SIXTH FRAMEWORK PROGRAMME
Sub-Priority 1.1.6.3
Global Change and Ecosystems

Contract for:

SPECIFIC SUPPORT ACTION

Annex I - "Description of Work"

Project acronym: YEOS
Project full title: YEellow Sea Observation, forecasting and information System
Proposal/Contract no.: 037030
Related to other Contract no.:

Date of preparation of Annex I: 10 December 2006
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Start date of contract:

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1. Project summary

Project abstract

The purpose of YEOS is to strengthen the GEOSS cooperation between EU and other key GEOSS players, by a two-step, bottom-up approach. The 1st step is to demonstrate benefits and build up confidence through a solid cooperation in national level (i.e., EU States-China-South Korea) and regional level (i.e., BOOS - Yellow Sea OOS). The 2nd step is to enlarge the cooperation to EuroGOOS – NearGOOS level. In practice the 2nd stage will be between GMES/GEOSS Projects in EU (e.g., MERSEA/ECOOP) and in NE Asia countries China-Korea-Japan-Russia. This includes, e.g., sharing satellite/in-situ data and best practice, and using MERSEA global forecast as boundary condition for NE Asia forecasting system etc. YEOS will fulfil the 1st step GEOSS cooperation by 1) jointly building up a proto-type Yellow Sea observation, forecasting and information system; 2) demonstrating the system in a period around August 2008, when all Yacht Games of 2008 Olympic Game will be performed in Yellow Sea waters; 3) disseminating YEOS products in different user levels especially to stake-holders and policy makers, and carry out international cooperation between regional Operational Oceanography Systems (OOSs) in Baltic and Yellow Sea (BOOS-YOOS). The YEOS observation system will be based on the integration of existing China-Korea monitoring system in Yellow Sea. YEOS forecasting system is built on advanced and matured European-Chinese operational modelling technology, including coupled ocean-ice and sediment transport forecasting system from Denmark and Germany (with ECMWF weather forcing), wave forecasting system and variational assimilation from China. YEOS, as a seed, will initiate the 2nd stage GEOSS cooperation through a forum which consists of YEOS consortium and the key players in European-NE Asia GEOSS projects, who will be invited as YEOS Advisory Group member. The outcome from the forum will be the 2nd stage GEOOS cooperation plan between EU and NE Asia countries.

2. Objectives of the project and state of the art

2.1 Objectives

The goal of the project is to build up a proto-type observation, forecasting and information system in Yellow Sea based on existing components. The goal will be archived by integrating advanced European technology in operational oceanography system and monitoring and modelling experiences in Chinese and Korean operational agencies and research centres. The project aims to strengthen ties between EU, China and Korea both in the GEO initiative and GOOS framework, through sharing the best practice on marine observation, forecasting and information system. The project is broken into following tasks:

1. Integration of existing China and Korea observation systems in Yellow Sea
2. Prepare background dataset for the forecasting system: river run-off, lateral boundary conditions, bathymetry
3. Prepare operational atmospheric forcing
4. Implement, test and validate a proto-type forecasting system in Yellow Sea and Bohai Sea: wave (FIO-WAM), coupled ocean-ice model (BSHcmod) and a sedimentation model (GKSS-SPM)
5. Implement and test a 3DVAR data assimilation in the 3D ocean model BSHcmod
6. Build up a proto-type information system to present near real time observations and forecasts
7. Demonstrate the proto-type observation-forecasting-information system in a Targeted Operational Period around August 2008.
8. Initiate larger scale EU-China-ROK cooperation under GEO/GEOSS and BOOS-YOOS cooperation under GOOS/CGOOS (Coastal GOOS) framework
9. Raise national awareness in China and ROK

Task 1 will be addressed by WP2; tasks 2 and 3 will be delivered by WP3; task 4 will be handled by WP4 (wave), WP5 (ocean-ice) and WP6 (sediment transport); task 5 will also be handled by WP5; task 6 is done in WP7, task 7 in WP8 and tasks 8 and 9 in WP9. WP1 is Project management.

2.2 State of the art

GEO initiative GEOSS is an international governmental effort to make operational observations on the earth system, aiming to provide scientific information for dealing with new challenges raising from global change and sustainable development, which have been documented in the Kyoto Agreement (1999) for climate change and Johannesburg Summit (2002) for sustainable development. The FP6 4th call has given a strong support to the GEOSS, especially in operational forecasting and observation system. *A targeted SSA action is called to enhance the co-operation between Europe and the developing countries within the context of marine observation systems for the GEOSS.*

International cooperation in GEOSS will bring mutual benefit both for EU and cooperation partners. The observation data and best practices in the GEOSS subsystems have to be shared through the international cooperation. For example, the advanced European global-regional forecasting system in EU FP6 project MERSEA, needs observation data in global for the assimilation. However it is a complicated issue to make this cooperation because of a diversity of national interests in making earth observations. Up to now few successful examples of GEOSS cooperation on marine component (i.e., marine meteorology and ecosystem observations) have been reported. YEOS proposes a *two-step, bottom-up approach* in order to strengthen the GEOSS cooperation between EU and other GEOSS key players. The 1st step is to demonstrate benefits and build up confidences through a solid cooperation example in the national level (i.e., EU-China-Korea) and sub-regional level for Operational Oceanography Systems (i.e., Baltic OOS - Yellow Sea OOS). The 2nd step is to enlarge the cooperation to the level of EuroGOOS (European Global Ocean Observation System) – NearGOOS (NE Asia Regional GOOS). In practice the 2nd stage will be taken between GEOSS Projects in EU (e.g., MERSEA/ECOOP) and NE Asia countries (e.g., China/Japan satellite programs), on sharing satellite/in-situ data and best practice as well as using MERSEA global forecast as boundary condition for NE Asia forecasting system etc.

The purpose of YEOS is to carry out the 1st stage GEOSS cooperation through a solid cooperation example between EU-China-Korea and BOOS-YOOS under GEOSS framework, and to initiate the 2nd stage GEOSS cooperation by organising a forum of EU and other GEOSS key players. Together with US and Japan, EU and China are the two of four co-Chairs of GEO. Republic of Korea (ROK) is also an active player in GEO. The cooperation with US and Japan in earth observation area has been well established in the last decades. A strong tie between EU, China and Korea within GEOSS needs more emphasis. The YEOS approach is to demonstrate that a close cooperation between the three players (EU-CN-ROK) is feasible and beneficial for all the countries. This is going to be demonstrated by establishing a pre-operational Yellow Sea observation, forecasting and information system, which is now not available. The system will use experiences from advanced forecasting and information systems from EU states and observation system and regional modelling skills from China and ROK.

Yellow Sea (including Bohai Sea) is a semi-enclosed sea surrounded by China, ROK and North Korea (Fig. 1). Extensive research and cooperation have been carried out in this region both in national and international level by CN-ROK. In national level, both countries have Yellow Sea coastal monitoring systems. China has launched her first marine satellite HY-1, and will launch the rest two in the following 5 years. China and ROK signed a scientific cooperation agreement in exploring Yellow Sea, which led to the establishment of a China-Korea Joint Ocean Research Centre (CKJORC) in 1995. The World Bank funded Yellow Sea Large Marine Ecosystem (YSLME) study, started in 1993, is also a CN-ROK cooperation. A Yellow Sea Operational Oceanography System (YOOS) has been initiated under the framework of NearGOOS. In the next 2-3 years, China and ROK will deploy several buoys in the middle Yellow Sea.

However, the existing works are fragmented. Major bottle-necks in developing the Yellow Sea monitoring-forecasting system are the lack of high quality, near real time weather forecasts, as well as coupled 3D ocean-ice models and operational infrastructure. These issues have been successfully solved by Europe Operational Oceanography Systems (OOSs, e.g., Baltic OOS) in the past decade. It is expected that the YEOS cooperation will lead to a jump of marine observation/ forecasting system and service in the Yellow-Bohai Sea region. On the other hand, China and Korea have their own advanced

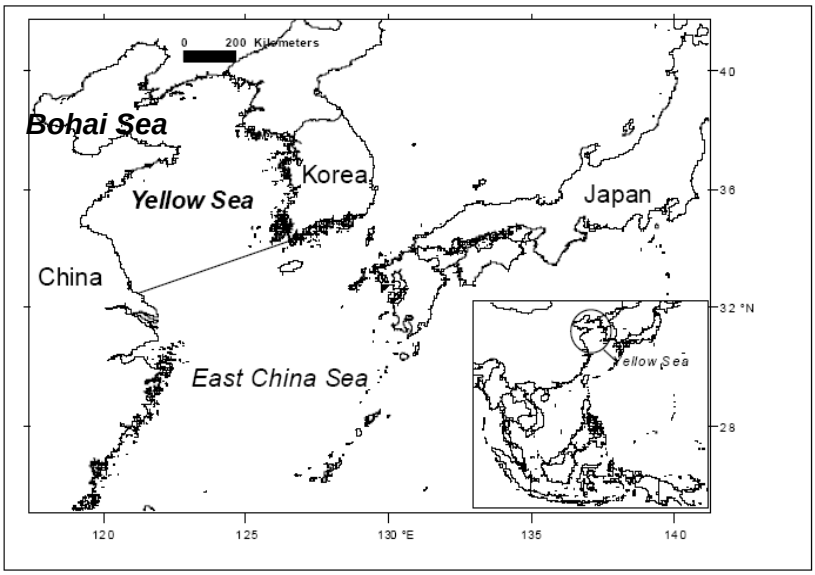

Fig. 1 Yellow Sea and Bohai Sea Area

monitoring system and research that Europe can benefit from. China's marine satellites give a chance to investigate multi-satellite products in this region. Both China and Korea have developed very high density surface wave and currents monitoring system with buoys and HF radars, which are advanced and ideal for wave-current interaction and data assimilation study. China also has a great experience in variational data assimilation for ocean models. The EU partners in YEOS can benefit on these aspects.

3. Participants list

List of participants

Partic. Role	Partic. no.	Participant organisation name	Participant short name	Country	Date entering	Date exiting
CO	1	Danish Meteorological Institute	DMI	DK	M1	M30
CR	2	China-Korean Joint Oceanography Research Centre	CKJORC	CN	M1	M30
CR	3	First Institute of Oceanography, State Oceanic Administration of China	FIO	CN	M1	M30
CR	4	Research Centre in Geesthacht of Hermann von Helmholtz Society of German Research Centres	GKSS	CN	M1	M30
CR	5	Institute of Atmospheric Physics, Chinese Academy of Sciences	IAP	CN	M1	M30
CR	6	Korean Ocean Research and Development Institute	KORDI	ROK	M1	M30
CR	7	North China Sea Branch of State Oceanic Administration, China	NCSB	CN	M1	M30
CR	8	Ocean University of China	OUC	CN	M1	M30

4. Relevance to the objectives of the specific programme and/or thematic priority

YEOS addresses Area VI of Sub-priority 1.1.6.3 – Global Change and Ecosystems: Operational forecasting and modelling including global climate change observation system. In order to support the Research Area VI, an SSA is called for:
'*Targeted actions to enhance the co-operation between Europe and the developing countries within the context of marine observation systems. They should aim to provide a European contribution to the development of pre-operational marine observation and information systems together with non-EU countries, in particular in developing countries, in the context of the GEO initiative GEOSS.'*

This is exactly the purpose of YEOS: *YEOS aims to provide a European contribution to the development of pre-operational marine observation (including forecasting) and information systems together with China and ROK, in the context of GEOSS.* Due to the influences of China and ROK in GEOSS, such a cooperation will raise EU's visibility in GEOSS and enhance EU's role in GEOSS.

4.1 Relevance to GEOSS

YEOS strengthens the international cooperation under the context of GEO initiative GOESS, which is realised through a **two-step, bottom-up approach for the GEOSS cooperation**. This can be demonstrated schematically in the Fig. 2.

The first-step GEOSS cooperation is within the circle '**GEOSS INCO-Stage 1**', which is the major part of YEOS. The second-step GEOSS cooperation is on the level of major GEOSS projects in Europe and Asia, e.g., MERSEA, China/Japan marine satellite projects etc. Leading person from these projects will be invited as member of YEOS Advisory Group. Hence a forum will be formed by YEOS consortium and the Advisory Group. Through this forum, a plan for the second-step GEOSS cooperation will be made.

4.2 Relevance to operational observation and forecasting system (scientific/technological aspects)

The YEOS baseline observation, forecasting and information system will enable China and Korea to consolidate their long-term observations into a forecasting system. YEOS will also build up a trust relationship between key GEOSS partners in EU, China and Korea.

The YEOS cooperation plan for the post-YEOS phase will lead to sharing satellite, in-situ and forecasting data and the best practices between EU and other GEOSS key players. This may largely improve the performance of the European forecasting systems.

YEOS observation, forecasting and information system will be the first such integrated system in China Sea. All partners will be benefited by sharing knowledge in operational modelling and observation system. The YEOS coupled 3D ocean model and sediment transports model are new to Chinese and Korea partners, while EU partners can benefit from China's high density coastal monitoring system, validation of European models in another area and variational data assimilation methods for ocean models.

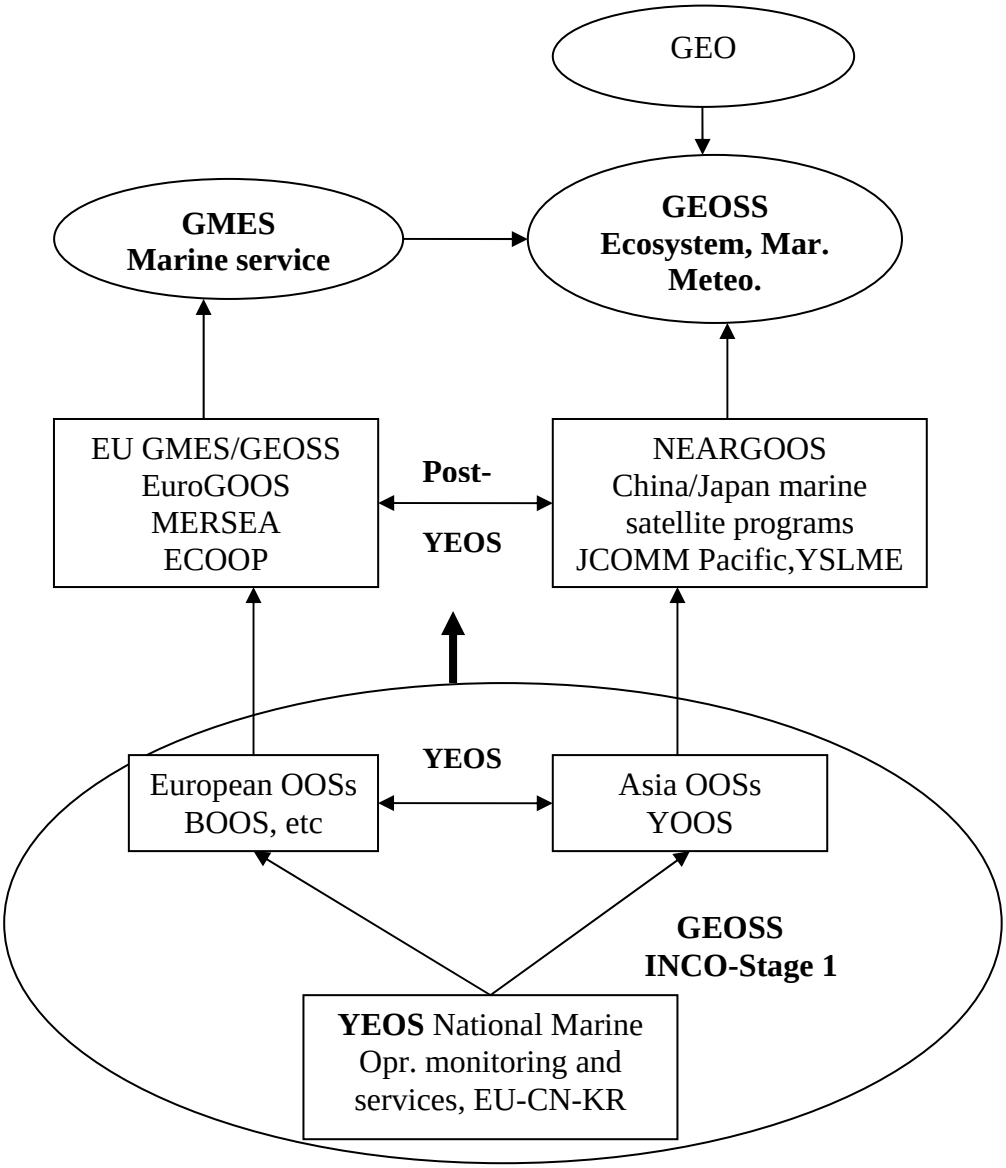

Fig. 2 A roadmap of the two-step, bottom-up approach for EU GEOSS international cooperation

5. Potential Impact

YEOS will have significant impacts beyond the YEOS consortium and period. For China and Korea, YEOS will move operational oceanography in China a large step forward, enhance the visibility of operational oceanography and support level from public and government. A successful example of operational observation and forecasting system in Yellow-Bohai Sea will make stake-holders and policy makers to realise the importance of international cooperation in GEOSS. For EU, YEOS is an additional approach to make a close relationship with China and Korea in GEOSS, therefore initiating the data sharing process between different subsystems in GEOSS. Part of the YEOS data exchange (e.g., Yellow Sea SST maps, some buoy measurements in Yellow Sea etc) will adopt data sharing principles of GEOSS, and considerations will be given to use of the developing GEONETCast system when these data are disseminated. The impacts of YEOS on GEOSS cooperation will be further described in following sections.

5.1 Contribution to standards

5.1.1 Social and economic impacts

1. The YEOS system will have a demonstration which covers the area and period of the Yacht Sports of Olympic Games (coastal waters of Qingdao) 2008. It is expected that the YEOS system and service will be highlighted by the event.
2. Currently in China and Korea, relatively lower level of marine service has been provided (fewer parameters, coarse resolution, and un-validated quality of the most products). YEOS system will promote marine service and its usefulness in maintaining sustainable marine economy in China and Korea, with high quality, near real time products.
3. Since the Yellow Sea cooperation agreement was signed by Chinese and Korea Presidents, the successful YEOS system will be helpful in enhancing the cooperation between the two countries

5.1.2 Contribute to international programmes

1. YEOS strengthens the coastal GOOS cooperation in the sub-regional level through a BOOS-NOOS-YOOS cooperation. The YEOS coordinator DMI represents both BOOS (with BOOS chairman-ship) and NOOS (as a NOOS steering group member). KORDI holds the YOOS chairman-ship. This cooperation is based on a solid demonstration system.
2. YEOS provides a forum for discussion larger scale cooperation in the future, between EU, China, Korea and other NE Asia countries in both ocean and atmosphere within the context of GEOSS, through an active communication between YEOS consortium and its Advisory Group.

5.2 Contribution to policy development

Via addressing international cooperation on GEOSS and operational forecasting between EU-Chin-Korea and between YOOS-BOOS, YEOS will provide a practical and successful way for GEO cooperation and transferring knowledge between different countries (regions). This will indirectly contribute to GEO policy development and EU INCO policy development.

The end of the YEOS project doesn't necessary mean that the YEOS impacts disappear. It has a large potential to make YEOS system permanent in China, which shall be operated by Chinese operational agency NCSB (North China Sea Branch) of SOA (State Oceanic Administration), with a mutual agreement between Chinese and EU partners. This system may also be extended to other areas of China Sea or NearGOOS sub-regions. The experience of this work can be used in other international cooperation projects related to technical transfer between EU and non-EU countries. The bottom-up approach for GEOSS international cooperation will be demonstrated by YEOS with its mechanism, efficient cooperation work, solid system development and demonstration. We believe this GEOSS cooperation model has a potential to be applied to other regions and GEOSS components.

A sustainable YEOS will make a friendly cooperation atmosphere in this region, which may benefit the stability and peace of the region.

5.3 Risk assessment and related communication strategy

There is no potential risk to EU, China and Korea due to the failure of this project. On the other hand, the possibility of failure of this project is very low. The communication between partners will be carried out via email, Skype and common YEOS website.

As described in the proposal, YEOS has all necessary financial support, models, data and techniques to achieve the success of the above 4 parts. The risk of fail is low. YEOS coordinator has a Chinese background, wide international working and scientific coordination experience. He also has a good knowledge on all relevant components (observation, forecasting and information system) of the project. Most of the YEOS SG group members have wide scientific management experiences. The participants who are responsible for the major YEOS components are all experts in the correspondent field.

There are three issues which specific attentions have been paid to when we design the YEOS work.

1. Computing platform used in China for YEOS system. Since currently the 3D ocean and sediment transport modelling system are run on a Linux platform, it will be a convenient way if a Linux platform is used to host the proto-type YEOS system.
2. The financial support from KORDI. Since KORDI's funding for YEOS will mainly come from KORDI's existing budget. It is important that KORDI's role in YEOS is related to KORDI's official functions and on-going research projects. This idea is adopted in the YEOS project design. As shown in the proposal, KORDI's role in YEOS is to *'lead the WP2 – integration of observation systems, test and validate sediment transport model, contribute to OOSs' cooperation, YEOS product dissemination'* This is because KORDI is responsible for China-Korea Yellow Sea cooperation and YOOS, and KORDI also has several on-going research projects on the Yellow Sea monitoring and sediment transport modelling.
3. Feasibility of the BSHcmod and GKSS-SPM in Yellow Sea and Bohai Sea. Both models have not been tested in the Yellow-Bohai Sea. However, the physical condition of the shallow, semi-enclosed Yellow-Bohai Sea is quite similar as the Baltic-North Sea. Both BSHcmod and GKSS-SPM are based on the primitive equations of physical ocean status and motion, with a numerical and parameterisation treatment suitable for shallow waters. It is expected that the BSHcmod and GKSS-SPM are feasible for the Yellow Sea and Bohai Sea waters.

6. Project management and exploitation/dissemination plans

This section describes the overall Specific Support Action's management as well as the exploitation/dissemination planning for target audiences within and outside the research communities.

6.1 Project management

YEOS is coordinated by Dr. Jun She in Danish Meteorological Institute. He is an expert on operational wave and 3D ocean modelling and observation system optimal design. He has a rich experience in international scientific coordination. He used to work in the First Institute of Oceanography in China (especially on Yellow Sea and East China research), Japan , US and Denmark. He is now the leader of BOOS modelling group and the Steering Group member of NOOS. He had experiences in coordinating EU FP5 project ODON (Optimal Design of Observational Networks, 2003-2005, http://www.noos.cc/ODON). He is also very familiar with YEOS China-Korea partners. This foresees strong and tight project coordination.

The project is managed by the YEOS coordinator with support from the Steering Group (SG), which is represented by the workpackage leaders. The coordinator will chair the SG. His responsibility is to ensure that the budget is correctly distributed, make regular reporting to EU, and ensure there is sufficient and proper communication between the WPs. Since the most of the WP leaders are also leaders in institutional, department or group level, this ensures a strong management team of YEOS. The SG is responsible for individual WPs and serves as contact point among WPs. Regular SG meeting will be arranged to ensure its efficient operations. During each SG meeting detailed steps in the WPs' workflow up to the next SG meeting will be identified and a table of delivery person/time will be made. This serves as an efficient tool to monitor progress. Communication between WP leaders and partners will also constantly be conducted through email and workshops to minimize any possible delays and monitor possible personal re-arrangement.

An advisory group will be established in order to form a forum for further cooperation under the framework of GEOSS and coastal GOOS, and exploiting the YEOS applications. It is expected that the advisory group will be represented by a BOOS/ECOOP/MERSEA representative, YOOS chairman, China Meteorological Agency (GEO responsible agency in China), State Oceanic Administration and A NEARGOOS representative. Together with the YEOS advisory group, YEOS will provide a forum for stimulating international cooperation with a sufficiently wide coverage.

Two YEOS workshops and four SG meetings will be organised to monitor the progress of the project.

6.2 Plan for using and disseminating knowledge

A substantial amount of knowledge and technology transfer will be carried out in YEOS, which is a two-way interaction. On one hand, the knowledge of European partners in operational forecasting system setup, 3D ocean-ice coupled model and sediment transport model are shared with Chinese and Korean partners. On the other hand, the knowledge of Chinese and Korean partners on variational assimilation scheme, ocean monitoring system and a unique regional WAM model (solving with a characteristic line method) will be shared with the European partners.

Since all models, data and techniques involved in YEOS are owned by YEOS partners and YEOS is an EU research project, there is no IPR issue involved. The models involved in YEOS are available for EU project. In the future it is possible to transfer YEOS forecasting system into a full operational system since such a practise has been done. The 3D coupled ocean-ice model BSHcmod and the GKSS sediment transport model have been used in operational agencies with signed agreements. Similar practice may be used in post-YEOS phase. Weather forcing data used in YEOS is from ECMWF. Since DMI is a member of ECMWF, there is no problem to use ECMWF data in YEOS. However agreements have to be made before these systems and data can be used for real operational service in China or South Korea.

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Table 1 Models/data/techniques involved in YEOS project and their owners

Model/Data/Techniques	Owner	Feasibility being used inYEOS	Feasibility being used for operational forecast
A 3rd Generation regional WAM model	FIO	Available	Based on agreement
A coupled 3D ocean-ice model	BSH, currently used by DMI based on agreement	Available	Based on agreement
Sediment tranport model	GKSS	Available	Based on agreement
Atmospheric forcing	ECMWF-DMI	Available	Based on agreement
3DVAR assimilation	IAP	Available	Available

6.3 Raising public participation and awareness

YEOS deliverables include a proto-type observation, forecasting and information system, observation dataset, forecasting products and future plan for EU-Asia GEOSS cooperation. Following activities will be carried out to raise public participation and awareness.

1. A YEOS website will be established in English, Chinese and Korean language. The website includes:
    a. Project introduction
    b. Near real-time operational forecast animation for the Yellow Sea (for demonstration area), satellite images and in-situ observations
    c. General introduction to Yellow Sea oceanography
    d. Updated YEOS news
2. National awareness meetings will be organised. The YEOS products will be disseminated to both public and stake-holders and policy makers in China and Korea. This will largely enhance the support to operational oceanography both in public and government levels. During the YEOS demonstration period, YEOS forecast products will be available to the public. The YEOS news will also be disseminated via YEOS information system, website, emails and local news media. An evaluation of the YEOS products will be carried out.
3. During OL2008, YEOS consortium will contact Chinese media to raise public awareness on YEOS products
4. YEOS advisory group will be another approach to disseminate and exploite YEOS products and experiences. The YEOS products can be disseminated by the advisory group to a wide operational community in the world. By planning the future GEOSS cooperation (so-called 2nd-step here), the potential YEOS products and experience can be largely exploited.
5. Training courses are used as a tool to transfer knowledge, disseminate YEOS results and raising awareness. A one-week educational course will be organised by OUC through WP6 to introduce the Yellow Sea observation, forecasting and information system.

7. Workplan – for the full duration of the project

7.1 Introduction - general description and milestones

To achieve the objectives described in section 2, YEOS is broken into 9 workpackages, which include a consortium management WP (WP1) and 8 supported activity WPs (WP2-WP9). The purpose of YEOS is to enhance the EU-China-Korea cooperation through a joint effort of implementing a YEOS observation, forecasting and information system. WP2 integrates existing YEOS observation system, provide historical and real time observations for model validation and assimilation. WP3 provides all necessary forcing data for YEOS wave-ocean-ice-sediment forecasting system. The components of the forecasting system will be implemented and tested in WP4-WP6, which includes wave model, 3D ocean model together with a 3DVAR data assimilation scheme and sediment transport model. The products will be presented in WP7 – YEOS information system. The training courses of the YEOS forecasting system are combined with short period visits, which will be arranged in WP6. WP8 assembles WP2-WP7 and gives a demonstration of the entire YEOS system for a Targeted Operational Period (TOP): M18-M23 (August 2008 – Jan. 2009). International cooperation, product dissemination and awareness are managed in WP9.

As for the model validation, there will be two categories. One is pre-validation, which uses historic dataset (e.g., July – August 2006) to validate WAM, BSHcmod and GKSS-SPM, to ensure that the models are eligible for operational use. This work will be done in WP4-WP6. The other kind of validation is for the demonstration period TOP. The validation will be mainly done for winds, waves, water level, temperature, salinity and currents. This work will be done in WP8. Based on the demonstration and validation results, an evaluation report on the YEOS observation, forecasting and information will be made in WP9.

Milestones and expected result

1.	Kick-off meeting	M1
2.	Requirements on the input dataset for YEOS modelling system specified	M2
3.	Input dataset ready	M4
4.	Input dataset documented	M6
5.	A metadata set for existing observation systems ready	M6
6.	A historical dataset for validation ready	M6
7.	FIO-WAM implemented and tested in Yellow-Bohai Sea	M6
8.	BSHcmod implemented in Yellow-Bohai Sea	M6
9.	The 1st SG meeting	M6
10.	Half year management reports	M7
11.	GKSS-SPM implemented and tested in Yellow-Bohai Sea	M9
12.	FIO-WAM pre-validation completed	M12
13.	Pre-operational configuration of WAM-BSHcmod-SPM implemented	M12
14.	An online dataset for on-line access ready	M12
15.	BSHcmod pre-validation completed	M12
16.	3DVAR scheme implemented and tested	M12
17.	YEOS information system design finished	M12
18.	The operational system set-up (time schedule, software, hardware) designed	M12
19.	The annual financial report, management report.	M13
20.	Necessary operational evironment/infrastucture of BSHcmod fulfilled	M15
21.	A prototype YEOS information system implemented	M15
22.	GKSS-SPM model run for validation period completed	M15
23.	The 1st Workshop and 2nd SG Meeting	M16
24.	YEOS proto-type wave forecasting system documented	M18
25.	GKSS-SPM pre-validation completed	M18

26. BOOS-YOOS system: status and major challenges investigated M18
27. BOOS-YOOS cooperation plan ready M18
28. EU-China-Korea cooperation under GEOSS explored M18
29. BSHcmod pre-validation completed M18
30. YEOS system operational demonstration started M18
31. Half year management reports M19
32. Improved YEOS information system implemented M22
33. Improved YEOS information system tested M24
34. The 3rd SG meeting. M24
35. Assessment and harmonisation of existing observation systems (identify gaps, optimal blending satellite and in-situ observations, recommendations) ready M24
36. National awareness meetings are organised in China and Korea M24
37. The annual financial report, management report. M25
38. Validation for TOP forecasting results finished M28
39. Evaluation of Yellow Sea observation-forecasting-information system ready M30
40. A report on the perspectives of EU-China-Korea cooperation in GEOSS implementation plan ready M30
41. Final project workshop M30
42. Final YEOS report. M30

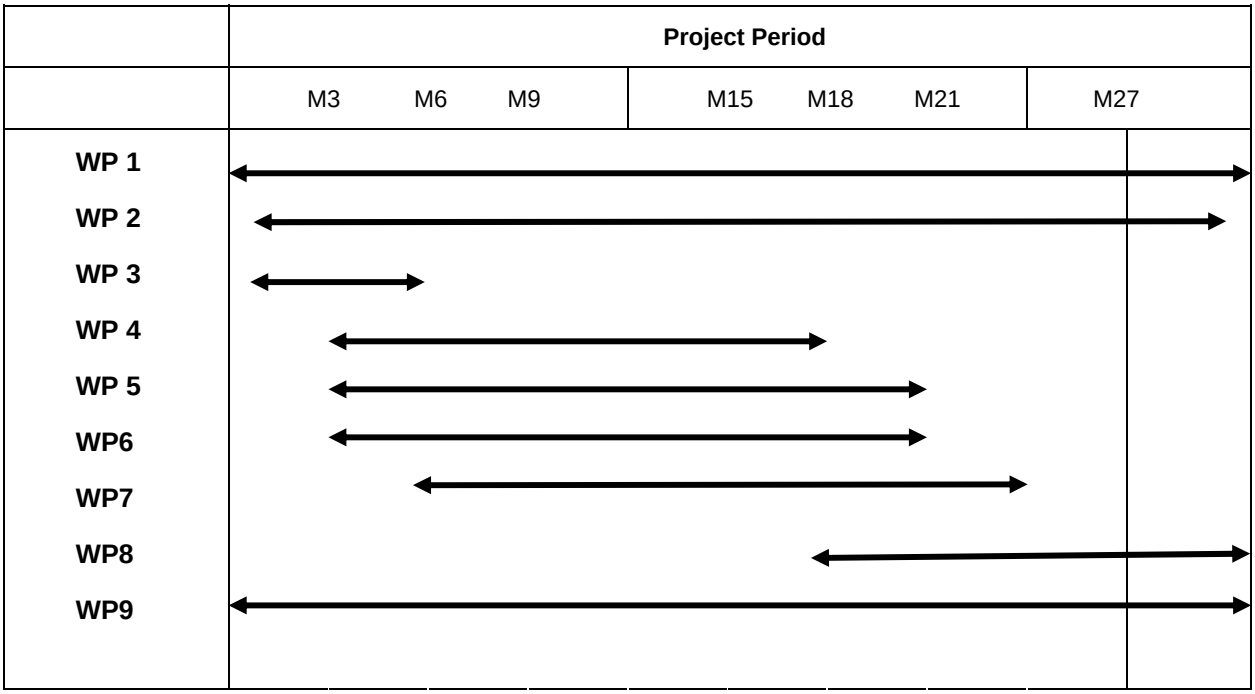
7.2 Planning and timetable

Table 2 shows the time table of YEOS.

The consortium management activity has only one WP, i.e. WP1, which last for entire project period. The support activities include 8 WP:

- WP2 – the integration of existing observing system will last for entire period of the project because during the project, it is expected continuous national contributions in expanding the observation system
- WP3 provides forcing data for the modelling system, which have to be ready as soon as possible. The forcing data for a selected period will be prepared within 4 months. Together with report writing, WP3 lasts up to M6
- The implementation, testing and pre-validation of the modelling system (WP4-WP6) will be taken place during M3 – M21
- The information system (WP7) will be designed from M6 and the first version should be ready in M15, just before the OL2008 demonstration (WP8)
- The demonstration system will start to be implemented before M18 and run for the TOP period. (WP8)
- The TOP validation and further model improvements will be made during M24-M28
- The international cooperation and awareness (WP9) will run through the entire project period.

Table 2 Time schedule of YEOS



7.3 Graphical presentation of the work packages

The interaction between WPs can be shown in the schematic WP flowchart in Fig. 3. The project can be divided into 4 parts:

1. Project management – WP1
2. Integrate/implement a YEOS observation, forecasting and information system: WP2 integrates existing YEOS observation system, provide historical and real time observations for model validation and assimilation. WP3 provides all necessary forcing data for YEOS wave-ocean-ice-sediment forecasting system. The components of the forecasting system will be implemented and tested in WP4-WP6. The products will be presented in WP7 – YEOS information system. The training courses of the YEOS forecasting system are combined with short period visits, which will be arranged in WP6.
3. Demonstration of the YEOS system: WP8 assembles WP2-WP7 and gives a demonstration and validation of the entire YEOS system for the TOP period.
4. International cooperation, product dissemination and awareness: WP9.

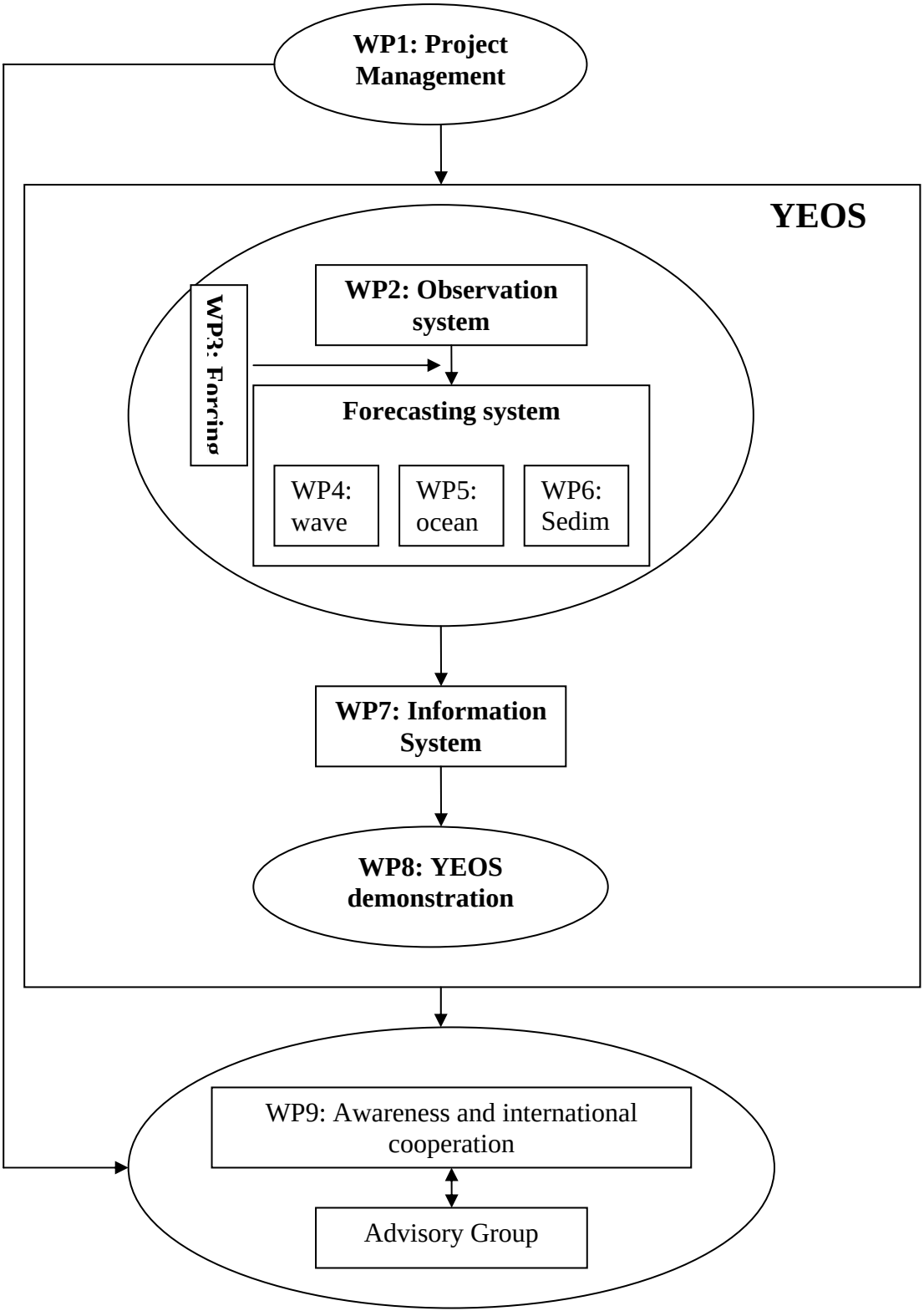


Fig. 3 Schematic flowchart of YEOS workpackages

7.4 Work package list

A summary of the 9 WPs is given in Table 3.

Table 3 Workpackage list

Work-package No	Workpackage title	Lead contractor No	Person-months	Start month	End month	Deliv-erable No
WP1	Project management	1	2	0	30	D1, D13
WP2	Integration of marine observation systems (YEOS-OBS)	6	12	0	24	D2,D3
WP3	Input dataset (YEOS-INPUT)	1	5	0	9	D4
WP4	Wave forecasting system (YEOS-WAVE)	3	6	3	18	D5
WP5	Coupled ocean-ice forecasting system (YEOS-OCEAN)	5	13	6	21	D6, D7
WP6	Sediment transport modelling (YEOS-SPM)	8	10	6	21	D8
WP7	Information system (YEOS-SPM)	1	3	6	24	D9
WP8	Demonstration of proto-type YEOS system (YEOS-DEMO)	7	17	18	30	D10, D11
WP9	Awareness and international cooperation (YEOS-AWARE)	2	9	0	30	D12
	TOTAL		77			

7.5 Deliverables list

YEOS has in total 13 deliverables. Table 4 gives a summary of them.

Table 4 Deliverables list

Deliver. No	Deliverable title	Delivery date	Nature [1]	Dissemi. level [2]
D1	Management reports	M7, 13, 19, 25	R	PP
D2	Assessment of existing operational observation network in Yellow-Bohai Sea	M24	R	PU
D3	Observation dataset	M12	D	PP
D4	Input dataset	M6	D	RE
D5	Yellow-Bohai Sea wave forecasting system	M12	P	RE
D6	Yellow-Bohai Sea ocean-ice forecasting system	M12	P	RE
D7	3DVAR assimilation in BSHcmod	M18	P	RE
D8	Yellow-Bohai Sea sediment forecasting system	M15	P	RE
D9	Yellow-Bohai Sea information system	M15	P	RE
D10	Demonstration of Yellow-Bohai Sea forecasting and information system	M24	D	PU
D11	Demonstration validation report	M30	R	PU
D12	EU-China-Korea cooperation perspective for marine component in GEOSS	M30	R	PU
D13	Final report	M30	R	PU

[1] Please indicate the nature of the deliverable using one of the following codes:
R = Report
P = Prototype
D = Demonstrator
O = Other

[2] Please indicate the dissemination level using one of the following codes:
PU = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).

7.6 Workpackage description

Workpackage number	1	**Start month**		M1			
Workpackage title: Project management (YEOS-MANAGE)							
Partner id (lead in bold)	**1**	2	3	5	6	7	8
Person-months:	2	0	0	0	0	0	0

Objectives

- To manage the consortium in an organised, efficient way
- To assure that there is appropriate communication and co-ordination between partners and WPs, and that the project tasks and deliverables are completed according to the project plan.

Description of work (leading institute is given)

The consortium is coordinated by DMI and managed by the Steering Group (SG). The progress made in each WP have to be reported to the coordinator every 6 months by the WP leaders. The progress and problems during the project will be reported and discussed in the SG meetings, in order to have a close monitoring of the project and to solve the problems raised.

Task 1.1 Co-ordinate the project in close contact with the Steering Group (SG). **DMI**

Task 1.2 Communicate with the partners to secure that the objectives are achieved and to assure that the work carried out by each partners is well co-ordinated: **DMI**

Task 1.3 Overall financial administration

Task 1.4 Prepare management reports every 6 months for European Commission. **DMI**

Task 1.5 Produce the final report. **DMI**

Deliverables

D1: Management reports:

- Meeting reports.
- 6-monthly status reports.
- Annual financial and status reports.
- Mid-term report.

D13: Final report. DMI+SG group

Milestones and expected result

M1.1 Kick-off meeting	M1
M1.2 The 1st SG meeting	M6
M1.3 Half year management reports	M7, M19
M1.4 The annual financial report, management report.	M13, M25
M1.5 The 1st Workshop and 2nd SG Meeting	M16
M1.6 The 3rd SG meeting.	M24
M1.7 Final project workshop	M30
M1.8 Final YEOS report.	M30

Workpackage number	2	**Start month**		M1			
Workpackage title: Integration of existing observation systems (YEOS-OBS)							
Partner id (lead in bold)	1	5	**6**	7	8		
Person-months:	2	1	3	3	3		

Objectives

- Assess existing satellite and in-situ observational networks, identify gaps
- Initiate pre-operational marine data exchange between Korea and China
- Build up observational datasets both for historical data and near real-time observations

Description of work (leading institute is given)

On-going operational monitoring activities will be documented and analysed. The gaps of the existing observation systems will be identified. Requirements for near real time data exchange (including hardware, software, data interoperability, format etc) will be identified, and preliminary operational data exchange will be made. There will be several new buoys deployed in the Yellow Sea during the YEOS period (with China and Korea national funding), the data will be integrated into the YEOS observation system.

Task 2.1 Document metadata for existing Yellow-Bohai Sea satellite and in-situ operational observation system **KORDI**
Task 2.2 Assess existing observation network **KORDI**
Task 2.3 Build up a historical observation dataset for model validation **IAP**
Task 2.4 Build up a near real-time dataset for online access through data exchange **NCSB**
Task 2.5 Harmonise on-going Yellow-Bohai Sea monitoring activities **KORDI/NCSB**
Task 2.6 Generate satellite products of SST and other parameters **DMI, OUC and KORDI**
Task 2.7 Work out recommendations to future Yellow-Bohai Sea observation systems **DMI**

Deliverables

D2. Assessment of existing operational observation network in Yellow-Bohai Sea
D3. Observation dataset and products

Milestones and expected result

M2.1 A metadata set for existing observation systems ready M6
M2.2 A historical dataset for validation ready M6
M2.3 An online dataset for on-line access ready M12
M2.4 Assessment and harmonisation of existing observation systems (identify gaps, optimal blending satellite and in-situ observations, recommendations) ready M24

Workpackage number	3	**Start month**		M1				
Workpackage title: Input dataset (YEOS-INPUT)								
Partner id (lead in bold)	**1**	3	5	6				
Person-months:	2	1	1	1				

Objectives

To provide all the necessary input dataset for YEOS forecasting system.

Description of work (task leader is given)

YEOS forecasting system has 3 components: wave, ocean-ice and sediment transport. To run these models in the YEOS area, an quality controlled input dataset is needed. This includes: weather forcing, bathymetry, background data for sea-bed type and suspended particulate matter, river run-off, T/S climatology, tidal constituents along the open boundary, river run-off and data for initialising the model. The spatial and temporal coverage and resolution of the input dataset will be specified through a close communication between this WP and modelling system WP4-WP6. The atmospheric forcing will be from ECMWF, provided by DMI. All other data will be provided by Chinese and Korean partners, who have used the data for their modelling activities.

Task 3.1 Prepare bathymetry data for the Yellow Sea and Bohai Sea **FIO**
Task 3.2 Prepare atmospheric forcing **DMI**
Task 3.3 Prepare initial field, river run off **IAP**
Task 3.4 Prepare lateral boundary condition and background data for sediment transport model **KORDI**
Task 3.5 Document the input dataset **DMI**

Deliverables

D4. Input dataset

Milestones and expected result

M3.1 Requirements on the input dataset for YEOS modelling system specified M2
M3.2 Input dataset ready M4
M3.3 Input dataset documented M6

Workpackage number	4	**Start month**		M3				
Workpackage title: YEOS wave forecasting system (YEOS-WAVE)								
Partner id (lead in bold)	1	**3**	7					
Person-months:	1	4	1					

Objectives

- To implement, test and validate a 3rd generation wave model FIO-WAM in Yellow-Bohai Sea
- To implement and test a pre-operational configuration for a proto-type YEOS wave forecasting system, based on the FIO-WAM.

Description of work

FIO-WAM is a third generation wave model. It was developed based on a community model WAM-Cycle4 but with a different numerical solution of wave propagation (based on a characteristic line method). The model has been used in the China Sea area for marine environment assessment work since 1991. In this WP, the FIO-WAM will be implemented, tested and validated for the YEOS area. Then an operational configuration will be made for the model (pre- and post- processing and automatic operational running interface).

The training courses of the YEOS wave forecasting system will be arranged in WP6, together with the training courses of YEOS ocean-ice-sediment transport forecasting system (see WP6 for details).

Task 4.1 Implementing and testing FIO-WAM in Yellow Sea and Bohai Sea **FIO**
Task 4.2 Running FIO-WAM for a given period by using WP3 forcing **FIO**
Task 4.3 Validating the FIO-WAM against WP2 observations **NCSB**
Task 4.4 Implementing and testing operational configuration of FIO-WAM (an automatic running pre-operational system) based on DMI operational forecasting system) **DMI**
Task 4.5 Documenting YEOS wave forecasting system **FIO**

Deliverables

D5. Proto-type YEOS wave forecasting system

Milestones and expected result

M4.1 FIO-WAM implemented and tested in Yellow-Bohai Sea M6
M4.2 Validation model run completed M9
M4.3 FIO-WAM pre-validation completed M12
M4.4 Pre-operational configuration implemented and tested M12
M4.5 YEOS proto-type wave forecasting system documented M18

Workpackage number	5	**Start month**		M3				
Workpackage title: YEOS ocean-ice forecasting system (YEOS-OCEAN)								
Partner id (lead in bold)	1	**5**	7					
Person-months:	4	6	3					

Objectives

- To implement, test and pre-validate a coupled 3D ocean-ice model BSHcmod for the Yellow-Bohai Sea
- To implement and test a 3DVAR data assimilation scheme based on IAP version
- To implement and test a pre-operational set- up of a proto-type YEOS ocean-ice forecasting system based on the BSHcmod

Description of work

BSHcmod is a coupled 3D ocean-ice coupled model based on primitive ocean equations and a Hibler-type ice model. The model has been used in Germany for Baltic-North Sea operational forecasting since early 1990s, and later on further developed by DMI. This model is a well calibrated operational model for the Baltic-North Sea. In this WP, the BSHcmod will be implemented, tested and validated for the Yellow-Bohai Sea. An operational pre-processing, post-processing and auto job execution interface will also be implemented. Hence a proto-type 3D ocean-ice forecasting system is established fir the Yellow Sea and Bohai Sea.

The training courses of the 3D ocean-ice model and forecasting system will be arranged in WP6, together with the sediment transport model and forecasting system (see WP6 Description of work)

Task 5.1 Implementing and testing BSHcmod (DMI version) in Yellow-Bohai Sea **DMI**
Task 5.2 Running the BSHcmod for a given period by using WP3 forcing **DMI**
Task 5.3 Implementing and testing IAP 3DVAR assimilation scheme in BSHcmod **IAP**
Task 5.4 Implementing and testing operational configuration of the BSHcmod **DMI**
Task 5.5 Documenting YEOS ocean-ice forecasting system **DMI**

Deliverables

D6. Proto-type Yellow-Bohai Sea ocean-ice forecasting system
D7. 3DVAR assimilation in BSHcmod

Milestones and expected result

M5.1 BSHcmod implemented and tested in Yellow-Bohai Sea M9
M5.2 Pre-operational configuration implemented and tested M12
M5.3 Pre-validation model run completed M12
M5.4 3DVAR scheme implemented and tested M12
M5.5 BSHcmod validation completed M18
M5.6 YEOS proto-type wave forecasting system documented M21

Workpackage number	6	**Start month**		M3			
Workpackage title: YEOS Sediment transport modelling (YEOS-SPM)							
Partner id (lead in bold)	1	4	6	**8**			
Person-months:	1	4	2	3			

Objectives

- To implement, test and validate a sediment transport model GKSS-SPM for the Yellow-Bohai Sea
- To implement and test a pre-operational set- up of a proto-type YEOS sediment transport forecasting system based on the GKSS-SPM
- To arrange training courses for the YEOS forecasting system

Description of work

The GKSS-SPM model solves the three-dimensional advection-dispersion equations. The BSH (German Federal Maritime and Hydrographic Agency) Eulerian dispersion model also forms the basis to simulate SPM transports and concentrations. The GKSS.SPM has been calibrated and run operationally at BSH for forecasting suspended particulate matters in the Norht Sea and Baltic Sea for several years. This WP will make this model and forecasting system available for Yellow Sea.

Another task of WP6 is to arrange training courses for YEOS observation, forecasting and information system. Major participants will be YEOS partners, oceanographers and PhD students from China and South Korea. The training course will be arranged by OUC around M16.

Task 6.1 Implementing and testing GKSS SPM for Yellow-Bohai Sea	**GKSS**
Task 6.2 Running the GKSS-SPM for a given period by using WP3 forcing	**GKSS**
Task 6.3 Prepare quality controlled satellite and in-situ observations for validation	**OUC**
Task 6.4 Validating the GKSS-SPM against satellite images and/or in-situ data	**KORDI**
Task 6.5 Implementing and testing operational configuration of the GKSS-SPM	**DMI**
Task 6.6 Documenting YEOS sediment transport forecasting system	**GKSS**
Task 6.7 Arrange training courses for the YEOS forecasting system	**OUC**

Deliverables

D8. A proto-type YEOS sediment transport forecasting system

Milestones and expected result

M6.1 GKSS-SPM implemented and tested in Yellow-Bohai Sea	M9
M6.2 Pre-operational configuration implemented and tested	M12
M6.3 GKSS-SPM model run for validation period completed	M15
M6.4 GKSS-SPM validation completed	M18
M6.5 YEOS proto-type SPM forecasting system documented	M21

Workpackage number	7	**Start month**		M6				
Workpackage title: YEOS information system (YEOS-INFO)								
Partner id (lead in bold)	**1**	6	7					
Person-months:	1	1	1					

Objectives

The objective is to implement an information system, which

- presents near real time observations and forecasting products
- enables users to freely choose domains and parameters of forecasts (including animations) and observations.

The YEOS website will also be part of the YEOS-INFO.

All of the above tasks are essential to:

- Improving services to the users
- Increasing quality of the products by better utilisation of existing data
- Providing more user-oriented products by means of more user-friendly product and data dissemination

Description of work

The information system is a web-based presentation system. Both DMI and BSH have already had such a system in operation. Both systems are user-friendly, easy to maintain but have their own advantages and disadvantages. The YEOS-INFO will be designed and implemented based on the two existing marine information systems

Task 7.1 Design of YEOS information system based on DMI and BSH marine presentation system and requirements from NCSB and KORDI **DMI**
Task 7.2 Implement YEOS information system **DMI**
Task 7.3 Test YEOS information system **NCSB**
Task 7.4 Make a Chinese version of the information system **NCSB**

Deliverables

D9. Yellow Sea and Bohai Sea information system

Milestones and expected result

M7.1 YEOS information system design finished	M6
M7.2 A prototype YEOS information system implemented	M15
M7.3 A Chinese version of the information system ready	M18
M7.4 Improved YEOS information system implemented	M22
M7.5 Improved YEOS information system tested	M24

Workpackage number	8	**Start month**		M18			
Workpackage title: Demonstration and validation of YEOS proto-type system (YEOS-DEMO)							
Partner id (lead in bold)	1	3	4	5	6	**7**	8	
Person-months:	4	2	2	2	1	5	1	

Objectives

1. To demonstrate the YEOS proto-type system for the Targeted Operational Period (TOP).
2. To validate the TOP results
3. To identify the priorities and potentials for further improvements

Description of work

The YEOS observation, forecasting and information system will be demonstrated in a near real-time operational mode for a 6month TOP period, i.e. August 2008 – Jan. 2009. The demonstration system at the first 3 months will only include wave and 3D ocean forecasting system. A full YEOS system will be demonstrated in the 2nd half of the TOP period.

The TOP model forecasts will be validated against observations obtained in WP2, which include waves, water level, T/S profiles and currents.

Task 8.1 Design operational model run time schedule and necessary hardware and software infrastructure **DMI**
Task 8.2 Fulfil all the software and hardware requirements **NCSB**
Task 8.2 Implement the YEOS forecasting components in a appropriate computing platform (at least on a powerful Linux PC) **NCSB**
Task 8.3 Test YEOS forecasting system in an operational mode **NCSB**
Task 8.4 TOP Demonstration **NCSB/DMI**
Task 8.5 TOP Validation **ALL**
Task 8.6 Priority and potential for further improvements **ALL**

Deliverables

D10. Demonstration of Yellow-Bohai Sea observation, forecasting and information system
D11. Validation report for TOP period

Milestones and expected result

M8.1 The operational system set-up (time schedule, software, hardware) designed M12
M8.2 Necessary operational evironment/infrastucture of BSHcmod fulfilled M15
M8.3 YEOS system TOP operational demonstration started M18
M8.4 Validation for TOP period finished M28
M8.5 Validation report ready M30

Workpackage number	9	**Start date or starting event:**		M0			
Workpackage title: Awareness and international cooperation (YEOS-AWARE)							
Partner id (lead in bold)	1	**2**	3	4	5	6	7	8
Person-months:	1	3	1	0	1	1	1	1

Objectives

- To set up an awareness campaign addressing a full hierarchy of stakeholders, throughout the project. Governmental agencies and authorities, policy-makers, the marine scientific community, and the marine industries and services sector will be the main target through national meetings in China and Korea. The campaign will promote the awareness and the understanding of the benefits of ocean forecasting in the Yellow Sea and Bohai Sea. The scope is to build momentum towards societal support and seek commitments from governments for operational ocean monitoring and forecasting.
- To enhance EU-China-Korea cooperation under GEOSS framework. This is a bottom-up approach based on BOOS-YOOS cooperation and a multi-dimension links between YEOS and on-going European and global initiatives on marine observation system (which is represented by YEOS advisory group).

Description of work (task leader in bold)

The main tools for raising awareness will be (1) meetings on national level and (2) preparation and distribution of informative material for general awareness, The awareness process will be supported by activities in the other WPs, especially the YEOS-INFO (WP7).

To strengthen the EU-China-Korea cooperation under GEOSS framework, a bottom-up approach will be used (described in section B.2). This will be realised through sharing knowledge between BOOS and YOOS partners, and an investigation on the future BOOS-YOOS cooperation plan and initiate new proposals by working together with the YEOS advisory group.

Task 9.1 YEOS website **DMI/KORDI/NCSB**

Associated with YEOS information system (WP7), a YEOS website will be built up. The major part of the site will be trilingual (English, Cinese and Korean). In order to raise the public awareness, popular oceanography of Yellow Sea will be a part of the website.

Task 9.2 Awareness in national and regional level **CKJORC**

National meetings will be held in China and Korea in the first 24 months of the project to bring national stakeholders together and provide a forum to:

- present the concepts of ocean monitoring and forecasting,
- outline the aims of YEOS,
- assess present capabilities in relation to operational oceanography,
- present the types of YEOS products that can be developed and the benefits that can be derived from these products especially to improve performances in local services,
- trigger mechanisms for interaction and feedback with end-users

Task 9.3 General awareness **NCSB**

In order to notify a wide scope and multi-level users of YEOS products, a programme of actions is envisaged consisting of the following main elements:

- production and distribution of brochures, distribution of available clips and documentaries in different languages (English, Chinese, Korean);

- use of the YEOS-INFO in the demontration period, to serve the water sports of 2008 Olympic Games; make contacs with local media dedicated visits/communications to Ministries, EC, GEOSS Secretariat in WMO and other high level authorities;

Task 9.4 Sharing knowledge in BOOS, NOOS and YOOS communities, use experiences from BOOS and NOOS in establishing YOOS system **KORDI**

Task 9.5 Perspectives of EU-China-Korea cooperation under GEO/GEOSS framework **DMI**
Together with YEOS advisory group, YEOS partners will explore further opportunities for the cooperation and initiate new proposal(s) which will benefit GEOSS implementation plan.

Deliverables

D12. EU-China-Korea cooperation perspective for marine component under GEOSS

Milestones and expected result

M9.1 BOOS-YOOS system: status and major challenges investigated	M18
M9.2 BOOS-YOOS cooperation plan ready	M18
M9.3 EU-China-Korea cooperation under GEOSS explored	M18
M9.4 National awareness meetings are organised in China and Korea	M24
M9.5 A report on the perspectives of EU-China-Korea cooperation in GEOSS implementation plan ready	M30

8. Project resources and budget overview

8.1 Efforts for the project (Specific Support Action Effort Form in Appendix 1)

Table 5a YEOS Project Effort Form

Partners	DMI	CKJORC	FIO	GKSS	IAP	KORDI	NCSB	OUC	Total
Support activities									
WP2:YEOS-OBS	2	0	0	0	1	3	3	3	12
WP3:YEOS-INPUT	2	0	1	0	1	1	0	0	5
WP4:YEOS-WAVE	1	0	4	0	0	0	1	0	6
WP5:YEOS-OCEAN	4	0	0	0	6	0	3	0	13
WP6:YEOS-SPM	1	0	0	4	0	2	0	3	10
WP7:YEOS-INFO	1	0	0	0	0	1	1	0	3
WP8:YEOS-DEMO	4	0	2	2	2	1	5	1	17
WP9:YEOS-AWARE	1	3	1	0	1	1	1	1	9
Total Support activities	16	3	8	6	11	9	14	8	75
Consortium management activities									
WP1: Project management	2	0	0	0	0	0	0	0	2
Total consortium management activities	2	0	0	0	0	0	0	0	2
Total activities	18	3	8	6	11	9	14	8	77

A detailed person-month division in each WP is given in Table 5 Project Effort form. This is based on the workload required for each project task.

In total, YEOS workload is 77 months, among which EU countries have 24-month workload, China has 44 months and Korea has 9 months. Korea partner is self-funded. The consortium management activity takes account of 2-month workload while support activities take 75-month work. The 2month management work is required by a relative complicated consortium management between EU-China-Korea partners. The rules, way of project management in China and Korea are somewhat different from EU countries. Also the tele-communication is not as convenient as in EU countries. These have to be considered in the consortium management.

The distribution of expected workload with time and WPs is shown in Table 5b. In the first 12 project months, 29 person-month is used for implementing proto-type YEOS system. For the 2nd 12 project months, another 29 person-month is used, mainly for testing, operationalisation, demonstration of YEOS system. For the last 6 project months, 19 person-month is used, mainly for validation, improvement and dissemination of YEOS products.

Table 5b Temporal distribution of project workload (in person month)

Project month	M1-M12	M13-M24	M25-M30	Total
WP1	0,5	1	0,5	2
WP2	4	8		12
WP3	5			5
WP4	4	2		7
WP5	7	6		13
WP6	6	4		10
WP7	0,5	1	1,5	3
WP8		5	12	17
WP9	2	2	5	9
Total	29	29	19	77

8.2 Overall budget for the project (Forms A3.1 & A3.2 from CPFs)

Contract Preparation Forms

EUROPEAN COMMISSION
6th Framework Programme on Research, Technological Development and Demonstration

Specific Support Action

A3.1

Please use as many copies of form A3.1 as necessary for the number of partners

Proposal Number	037030	Proposal Acronym	YEOS

Financial information - whole duration of the project

Participant n	Organisation short name	Cost model used	Estimated eligible costs and requested EC contribution (whole duration of the project)		Costs and EC contribution per type of activities: Specific activities (1)	Costs and EC contribution per type of activities: Consortium Management activities (2)	Total (3)=(1)+(2)	Total receipts
1	DMI	FC	Eligible costs	*Direct Costs (a)*	143.200,00	26.059,00	169.259,00	203.110,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	28.640,00	5.211,00	33.851,00	
				Total eligible costs (a)+(b)	171.840,00	31.270,00	203.110,00	
			Requested EC contribution		171.840,00	31.270,00	203.110,00	
2	CKJORC	AC	Eligible costs	*Direct Costs (a)*	21.500,00	,00	21.500,00	25.800,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	4.300,00	,00	4.300,00	
				Total eligible costs (a)+(b)	25.800,00	,00	25.800,00	
			Requested EC contribution		25.800,00	,00	25.800,00	
3	FIO	AC	Eligible costs	*Direct Costs (a)*	34.000,00	,00	34.000,00	40.800,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	6.800,00	,00	6.800,00	
				Total eligible costs (a)+(b)	40.800,00	,00	40.800,00	
			Requested EC contribution		40.800,00	,00	40.800,00	
4	GKSS	FC	Eligible costs	*Direct Costs (a)*	71.865,00	,00	71.865,00	79.770,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	7.905,00	,00	7.905,00	
				Total eligible costs (a)+(b)	79.770,00	,00	79.770,00	
			Requested EC contribution		79.770,00	,00	79.770,00	
5	IAP	AC	Eligible costs	*Direct Costs (a)*	27.500,00	,00	27.500,00	33.000,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	5.500,00	,00	5.500,00	
				Total eligible costs (a)+(b)	33.000,00	,00	33.000,00	
			Requested EC contribution		33.000,00	,00	33.000,00	
6	KORDI	AC	Eligible costs	*Direct Costs (a)*	30.500,00	,00	30.500,00	,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	,00	,00	,00	
				Total eligible costs (a)+(b)	30.500,00	,00	30.500,00	
			Requested EC contribution		,00	,00	,00	
7	NCSB	AC	Eligible costs	*Direct Costs (a)*	34.500,00	,00	34.500,00	41.400,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	6.900,00	,00	6.900,00	
				Total eligible costs (a)+(b)	41.400,00	,00	41.400,00	
			Requested EC contribution		41.400,00	,00	41.400,00	
8	OUC	AC	Eligible costs	*Direct Costs (a)*	19.000,00	,00	19.000,00	22.800,00
				of which subcontracting	,00	,00	,00	
				Indirect costs (b)	3.800,00	,00	3.800,00	
				Total eligible costs (a)+(b)	22.800,00	,00	22.800,00	
			Requested EC contribution		22.800,00	,00	22.800,00	
TOTAL			Eligible costs		**445.910,00**	**31.270,00**	**477.180,00**	**446.680,00**
			Requested EC contribution		**415.410,00**	**31.270,00**	**446.680,00**	

Contract Preparation Forms

EUROPEAN COMMISSION
6th Framework Programme on Research, Technological Development and Demonstration

Specific Support Action

A3.2

Proposal Number	037030	Proposal Acronym	YEOS

Estimated breakdown of the EC contribution per reporting period

Reporting Periods	Start month	End month	Estimated Grant to the Budget: Total	Estimated Grant to the Budget: In which first six months
Reporting Period 1	1	12	170.000,00	,00
Reporting Period 2	13	24	170.000,00	85.000,00
Reporting Period 3	25	30	106.680,00	106.680,00
Reporting Period 4			,00	,00
Reporting Period 5			,00	,00
Reporting Period 6			,00	,00
Reporting Period 7			,00	,00

8.3 Management level description of resources and budget

8.3.1 Cost for consortium management activities
A summary of the cost of consortium management activities is given in Table 6a.
The cost for the consortium management activities mainly include:

- maintenance of the consortium agreement if it is obligatory
- financial administration work
- deliver management reports
- coordination of the technical activities of the project;
- the overall legal, contractual, ethical, financial and administrative management;
- coordination of knowledge management

Table 6a YEOS cost estimation (Euro) for consortium management activities

Cost items	Coord. (DMI)	DMI	CK-JORC	FIO	GKSS	IAP	KORDI	NCSB	OUC	Total
Partner No.		0	0	0	0	0	0	0	0	
Person month	2	0	0	0	0	0	0	0	0	2
Person cost	15000	0	0	0	0	0	0	0	0	15000
Durable equip.	3000									3000
Travel Subst.	2000	0	0	0	0	0	0	0	0	0
Other cost	6059									8059
Subtotal	26059	0	0	0	0	0	0	0	0	
Overhead 20%	5211	0	0	0	0	0	0	0	0	3000
Total	31270	0	0	0	0	0	0	0	0	31270
% from EU	100	100	100	100	100	100	0	100	100	
Amount from EU	31270	0	0	0	0	0	0	0	0	31270

Coordination: 2-month coordination work is needed. The coordinator travel funds are needed for two meetings (€1000/trip) on consortium management.

For **Durable equipment**, a lap-top is needed for the consortium management, which costs €3000.

In the column of **'Other cost'**, funds €6059 are requested for arranging meetings and publications.

Person cost: for a senior scientist, DMI cost is €7500/month, with an overhead 0f 20%.

The total requested grant from EC for the consortium management activities is €31,270. This amount is 7% of the total requested cost from EU.

8.3.2 Cost for support activities

Table 6b YEOS cost estimation (Euro) for support activities

Cost items	DMI	CKJORC	FIO	GKSS	IAP	KORDI	NCSB	OUC	Total
Partner No.	1	2	3	4	5	6	7	8	
Person month	16	3	8	6	11	9	14	8	75
Person cost	120000	4500	12000	64865	16500	22500	21000	12000	273365
Durable equip.									0
Travel Subst.	17000	17000	7000	7000	11000	8000	13500	7000	87500
Other cost	6200		15000						21200
Subtotal	143200	21500	34000	71865	27500	30500	34500	19000	382065
Overhead 20%	28640	4300	6800	7905,15	5500	0	6900	3800	63845
Total	171840	25800	40800	79770,15	33000	30500	41400	22800	445910
% from EU	100	100	100	100	100	0	100	100	
Amount from EU	171840	25800	40800	79770,15	33000	0	41400	22800	415410

* GKSS has a 11% overhead

A summary of the cost breakdown for YEOS support activities is given in Table 6b. The description of the calculation is given below:

Person cost is mainly used for implementing and integrating existing components into a pre-operational system, carrying out training courses and seminars. Since YEOS covers three systems, i.e., observation, forecasting and information system (where the forecasting system consists of wave, ocean-ice and sediment subsystems), the amount of work is relatively large. Due to the low hourly cost of Chinese partners and no EU contribution to KORDI, the total person-month cost (including overheads) is still manageable within a SSA.

For Chinese partners, an exchange rate of 1Euro~10Yuan is used. The monthly salary for all Chinese partners is set to the €1500/month in the senior scientist level. This is because, in practice, China has a flexible salary system. For a senior scientist, his/her salary includes several parts: fixed salary, floating salary and other terms. The €1500/month is based on realistic estimation from the Chinese partners.

The **Travel cost** in support activities includes five parts: 1) a one-week training course 2) short-visiting; 3) national awareness meetings in China and Korea (WP9); 4) working meetings (1 for each of WP2-WP9) and 5) 2 workshops + 3 Steering Group meetings.

1) Training course: the one-week course is designed for educating Chinese and Korean oceanographers on YEOS observation, forecasting and information system. It will be jointly organised by OUC and CKJORC in Qingdao. 7 experts will be invited (where 4 from EU countries and one from ROK and 2 from China). The travel budget is estimated as 4x2500 + 1500 +2x1000 = €13500.

2) Short-visit, key Chinese partners also have to come to EU countries to learn the forecasting and information system in advance (NCSB). IAP will implement the 3DVAR data assimilation system in DMI which requires a short period for stay. However some of the short-visit events may combine with

the workshops or SG meetings so that the travel budget can be saved. In total this counts 60 person-days short-visit and 4 EU-CN trips (in total €12000).

3)Two national awareness meetings, for each meeting, up to 10 invited people will be paid by EU funds for domestic travel (€500/person). In total this costs €10,000. This amount will be added to travel cost to WP9 leader CKJORC, who is responsible for organising the meetings.

4) WP working meetings: up to 8 working meetings are requested on the level of €1000/trip (one meeting/WP for WP2-WP9). The total cost for the working meetings is €8000. This amount is added to the WP leaders' travel cost.

5) Steering Group (SG) meeting and workshops: The purpose of the 3 SG meetings is for ensuring the inter-WP cooperation. There will be two workshops to share new knowledge and disseminate products (one SG meeting is associated with one of the two workshops). The SG group, i.e., coordinator + WP leaders, has 8 persons. Hence, the requested trips are 8*2 EU-CN trips (€2000/trip) and 3*2 EU trips (€1000/trip), 2 KR-CN trips, and 5*2 China domestic trips (€500/trip). In addition to this, GKSS needs to participate the 2 workshops (€3500) arranged together with the SG meeting. The total travel cost for the consortium management is €47500, in which €40500 is requested from EU.

The summation of the above 5 items gives €91000. Considering some combined meetings, the total estimated travel budget for the supported activities is €875000, as shown in Table 6b.

Other cost
The other cost mainly covers the travel budget for the Advisory Group (AG) and the cost for printing materials for dissemination and arrange workshops

The Advisory Group is expected to have 5 members, who are expected to be from China Meteorological Agency, State Oceanic Administration, YOOS/GOOS representative, BOOS/ECOOP chairman, and a NEARGOOS representative (Japan). Among them two is from China, one from EU countries, one each from Korea and Japan. The five experts are invited to participate 2 YEOS workshops (one in China and one in Europe). In total there are 5 international trips (€2000/trip) and 5 EU/domestic travels (€1000/trip), which cost €15000.

The rest €6200 will be used for project publications, printing YEOS brochure, arrange workshops etc.

8.3.3 Contribution from consortium

In addition to the requested funding from EU, the consortium also contributes broadly to the project.

8.3.3.1 Budget for Korean partner KORDI
Since the role of KORDI in YEOS well fit into its institutional interests, KORDI will be fully self-funded in YEOS. KORDI is carrying out many on-going projects on the Yellow Sea marine environment observation and modelling sponsored by Korean government. There are also other projects on the research of the Yellow Sea environment such as development of fine sediment transport. Through there on-going project, KORDI can participate in YEOS and support its activities as a YEOS partner. Total KORDI contribution to the project is €30500.

8.3.3.2 DMI contribution
DMI will make its own contribution in making high resolution weather forecast (HIRLAM model, with a resolution of 7,5km) available for Yellow Sea and providing free parallel computing.

In summary, the total project cost is €477,180 among which €446,600 is requested from EU, among which the consortium management cost is €31270.

9. Other issues

9.1 Ethical issues

There are no ethical issues associated with the subject of the proposal.

Table A. Proposers are requested to fill in the following table

Does your proposed research raise sensitive ethical questions related to:	**YES**	**NO**
Human beings		X
Human biological samples		X
Personal data (whether identified by name or not)		X
Genetic information		X
Animals		X

Table B. Hereby the consortium confirm that the proposed research does not involve following items:

- Research activity aimed at human cloning for reproductive purposes,
- Research activity intended to modify the genetic heritage of human beings which could make such changes heritable[3]
- Research activity intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

	YES	**NO**
Confirmation : the proposed research involves none of the issues listed in Table B		X

9.2 Gender issues:

YEOS will dedicate to promote the participation of female scientists and students in the project. Female scientists from YEOS partner CKJORC, FIO, IAP, NCSB and OUC will be involved in the project. In case of any new employment made using YEOS funding, female scientists are welcome to apply.

9.3 Policy issues:

There are no other EC-policy related issues.

Appendix A - Consortium description

A.1 Participants and consortium:

There are in total 8 partners in YEOS, with two from EU (one major operational agencies and one research centre), four from China (one operational agency responsible for Yellow-Bohai Sea monitoring and forecasting, two research centres and one university), one China-Korea Joint Research Centre on Yellow Sea (CKJORC) and one major Korean research institute on marine monitoring and modelling (KORDI). The role of partners is determined by their specific skills and official duties. A summary of the role and relevant skills is given in Table A.1.1.

Table A.1.1 Role and specific skills of the participants

Participant no.	Name	Role	Relevant skills and experiences
1	DMI	Project coordination, implement 3D ocean model and information system, contribute to OOSs cooperation, assist demonstration of the YEOS system	Operational wave modelling, coupled ocean-ice modelling, information system, remote sensing, hold BOOS chairman-ship
2	CKJORC	Contribute to integration of observing system, building up database, OOS cooperation, YEOS product dissemination, leading Awareness WP.	Expertise in Yellow Sea observing system, operational oceanography system and database, wide experiences in international cooperation.
3	FIO	Implement and validate FIO wave model, validate 3D ocean model, assist demonstration of the YEOS system	Strong wave modelling and 3D ocean modelling expertise in the region.
4	GKSS	Implement and test the sediment transport model in Yellow-Bohai Sea	Original owner of the sediment transport model in YEOS. Expertise in sediment transport modelling
5	IAP	Implement 3DVAR assimilation scheme in BSHcmod, assist integrating observing system, implementing and testing the BSHcmod.	Ocean modelling, data assimilation
6	KORDI	Test and validate sediment transport model, lead integrating observing system, contribute to OOS cooperation, YEOS product dissemination	Sediment modelling, Yellow Sea monitoring, hold YOOS chairman-ship
7	NCSB	Build up observation database, test BSHcmod, demonstrate YEOS system, work together with DMI to implement the information system	Expertise in operational modelling and monitoring
8	OUC	Contribute to integration of YEOS observing system (esp. bio-chemical parameters), SPM validation and future cooperation possibility in ecosystem modelling, disseminate YEOS results in research communities	Expertise in marine ecosystem and pollutant modelling, remote sensing.

In YEOS, participants from China and South Korea are involved. Firstly, their involvements are necessary because a Yellow Sea observation, forecasting and information system has to be understood and operated by Chinese and Korean partners. Secondly, the selection of the partners is proper. The coordinator has been working in FIO, China on Yellow Sea modelling for several years and has a close cooperation with NCSB, KORDI and China research centres which deal with Yellow Sea and Bohai Sea research. The purpose of YEOS is to strengthen the EU-China-Korea cooperation through implementing an integrated observation, forecasting and information system of Yellow Sea and Bohai Sea. To this end, Chinese and Korean partners are selected with concerns below:

- NCSB is the only Chinese operational monitoring and forecasting agency responsible for the Yellow Sea and Bohai Sea; NCSB is essential in hosting and demonstrating YEOS system.
- KORDI is the leading ocean research institute in South Korea and major Korea monitoring agency on Yellow Sea. KORDI is also leading YOOS and very active in NEARGOOS. KORDI is essential in YOOS-BOOS cooperation, and integrating Korean part of the Yellow Sea observation system into the YEOS system.
- CKJORC is an official organisation established by China and Korea governments. It is actively involved in and coordinating many kinds of China-Korea cooperation on Yellow research and monitoring. CKJORC has to be involved due to its role in China-Korea cooperation activities.
- FIO has an advanced wave model on Yellow Sea and Bohai Sea, as well as a strong physical oceanography group on Yellow-Bohai Sea research. FIO is essential for the wave forecasting system.
- IAP has the strongest marine data assimilation group in China. IAP will implement a 3DVAR assimilation scheme in the YEOS 3D ocean forecasting system.
- OUC is the largest ocean university in China. The OUC partner has expertise in sediment transport modelling and ecosystem modelling. OUC is a perfect partner for arranging seminar and training courses. OUC is important in extending the dimension of future EU-China-Korea cooperation in ecosystem modelling and disseminating YEOS products to the Chinese research community.

Partner 1. Danish Meteorological Institute (DMI)

DMI was founded in 1872. Now, more than 125 years later, DMI has a staff of 400 employees and more than 600 associated observers, and an annual turnover of 33.60 million Euro.

The main objectives of DMI are notably:
to make observations
to provide forecasts and other information
to communicate these to the public
to contribute to the development of the meteorological, oceanographic and related geophysical sciences

DMI provides meteorological, oceanographic and related services for the community within the large geographical area of the Kingdom of Denmark (Denmark, the Faroe Islands and Greenland), including surrounding waters and airspace. DMI's area of activity comprises forecasting and warning services as well as continuous monitoring of weather, sea state, climate, and related environmental conditions in the atmosphere, over land and in the sea. The purpose of these activities is to assist in the protection of life and property as well as to provide a basis for economic and environmental planning (aviation, national defense, shipping, agriculture, sporting and recreational events, etc.). Through scientific research and development DMI secures the optimum accomplishment of its tasks and serves the community with up-to-date information.

DMI's role is to coordinate the project, lead WP1 – Project management, WP3 - input dataset and WP6 information system, implement 3D ocean model and information system, provide atmosphere forcing, contribute to the OOSs cooperation, training courses and assist demonstration of the YEOS system.

Key persons involved

Dr. Jun She, PhD in climate dynamics, 1991; employed by Centre for Marine Forecast at DMI since 1998, working on operational wave and 3D ocean modelling and validation, HIRLAM-WAM coupling and optimal design of observational networks. 1991-1995: working on typhoon wind/wave simulation data assimilation and Yellow Sea Large Marine Ecosystem at the First Institute of Oceanography, China; 1995-1996: visiting researcher at JAMSTEC, developing general methods in Pacific buoy network design; 1996-1998: Research Assist. Prof. at the Centre for Coastal Physical Oceanography, on 3D Ocean modelling and parameterization. He is a Steering Group member of an international organisation NOOS (NW Shelf Sea Operational Oceanography System) and currently coordinating an EU FP5 project ODON (Optimal Design of Observational Networks).

Dr. Erik Buch, PhD in oceanography, 1985; Head of the Centre for Marine Forecasting at DMI. Expertise in sea ice and ocean climate. BOOS chairman since 1994. He is coordinating an EU FP5 project PAPA, a MERSEA Steering Group member responsible for downscaling activity and currently coordinating a pan-European effort ECOOP (pan-European Coastal-shelf Sea Operational observation and forecasting system).

Dr. Per Berg, PhD in applied mathematics, 1989; has been worked on 3D coastal/shelf sea modelling since 1993. He used to work on 3D ocean model Mike3 in DHI – Water and Environment between 1993 – 2004. Started to work on the DMI 3D operational Baltic-North Sea model BSHcmod since 2004.

Mr. Jacob Woge Nielsen, Msc. in oceanography, 1988; has been worked in DMI on storm surge forecasting and wave modelling since 1991. He is the leading person on operational activities in the Centre for Marine Forecasting, with experience of more than a decade for operational system configuration. He developed a preliminary information system for presenting different type of model products: http://ocean.dmi.dk .

Partner 2. China-Korean Joint Oceanography Research Centre (CKJORC)

China-Korea Joint Ocean Research Center (CKJORC), which is established by Chinese and Korean Governments in 1995. Her aim is to build up the linkage between ocean scientists and marine agencies and promote the cooperation on the marine science and technology and coordination on the ocean reseaerh activities between China and Korea.

CKJORC will pursue the goals as an information center, data warehaouse and cooperative project development center. CKJORC will also provide the support with the insfrastruture, information and data which are avaiable in the Yellow Sea region, finally strenthen the cooperation between China and Korea.

Currently there are six employees working in the Centre. Four of them are senior scientists. CKJORC has participated and coordinated several research and monitoring projects in Yellow Sea, e.g., 'Yellow Sea Water Cycle Investigation Program'. CKJORC has also organised marine training courses for many times, e.g., 'Ecosystem modelling training course' together with MUMM - Management Unit of North Sea Mathematical Models in Belgium. Participants of these training courses are from China, South Korea and other countries.

CKJORC's role in YEOS is to lead WP9 – Awareness, contribute to the integration of observing system, building up database and YEOS product dissemination, and arrange seminars and organize training course.

Key persons involved

Dr. Hoi-Soo Jung, PhD in oceanography in 1994, Soul University. Director of CKJORC. Post Doc. in 1998 at WHOI, USA; Member of ROC President Scientific and Technological Advisory Committee in 2005, expertise in scientific management and international cooperation.

Mr. Hyun Yeong Kim, MBA in 1986, Yonsei University. Head of Technical Department of CKJORC. Ex- Director of Ocean Policy Department and Administration Department of KORDI.
Expertise in international cooperation in ocean science, ocean policy, R & D management, administrative works for scientific projects.

Partner 3. First Institute of Oceanography of State Oceanic Administration (FIO)

FIO was founded in 1958. It has a staff of 230 employees and more than 300 associated observers, and an annual turnover of RMB 100 million (approximately equivalent to 10.4 million Euro).

The main objectives of FIO consist of:
- to make observation at regional and global regions
- to foster the development of ocean models and their application in hindcasting/forecasting
- to improve the understanding of the oceanic processes and their roles in the regional/global climate systems
- to provide technical and scientific transmission (including the Met-Ocean, G&G, ecology, and etc.) to the public and enterprises
- to contribute to the national sustainable development

FIO, as a leading national oceanography research centre, carries out the basic and applied research to foster the development of ocean science and to guarantee the sustainable increase of national blue GDP along with the best ocean protection. Through the multidiscipline research, FIO aims to increase the understanding of various processes within China Sea and neighbourhood oceans, and to build the capacity to predict the variability and to assess the related consequence. FIO provides service to meet the requirements from the public and industries. Also it provides scientific supports for the national environmental planning and policy-making.

FIO's role is to lead WP4 – Wave forecasting system, implement and validate FIO wave model, validate 3D ocean model, assist demonstration of the YEOS system, contribute to training courses.

Key person involved

Dr. Weidong Yu, PhD in physical oceanography. Employed by FIO since 1995, working on numerical wave modelling, validation and typhoon simulation. 1998-1999: visiting scholar at LMD/CNRS, France, developing global atmospheric GCM and ocean wave coupled model. 2000-2005: Associate Research Professor at FIO, developing FIO's observation program in Indo-Pacific Warm Pool region and carrying out large-scale atmosphere-ocean interaction. He is an associate member of CLIVAR IOP and PI of two international cooperative programs sponsored by Chinese Ministry of Science and Technology.

Mr. Gongke Tan, MSc in physical oceanography in 1991, Director of International Cooperation Office in FIO, ex-director of CKJORC, expertise on Yellow-Bohai Sea operational oceanography and international cooperation.

Partner 4. The GKSS Forschungszentrum Geesthacht GmbH (GKSS)

The GKSS Forschungszentrum Geesthacht GmbH (GKSS) is one of 15 members of the German Helmholtz Association of National Research Centres. GKSS is situated at Geesthacht near Hamburg and has a branch in Teltow near Berlin with a total staff of approximately 750 employees, including about 420 scientists, engineers and technicians. The main GKSS research areas cover materials science with two foci on engineering materials for lightweight structures and on functionalised materials for separation technologies and regenerative medicine, as well as environmental research focussing on research for managing the coastal zone; all these are closely embedded in research programmes of the Helmholtz Association.

Major research facilities at GKSS include the Geesthacht research reactor (FRG-1), which is used as a source of neutrons for research purposes; extensive experimental and testing facilities, pilot plants, mainframe computers, a research vessel and environmental monitoring facilities. GKSS comprises three research institutes, and its organisational structure is based on project management principles which promote networking of GKSS's activities internally and in particular with external partners. The latter include research institutes, universities, communities, private and public companies at both the national and international levels. Research at GKSS is problem- and user-oriented and covers basic as well as applied research including the establishment of both technical and commercial prototypes. About 76 % of GKSS's annual budget (74,6 mill. Euro in 2003) is provided by the national federal and states governments, while 24 % are generated via EU and national research projects, contract research, and licensing of GKSS patents for products and processes. High-level training and education for e.g. students, PhD-students, and post-docs play an important role at GKSS and is provided by numerous of its institute and department leaders, several of which being part-time affiliated to universities in Germany and abroad. Since the year 2000, researchers at GKSS have coordinated more than 20, and have participated in more than another 75 EU-funded research projects in the frame of FP5 and FP6 priority programmes.

GKSS's role is to implement and test the sediment transport model in Yellow-Bohai Sea, contribute to training courses.

Key persons involved

Dr. Arno Behrens, Ph.D. in Oceanography at the University of Hamburg in 1986. Since 1986 he is a research Associate at the Institute of Hydrophysics at the GKSS Research centre with a long experience in wave and current modelling. In particular he is responsible for current and wave model applications and operational implementations at national and international forecasts centres. For instance he was in charge of the implementation of a new ocean wave forecast system at the German weather centre (Deutscher Wetterdienst, DWD). He participated in the European project PROMISE and SEAROUTES.

Gerhard Gayer studied Oceanography at the University of Hamburg (M.Sc. in 1985). Since 1985 he is a research Associate at the Institute of Hydrophysics at the GKSS Research centre and specialised in wave modelling in shallow water applications and coupling with hydrodynamic circulation models. He participated in implementing wave models at various weather services and other institutions (e.g. SMHI-Sweden, MUMM-Belgium, and BAW-Germany). He was in charge of the implementation of a new suspended particulate matter transport module at the German BSH (Federal Maritime and Hydrographic Agency, Bundesanstalt für Seeschifffahrt und Hydrographie).

Dr. Heinz Günther, Ph.D. in Geophysics, published more than 70 papers on wave modelling, data assimilation, and measurements as well as coupling of numerical models. He was involved in about 30 national and international projects, in particular in: Implementation of an ocean wave forecasting system at ECMWF, and wave statistics in the German Bight and Southern Baltic Sea. He participated in the European projects NEPTUNE (MAST II), WASA (Climate and Environment), PROMISE (Mast IV), MaxWave, HIPOCAS, SEAROUTES and was coordinator of the Mast IV project EuroROSE. Presently he is participating in the FP6 projects SAFEDOR, ADOPT.

Partner 5. Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences

The Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences, originated from the former Institute of Meteorology of Academia Sinica established in February of 1928, one of the earliest eight institutes engaged in the research of modern natural sciences in China, is a comprehensive research institution focusing on the atmospheric motion, physical and chemical processes and the interactions between the atmosphere and its surrounding environment. The Institute also aims to develop new atmospheric sounding and experimental techniques, to provide theory and methodology for monitoring, predicting and even controlling over weather, climate and environment. Many research subjects have been initiated and developed in the Institute in China, such as atmospheric dynamics, numerical weather prediction, satellite meteorology, comprehensive disaster mitigation, global climatic change, atmospheric chemistry and atmospheric environment etc.

IAP has a strong research group in ocean modelling, data assimilation and forecast. In particular, the first experiment on the extra-seasonal climate prediction by numerical model (AGCM) was performed in the world in 1988 and the prediction system was established and operated thereafter (CLIVAR, 1996). IAP developed the first Chinese operational oceanic data assimilation system. The system is now used in National Climate Centre. A new 3DVar assimilation system, OVALS (Oceanic Variational Data Analysis System) was developed and applied successfully in the researches for the Tropical Pacific, China regional seas and ENSO forecasts. This system was also used in National Center for Marine Environment Forecast of China.

IAP's role is to lead WP6 – 3D ocean-ice forecasting system, implement 3DVAR assimilation scheme in the BSHcmod, assist integrating observing system, implementing and testing the BSHcmod, contribute to training courses.

Key persons involved

Prof. Jiang Zhu. Deputy Director of IAP. Research interests: Ocean modelling and data assimilation, optimal control methods and applications to geosciences.

Prof. ZHOU, Guangqing , PhD in climate dynamics, 1996; Director of Information Centre of Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences since 2003; Senior Scientist (Professor) in IAP since 2002 working on ocean general circulation model (OGCM) development and coupling with atmospheric models, short-term climate prediction especially ENSO prediction, oceanic data assimilation and its application in shot-term climate prediction. 1997-1999: developing IAP ENSO Forecast System which is now also used in National Center for Marine Environment Forecast of China; 1998-2000: developing a 3DVar oceanic data assimilation system which is operationally used in National Climate Center of China; 2002-2004: developing OVALS (Oceanic Variational Analysis System) and applying in tropical Pacific and China adjacent seas.

Partner 6. Korean Ocean Research and Development Institute (KORDI)

KORDI(Korea Ocean Research and Development Institute) was established in 1973, as the nation's only comprehensive ocean research institute and been engaged in various R&D activities of ocean science and technology contributing development of ocean-related national policies and advancing ocean development to the next level.

KORDI is carrying out many on-going projects on the Yellow Sea marine environment observation and modelling sponsored by Korean government. There are also other projects on the research of the Yellow Sea environment from other funding sources, such as Yellow Sea Large Marine Ecosystem (funded by the World Bank) and the development of fine sediment transport model. Through these on-going project, KORDI can participate in YEOS and support its activities as a YEOS partner.

KORDI's role is to lead the WP1 – integration of observation systems, test and validate sediment transport model, lead integrating observing system, contribute to OOS cooperation, YEOS product dissemination

Key persons involved

Dr. Dong-Young LEE, Ph.D. Coastal and Oceanographic Engineering, Univ. of Florida, Florida, USA, 1983. He is the Head of Marine Environmental Engineering/Coastal Disaster Prevention Research Lab. in KORDI. He used to be the Director of Ocean Instrument, Data Management and Service Division in KORDI, NEARGOOS Chairman and the Director of China-Korea Joint Ocean Research Centre in Qingdao, China. He served ROK Air Force as a marine meteorological officer in 1972.10 - 1977.2, and then worked as a Research Associate and Assistant Professor in the Univ. of Florida during 1984.1 - 1985.9, and a Senior/Principal Research Scientist in KORDI since 1985.9.

Partner 7. North China Sea Branch of State Ocean Administration, China (NCSB)

Founded in 1965,NCSB is a governmental organization under the State Oceanic Administration (SOA). The responsibility of NCSB is to represent the SOA to carry out marine administrative management, maritime rights and interests maintenance, marine environment protection and marine environment monitoring & forecasting in North China Sea which covers the BoHai Sea and the Yellow Sea.

Currently NCSB has about 1000 scientific and technological employees. Among them there are around 100 senior scientific and technological employees. NCSB has 7 vessels and 2 airplanes for Marine Surveillance monitoring. All of them are equipped with marine monitoring instruments. In addition to this, NCSB is equipped with a satellite reception and processing system, a few marine automatic observing systems and global marine meteorology data collecting system. The NCSB also has several laboratories on marine biology , chemistry , hydrology, meteorology and geology.

NMFC（North China Sea Marine Forecasting Center）is a department of NCSB, which is reaponsible for forecasting the marine environment of Yellow Sea and Bohai Sea. The NMFC is developing a "Marine environment monitoring and forecast system of 2008 Olympic ship game" in Qingdao. The system including four Marine data Buoy station, two High frequency radar system, one ADCP placed on the seabed. By the way, a monitoring vehicle and a monitoring vessel is also used for the monitoring work. Some advanced marine environment numerical forecasting model will be introduced into NMFC for the marine environment forecasting.

NCSB's role is to lead WP8 – Demonstration of YEOS system, to build up observation database, test BSHcmod, demonstrate YEOS system and work together with DMI to implement the information system.

Key person involved

Mr. Mingke Guo, Msc in physical oceanography. Director of North China Sea Marine Forecasting Center of NCSB, SOA. Professor of oceanography. Mainly engaged in marine environment monitoring, marine environment numerical forecast, marine environment and disaster assessment etc. Participated and coordinated 5 China natural science foundation projects and 3 research projects in "863 " Program during 1988-2005, e.g., "Integration and application system of airborne multi-sensors", "Development of ocean wave numerical forecast model" and "North Pacific Ocean meteorology navigation research" etc. Awarded with the "Second award for Science and Technology advancement of SOA", "Second award for Science and Technology advancement of Liu-en lan Youth", "Second award for Science and Technology advancement of Ministry of communications", "Award for innovation in Science and Technology of the UN Technology promotion system".

Partner 8. Ocean University of China (OUC)

Ocean University of China, especially renowned for its marine sciences and fishery sciences, is one of the key comprehensive universities under the direct jurisdiction of the Ministry of Education in China. It consists of such branches of learning as science, engineering, agronomy (fishery), economics, literature, medical science (pharmaceutics), philosophy and law. The university has 73 different laboratories and a 3500-ton marine research vessel Donfanghong 2. The university has set up 26 research institutions, among which the Institute of Physical Oceanography, the Academy of Marine Drugs, the Institute of Ocean Remote Sensing, the laboratory of Marine Environmental Science and Engineering, and the Academy of Marine Economy and the Law of the Sea are most well known. Being multi-disciplinary, comprehensive and talent-packed, they are mainly engaged in theoretical studies mainly on physical oceanography, marine chemistry, marine biology and marine geology, research in marine environment investigation and prediction, exploitation and utilisation of marine resources, etc. The university has always laid stress on the training of scientists and teachers. In the past years, half of the teachers of the university have been to foreign countries as students, visiting scholars or guest lecturers. It has established cooperative and exchange relationship with more than 50 universities and research institutions in 35 foreign countries or regions.

OUC's role is to lead WP7 – YEOS-SPM, arrange seminar and training courses, contribute to integration of YEOS observing system, validation of sediment transport modelling and future cooperation possibility in ecosystem modelling, and disseminate YEOS results in research communities.

Key person involved

Dr. Huiwang GAO, Ph.D in atmospheric physics, 1996, with postdoctoral research work on marine ecosystem and modelling during 1996-1998. He is a professor of marine environmental science and the Dean of College of Environment Science and Engineering, the Director of Institute of Marine Environment at OUC. He is a member and deputy Secretary of Chinese Association of Ocean and Limnology and Editorial Board members of several Chinese journals on marine and atmospheric Sciences. He has published over 50 papers in Chinese and international journals mainly on the transportation and dispersion of air pollutants (dust, sulphur and nitrogen), marine ecosystem modelling, depositions of nitrogen and dust to the sea.