for the future developments of biomass and carbon stocks monitoring and global fire assimilation systems.

The carbon flux data to be produced by GEOLAND-2 could be used in a synthesis flux inversion of GEMS type, or even along with the GEMS products in a single synthesis flux inversion. This would present an opportunity for more accurate inversion results, but has a number of caveats. (AH) As a first step, it would be safer and interesting to compare two independently generated flux products. (RE) It remains to be seen, how the GEOLAND-ONC carbon flux differs from the GEMS a priori biosphere model carbon flux, since GEOLAND-ONC is planned to be used in the atmospheric modelling by GEMS. (ML)

Carbon flux observations by FLUXNET are expected to become available in real time for Europe through the CARBOEUROPE project. Global data are expected to be available in delayed mode only. (JCC) GEMS-GHG (greenhouse gas sub-project) could still assimilate the data since operation in delayed mode would be satisfactory. Only GEMS-AER and –GRG require real time operation. (AH) The flux tower data may also be used for verification instead of data assimilation. Then delayed mode is possible anyway. (AB)

JRC, Ispra, is the contact point of the European Commission for carbon cycle research issues and contacting the related end users in the European Commision. (HdG)

Biomass burning induces a large carbon flux with clear synoptic signal in the atmosphere. GEMS needs a better fire emission model to improve its final atmospheric assimilation products. (AH)

Depending on the maturity of the available global fire monitoring systems, a Global Fire Assimilation System (GFAS) could be funded by DG Research (currently less mature) or as/in a GMES core service

(currently more mature). The GMES core services may explicitly have the purpose to provide input to other GMES core services. (PB)

Information on funding possibilities may be obtained on a FP7 Environment information day on 15 January 2007. JRC as part of the European Commission researches fires already very actively. A GFAS may also be part of either the land or the atmosphere core service. (HdG)

2.4 Advice for Writing the Final HALO Reports

HALO has already given recommendations to the IPs, as the representatives of the IPs in HALO have learnt about their own projects by actively participating in the HALO collaboration. (PB)

The recommendations on infrastructure should be communicated to BOSS4GMES to assure that it can built on the work done in HALO and does not have to rediscover the issues and conclusions found in HALO. The findings should be presented at two different levels: (PB)

1. What do the three global monitoring services of GMES expect from the telecommunication network? The telecommunication services may then find the best technical solution internally. TANGO may help since it looks at satellite telecommunication in GMES.
2. What telecommunication infrastructure exists currently?

The recommendations concerning the GMES governance and data policy need to be communicated to the GMES bureau and other stakeholders like WMO and GEOSS (GEONETCast) to facilitate the decision process on this higher level. (PB)

The discussion on data exchange infrastructure still seems to be confusing to HdG. To make an impact, HALO needs to make a strong statement, here. The scientific recommendations are convincing and will surely be picked up. A recommendation on where/how to access in-situ observations, including elevation, in the future would be very welcome. (HdG)

2.5 Miscellaneous

AH thanks the HALO partners for the interesting collaboration in the project.

HALO will synthesis the discussions at the workshop and will include them in new draft versions of the final HALO reports to be compiled in January. The reports will be iterated project-internally in February and finalised in March 2007. (AH, agreed by PB)

A follow-up of HALO may be called for in FP7. (PB) Some form of collaboration between the atmosphere, ocean, and global land core services, similar to the collaboration in HALO, will be necessary in the future. (ML)

3 Actions

1. update estimates of atmosphere model output data volumes in January 2007 (JK)
2. write brief document on how WIS and SIMDAT could accommodate the GEMS and MERSEA data transfer requirements to be written in January 2007 (BR, DS, and GM)
3. include chapter summarising the requirements for a water monitoring system in Final Scientific Report in January 2007 (JK, AH, YD, JCC)
4. update the three final HALO reports in January 2007 (all HALO partners)
5. iterate the three final HALO reports in February 2007 (all HALO partners)
6. finalise the three final HALO reports in March 2007 (all HALO partners)

4 Agenda

Monday, 4 December 2006			
0900	10’	Welcome	Marbouty, Director ECMWF
GMES Updates			
0910	24’	GMES Overview	Breger, EC
0934	24’	GEMS Outlook	Hollingsworth, ECMWF
0958	24’	MERSEA Outlook	Desaubies, IFREMER
1022	24’	GEOLAND Outlook	Leroy, MEDIAS-F
1046	24’	ESA GSE Overview	Zehner, ESA
1110	20’	coffee break	
Current Developments in Infrastructures			
1130	30’	WMO Information System (WIS) Update	Schiessl, WMO
1200	30’	SIMDAT – A GRID Implementation for the WIS, Update	Raoult, ECMWF
1230	20’	EUMETCast Update	Williams, EUMETSAT
1250	70’	lunch break	
Recommendations on Candidate Solutions for GMES Infrastructure			
1400	15’	Background to Proposal of Our Industrial Partners: HALO and Infrastructure Requirements for the GMES Backbone	Kaiser, ECMWF
1415	90’	Infrastructure Candidate Solution Review and Recommendation	Levy, ASTRIUM / Pechinot, ALCATEL
1545	30’	coffee break	
1645	60’	Discussion on Candidate solutions	
1745		end of day 1	
1930		dinner	
Tuesday, 5 December 2006			
0900	90’	Conclusions on Candidate Solutions	
1030	30’	coffee break	
Recommendations on Scientific Aspects of the GMES Infrastructure			
1100	30’	Scientific Recommendations Ocean-Atmosphere: Overview	Desaubies/Bentamy, MERSEA
1130	30’	Scientific Recommendations Land-Atmosphere: Biomass Estimates / Wildfires & Biomass Burning	Calvet, GEOLAND / Kaiser, HALO
1200	60’	lunch break	
1300	150’	Discussions and Conclusions on Scientific Recommendations	
1530		end of workshop	

5 List of Participants

(References to the participants in Section 2 “Minutes of the Discussions” are abbreviated by their initials.)

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The following ECMWF personnel attended temporarily and contributed to the discussions. (email: *first initial.surname*@ecmwf.int)

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