

GRACE grant no 679266

Dissemination and Exploitation Plan Draft 2

D6.7

WP6: Management, dissemination and communication





Prepared under contract from the European Commission Contract n° 679266 Research and Innovation Action Innovation and Networks Executive Agency Horizon 2020 BG-2014-2015/BG2015-2

Project acronym:	GRACE
Project full title:	Integrated oil spill response actions and environmental effects
Start of the project:	01 March 2016
Duration:	42 months
Project coordinator:	Finnish Environment Institute (SYKE)
Project website	http://www.grace-oil-project.eu
Deliverable title:	Dissemination and Exploitation Plan Draft 2
Deliverable n°:	D6.7
Nature of the deliverable:	Report
Dissemination level:	Confidential
WP responsible:	WP6
Lead beneficiary:	SYKE

Due date of deliverable:	31 August 2017
Actual submission date:	31 August 2017

Deliverable status:

Version	Status	Date	Author	Approved by
1.0	Draft	23.8.2017	Kirsten Jørgensen, SYKE + all contact persons	
1.2	Draft	30.8.2017	Kirsten Jørgensen, SYKE Maria Koski, SYKE	WP6+ steering group 30.8.2017
1.3	Final	31.8.2017	Kirsten Jørgensen, SYKE Maria Koski, SYKE	Steering group 31.8.2017

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Executive Summary

The dissemination and exploitation plan contains the second draft of planned publications, participation in conferences and other outreaching activities. It also contains an overview of the products to be developed in GRACE and the plan for commercialization of these.

The potential end users have been identified to belong to a) The private sector, b) Public sector national oil spill response authorities and their subcontractors, 3) Public sector (cross boarder associations and their working groups), 4) Scientific community. An e-mailing list with contacts to private and public stakeholders and NGOs will be produced at the beginning of the project and a notification about the GRACE project and the GRACE project web pages will be made.

So far 5 abstracts have been prepared for three different conferences in 2016 and 2017. At this stage 18 scientific articles have been planned. They are all still with tentative titles. The members of the consortium are planning to attend 25 different conferences during the course the project in Europe and also some outside Europe.

A list of planned products has been elaborated with a timetable for commercialization. 12 different products are listed of which 9 are of commercial interest. The companies involved in the project are playing a large role in the commercialization plan.

The project has so far made four press releases on the progress and is planning to continue this when relevant. The web-pages of GRACE serve a source of information of the outcomes of the project.

Identification of potential end users

The potential end users of the innovation and research results in GRACE includes: The private sector

- Oil exploration companies
- Shipping companies including ice breakers
- Sensor developers
- Commercial laboratories performing oil impact research
- IT companies developing data transfer and data visualization
- Biotechnological companies for microbial inoculants and natural degradation
 assessments
- Consulting companies providing assessment of risks for the oil industry
- Ports
- Oil spill responders such e.g. Oil spill response limited (OSRL), The international tanker owners pollution federation limited (ITOPF)

Public sector national oil spill response authorities and their subcontractors

- National Oil Spill Response Authorities
- Coast Guards
- Defence forces

Public sector (cross boarder associations and their working groups)

- Environmental authorities
- EMSA
- HELCOM Response
- IMO HNS
- Copenhagen agreement (oil spill response in the Nordic Countries)
- Arctic council EPPR
- Central Command for Maritime Emergencies, Germany
- Federal Institute for Risk Assessment (BfR), Germany
- WWF

Scientific community

- On-line oil sensing
- Biotechnology
- Ecotoxicology
- Higher education

An e-mailing list with contacts to private and public stakeholders and NGOs will be produced at the beginning of the project and a notification about the GRACE project and the GRACE project web pages will be made. Representatives from these stakeholder groups will also be invited to the final seminar.

Publication plan

The contacts to the scientific community will be ensured through publication in high level international journals preferably with free access. Furthermore, the participation in international conferences will ensure information to the scientific community. We will also propose to conference organizers to include special sessions on oil contamination topic.

So far the following abstracts have been submitted:

Johann, S. et al. 2016. Determination of oil spill and response impacts on biota using effect-based tools and ecological risk assessment – GRACE project WP3 SETAC GLB conference 2016 in Tübingen, Germany Sept 5-8, 2016.

Leonie Nuesser, Sarah Johann, Elad Salomons, Olya Skulovich, Sarah Hartmann, Caroline Ganal Catrina Cofalla, Holger Schuettrumpf, Avi Ostfeld, Kirsten Jørgensen, Tarmo Kõuts, Henner Hollert and Thomas-Benjamin Seiler. Zebrafish larvae behaviour as a biological early warning system for aquatic systems. Extended and short abstract for SETAC Europe, Brussels May 2017.

T.-B. Seiler, S. Johann, L. Nüßer, K. Lehtonen, A. Ahvo, R. Turja, A. Reunamo, J. Nuutinen, I. Marigómez, M. Soto, N. Etxebarria, U. Izagirre, A. Orbea, X. Lekube, E. Gil-Uriarte, A.J. Olsen, B.M. Jenssen, I. Salaberria, T.M. Ciesielski, D. Altin, T. Kõuts, S. Pärt, M. Duchemin, K. Jørgensen & H. Hollert. Oil spill and response impacts on biota in cold climates – effect-based tools and ecological risk assessment. Abstract for SETAC Europe, Brussels May 2017.

X. Lekube, A. Ahvo, D. Altin, T.M. Ciesielski, E. Gil-Uriarte, U. Izagirre, K.S. Jørgensen, I. Marigómez, J. Nuutinen, M. Soto, R. Turja, K.K. Lehtonen. EU H2020 project GRACE: Experimental design for assessing the impact of oil and oil-dispersant exposure on Norwegian Sea and Baltic Sea mussels (*Mytilus* spp.) under "natural" conditions. Abstract for SETAC Europe, Brussels May 2017.

Siim Pärt, Tarmo Kõuts, Kaimo Vahter, Real time in situ oil-spill monitoring using FerryBox system equipped with UV-fluorometer. Abstract and poster at Baltic Sea Science Congress, Warnemünde, June 2017.

Tarmo Kõuts, Siim Pärt, Kaimo Vahter, Operational *in situ* oil spill detection in the Baltic Sea, using FerryBox system equipped with oil sensor. Abstract at EuroGOOS Conference, Bergen, October 2017.

Siim Pärt, Tarmo Kõuts, Kaimo Vahter and Leonie Nüßer, Use of Ships of Opportunity – SOOP, for on–line oil spill monitoring. Abstract for Transport Research Arena, Vienna April 2018.

Jaak Truu, Marika Truu, Kirsten Jorgensen, Anna Reunamo, Ossi Tonteri, Nga Dang Integration of multiple omics data for assessment of specific microbial community response to accidental release of oil into the marine ecosystem. 7th International Weigl Conference, Lviv, Ukraine, Sept 2017.

Jaak Truu, Marika Truu, Kirsten Jorgensen, Anna Reunamo, Ossi Tonteri, Nga Dang, Tarmo Kõuts, Siim Pärt Development of nature-based solutions for marine oil spill response actions. Nature-based solutions (NBS2017), Tallinn, Estonia, Oct 2017.

The following scientific articles are planned at this stage:

Introduction article of GRACE in 2017 SPRINGER OPEN (Environmental Sciences Europe; Henner Hollert RWTH). The information should be kept on a general level per WP.

WP1

Development of on-line in situ methods for oil spill detection at open sea using FerryBox technology, review of WP1 results, Kõuts T., Pärt S., Vahter K. peer review article

Use of SmartBuoy technology for oil spill detection at fairways – Meritaito and Luode team etc, paper in technological journal.

Oil bioremediation kinetics characteristics in cold marine environment

Metagenomic study on oil biodegradation in sea water-ice interface

Pilot-scale electrokinetic treatment of oil contaminated marine sediments

Final paper summarizing all collected results by WP2 during the GRACE project

WP3

Monitoring of biological effects of oil spills and oil spill responses in the northern Atlantic and Baltic Sea. Review article to be based on the deliverable 3.1. 2017. Marigomez, Seiler, Lehtonen, et al. Suggested journal: *Environmental Reviews*

NTNU

Effect of crude oil water accommodated fraction on survival, physiological and oxidative stress biomarkers in the North Atlantic copepod Calanus finmarchicus. Suggested journal: *Aquatic Toxicology.*

Genotoxic effects of crude oil water accommodated fraction in the North Atlantic copepod Calanus finmarchicus. Suggested journal: *Aquatic Toxicology*.

Effect of refined marine-oil pollution on survival, physiological and oxidative stress, and genotoxic biomarkers in the North Atlantic copepod Calanus finmarchicus. Suggested journal: *Chemosphere*.

Effect of marine diesel pollution on oxidative stress and genotoxic biomarkers in the North Atlantic copepod Calanus finmarchicus. Suggested journal: *Marine Pollution Bulletin*.

Effects of chemically dispersed crude oil on survival, physiological and oxidative stress, and genotoxic biomarkers in the North Atlantic copepod Calanus finmarchicus. Suggested journal: *Marine Pollution Bulletin*.

Using transcriptional responses to raw oil and dispersed oil in zebrafish embryos to aid biomarker discovery. Nüßer et al. Suggested journal: *Environmental Science and Technology*

Innate immune gene expression in zebrafish embryos after multistressor interactions of bacterial infection and PAH exposure. Johann et al. Suggested journal: *Molecular Immunology* or *Environmental Science and Pollution Research*

Mobile zebrafish behavior-triggered biosensor system for oil spill monitoring and detection directly in a flow-through system. Nüßer et al. Suggested journal: *Journal of Environmental Monitoring*. Article based on deliverable D 1.11

Effect-based assessment of biodegradation and remediation success after oil spill scenarios in a cold climate. Seiler et al. Suggested journal: *Science of the Total Environment.* Article based on deliverable D 2.4

Definition of an effect-based bioassay toolbox for high-throughput cost-effective investigation and fingerprinting of oil contamination and environmental risk assessment. Johann and Nüßer et al. Suggested journal: *Aquatic Toxicology*. Article based on deliverable D 3.9

Adverse outcome links during early development of zebrafish in response to crude oil and dispersant contamination. Johann et al. Suggested journal: *Environmental Toxicology and Chemistry*. Article based on deliverable D 3.12

Seasonal variablility in biomarkers of pollution effects in mussels (*Mytilus trossulus*) in the Baltic Sea: a baseline study. Ahvo, Turja, Uriarte, Brenner, Lehtonen, et al. Suggested journal: *Marine Pollution Bulletin*

Biological effects of water-accommodated fractions of North Sea crude oil on mussels (*Mytilus trossulus*) from the Baltic Sea under different salinity and temperature conditions. Ahvo, Turja, Uriarte, Reunamo, Lehtonen, Jörgensen, et al. Suggested journal: *Aquatic Toxicology*

Biological effects of water-accommodated fractions of North Sea crude oil on the copepod *Limnocalanus macrurus* from the Baltic Sea. Turja, Lehtiniemi, Vuori, Kanerva, Ahvo, Lehtonen, et al. Suggested journal: *Chemosphere*

Effects of exposure to water-accommodated fractions of North Sea crude oil on the transcriptome of the mussel *Mytilus trossulus* from the Baltic Sea. Turja, et al. Suggested journal: *Environmental Pollution*

The following actions for special journal issues are planned:

Special issue on Grace research in Environmental Science and Pollution Research (with option for Open Access). Timetable: late 2017-early 2018 for submission of papers, then peer-review process. WP1 and microbiological tasks might be better suited in other journals, so not all WPs need to submit for the special issue. As an editor Henner Hollert/RWTH AACHEN to invite Grace consortium for a special issue in ESPR, if the General Assembly agrees to it in Spring 2017.

Participation in conferences

Table 1. Participation in the following conferences is planned.

What conference?	Where?	When?	Partner attending
AGU	San Francisco, USA	December 2017	13/MICB
AMOP	Canada	June 2018	02/AU
AMOP 2018	Canada	Unknown	08/GOSR
Arctic Frontier	Tromsa, Norway	year 2017	09/LAMOR
Arctic Frontiers	Tromsoe, Norway	January 2018	02/AU
Arctic Oil Spill Conference 2018	Unknown	year 2018	08/GOSR
Arctic Technology Conference	Canada	Year 2018	12/NORUT
BSSC'2017	Warnemünde, Germany	June 2017	04/TUT
EGU 2018	Vienna, Austria	April 2018	13/MICB
EGU'2017	Vienna, Austria	April 2017	04/TUT
FEMS 2017	Valencia, Spain	June 2017	03/UTARTU
ICMBE 2017	Paris, France	May 2017	03/UTARTU
IEEE conference	not known	year 2018	04/TUT
7th International Weigl Conference	Lviv, Ukraine	Sept 2017	03/UTARTU
INTERSPILL'2018	London, UK	March 2018	04/TUT
IOSC	Long Beach, USA	year 2017	09/LAMOR
ISME 2018	Leipzig, Germany	Year 2018	01/SYKE
ISME 2018	Leipzig, Germany	Year 2018	03/UTARTU
ISME 2018	Leipzig, Germay	Year 2018	12/NORUT

NBS 2017	Tallinn, Estonia	Oct 2017	03/UTARTU
Norwegian. Env. Tox. Symposium	Svalbard, Norway	March 2018	07/NTNU
Norwegian. Env. Tox. Symposium	Possibly Bergen, Norway	Year 2020	07/NTNU
Oil spill conf.	unknown, outside Europe	unknown	04/TUT
Oil spill conf.	unknown, outside Europe	unknown	01/SYKE
Oil spill conf.	unknown, outside Europe	unknown	02/AU
Oil spill conf.	unknown, outside Europe	unknown	03/UTARTU
Oil spill conf.	unknown, outside Europe	unknown	10/MTOY
Ocean Business'2017	Southhampton, GB	April 2017	04/TUT
SETAC GLB 2016	Tübingen, Germany	Sept. 2016	05/RWTH
SETAC EU 2017	Brussels, Belgium	May 2017	04/TUT
SETAC EU 2017	BRUSSELS, Belgium	May 2017	06/UPV-EHU
SETAC EU 2017	Brussels, Belgium	May 2017	05/RWTH
SETAC EU 2018	Rome, Italy	May 2018	07/NTNU
SETAC EU 2018	Rome, Italy	May 2018	02/AU
SETAC EU 2018	Rome, Italy	May 2018	01/SYKE
SETAC EU 2018	Rome, Italy	May 2018	05/RWTH
SETAC EU 2019	Helsinki, Finland	year 2019	06/UPV-EHU
SETAC EU 2019	Helsinki, Finland	May 2018	07/NTNU
SETAC NA 2019	Toronto, Canada	Nov 2019	05/RWTH
SETAC-Europe 2016	Nantes, France	May 2016	13/MICB
SICTA 2017	MADRID, Spain	year 2017	06/UPV-EHU
SICTA 2019	MEXICO DF	year 2019	06/UPV-EHU
TRA 2018	Vienna, Austria	April 2018	04/TUT

The SETAC EU 2019 has very recently been confirmed to be held in Helsinki Finland. We will suggest a special session on GRACE related topics at this conference. Kari Lehtonen from SYKE is in the organizing committee.

The Finnish Environmental Pollution Prevention Group headed by J. Rytkönen is planning the Full Scale Arctic Exercise and a 2 day seminar in Finland to be held just prior the Interspill 2018 conference in London, in order not to have the parallel event with Interspill. The idea is also to have overseas visitors for our event and they might have interest to stay in EU longer. This "International seminar Oil spills in Arctic Areas" 2018 event is scheduled for 7.-8.3.2018, and the site is Oulu, Northern Baltic coast in Finland. This Full Scale Arctic event would be run on the basis of the Copenhagen agreement and MOSPA, the Oil Combating Agreement of the Arctic Nations under the Arctic Council (E.P.P.R is coordinating work). J. Rytkönen is running the operational plan for this event with SAR demonstration and oil combating in ice conditions. Some of the GRACE specific items could possibly be taken on board to be used in that exercise. At the seminar there will be room for 3-6 presentations by GRACE people and related experts in the GRACE network at the symposium. Thus this event would be a good opportunity for GRACE to be highlighted with observers and overseas visitors. More information: www.syke.fi/projects/mospa2018.

Products and business plans to obtain the expected impact

The companies involved in the project are already strong players on the market and they have their own routes of promoting new products to their customers through existing contacts. Furthermore

company web-pages, and participation in exhibitions in this field will enhance the way to the right market. The companies in GRACE already have some business plans for this market. In the GRACE project the Innovation Management Board is coordinating the status of innovation and planned new products.

"Product"	Type of market	Time to	Partner	How to be	Exploitation
		market introduc- tion	in charge	commercializ ed (ways of reaching and bringing to markets)	(commercial potential) 1000€/ year
Oil detecting smart navigation buoy	Oil detecting smart navigation buoys located to critical fairway sections enhance oil response preparedness and enable novel applications to e- navigation. Huge potential in all countries wanting to preserve sea nature and improve possibilities to manage oil spills.	By the end of 2016	Meritaito	Unfortunately those who would benefit from the data created by smart buoys do not own and maintain them. It may be difficult to find a party who is willing to be responsible for the costs.	Estimates for commercial value are not yet carried out.
Zebrafish behavior online biounit as a ferrybox	Worldwide deployment on ferries, research vessels	M36	RWTH	Possibility to market through a spin-off, or licence to other manufacturer s	Too early to estimate
Service to investigate oil impact in any laboratory breeding zebrafish (no need of endemic species)	Service offered by all research laboratories and consultants breeding zebrafish	M36	RWTH	Results would be freely available (OA publications), and the knowledge could be utilised by any interested enterprise	Too early to estimate
Biotest batteries (including SOPs etc.) for cost-effective high-throughput environmental	Service offered by research laboratories and consultants	M36	RWTH	Results would be freely available (OA publications), and the knowledge	Too early to estimate.

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assessment of oil contaminations	Demin			could be utilised by any interested enterprise; possibility to found a spin- off offering such services	
Task 2.3. Clean up of oil- contaminated shore areas and bottom sediments	Service and technology offered to problem owners	Start Q3/2016 – End Q4/2018	Lamor	The project is sold as a part of Lamor's service portfolio.	50m EUR per year
Horizontal rope mop under ice, task 4.2.1	From the result of pre-study Lamor suggest to combine the rope mop and ROV project to one project	36 months	Lamor	Project will be combined with 4.2.2	
Test tank in Porvoo, task 4.2.2	Test tank for testing of oil recovery under ice. The test tank will also be used to test current needed for moving oil under ice with help of thruster. users for the tank are Government body's and oil company's	24 months	Lamor	Test tank will be used for research and the result will be published at seminars ja technical publications. Test tank will also be used to add data to Oil in Ice Code project. Test tank will also be rented for customers.	30KEUR/ year
ROV nozzle, under ice brush unit, task 4.2.2	Under ice oil collection unit will be developed for oil recovery. The under-ice oil recovery unit will be marketed to oil companies that operate in Arctic waters and Governments	36 months	Lamor	Under Ice vehicle is a new innovation and will be presented in seminars, Lamor marketing channels and direct to the end customers that Lamor already have contacted. End	1500K EUR/year

				customers have shown interest in the technology and impressed their interest to follow the tests that will be done whit the under-ice oil recovery unit.	
Oil recovery bucket skimmer, task 4.3.4		30 months	Lamor		
Strategic Net Environmental Benefit Analysis(sNEB A) tool report		36 months	AU		To be public available
Oil in ice code	Training courses, manuals and simulators including aspects of safe ways to navigate to minimize oil spills would be a good way of making a product of Oil in ice code.	Month 18	SSPA		Limited
Matrix for operational requirements Selection matrix to define adequate response strategies in relation to prevailing ice and oil spill conditions		Month 24	SSPA		Limited direct commercial value.

Table 3. Exploitation potential per participan	ant
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Dortiging of No	Dortiginant	Country	Total avalaitation
Participant No	Participant	Country	Total exploitation
	organisation name		potential
			1000 €/year
1 SYKE	Finnish Environment	Finland	0
	Institute SYKE		
2 AU	Aarhus University	Denmark	0
3 UTARTU	University of Tartu	Estonia	0
4 TUT	Tallinn University of	Estonia	Low
	Technology		
5 RWTH Aachen	RWTH Aachen	Germany	Low
	University	,	
6 UPV/EHU	University of the	Spain	0
	Basque Country		
7 NTNU	Norwegian University	Norway	0
	of Science and		-
	Technology		
8 GOSR	Greenland Oil Spill	Greenland	Low. There is no
	Response A/S		market until an oil spill
			happens. Currently
			everything works
			subscription free.
9 Lamor	Lamor Oy	Finland	51530 €/year
9 Lamoi		Finianu	51550 eyear
10 MTOY	Meritaito Oy	Finland	still to be estimated
11 SSPA	SSPA Sweden AB	Sweden	Low
12 NORUT Narvik	Norut	Norway	0
13 MICB	University of Manitoba	Canada	0

Outreach to international working groups

As the GRACE project partners include the Finnish Environmental Pollution Response group, a direct contact to the public bodies working groups is ensured. Currently Ms. Heli Haapasaari from SYKE is the Chairman of the HELCOM RESPONSE group, and she is also the Finnish representative of the EMSA Consultative Technical Group for Marine Pollution Preparedness and Response (CTG MPPR) together with Mr Jani Häkkinen, who is also is a member of the OPRC-HNS (Oil Pollution Preparedness, Response and Co-operation - hazardous and noxious substances) Technical Group under the IMO. This group is currently finalizing the update of the guidelines for the use of dispersants. The Finnish Environmental Pollution Response Group also has a representative in the HELCOM working group on aerial surveillance and European Maritime Safety Agency (EMSA) CleanSeaNet satellite service User Group. Mr. Markus Santasalo is the member of the Copenhagen agreement group, which is a Nordic collaboration group for all the Nordic Countries, including the non-EU states with activities in the Arctic such as Norway and Iceland. Furthermore an advisory board will be nominated to give advice to the project management. The advisory board will have members from both the public and the private sector.

So far the GRACE project has been presented shortly at the

-Copenhagen agreement (Nordic countries) Oct 2016 -HELCOM response meeting autumn 2016 and spring 2017 -Arctic Council EPPR (Emergency, Preparedness, Prevention, Response) working group meeting Dec. 2016 (shortly by advisory group members)

These working groups will be informed on progress throughout the project.

Data management plan

The right for the results produced in the project and the rights to exploit the knowledge commercially will be settled in the consortium agreement between all the partners. The data produced in the project will be available to the project participants during the project. Data that can be directly published will be published in open access peer-reviewed international journal. Sequence data obtained in wp2 will be deposited to international databases with free access. Data from Greenland will be submitted to the environmental databases maintained by DCE for the Greenland authorities. During the project a joint digital space for the project results will be made available to all the project partners. Some results of the on-line monitoring e.g. from ferrybox data will be made available on the BOOS/EMODnet systems

Strategy for knowledge management and protection

Before publication of results from the project it must be checked that there is no conflict with e.g. patenting of certain application. This is set down in the consortium agreement, and the GRACE Innovation Management Board is assisting and facilitating this. By reserving money in the budget for publishing in open access international journals of high quality, open access-publishing can be ensured.

Other communication activities

The project has produced web pages www.grace-oil-project.eu at the start of the project. The web pages will be updated with news from the project and with some basic information for different target groups. Furthermore, a project brochure was printed at the beginning of the project. A big part of the communication will take part directly within the work packages. E.g. a PhD. course on the sNEBA will be developed in WP5. The members of the Finnish pollution response group, which are member of international groups will be invited to talk about the group's work to the research personnel in GRACE. Later on these members will be encouraged to inform about the GRACE activities in group meetings. Furthermore the project personnel will attend scientific meetings in their field throughout the project, and they will offer presentations on the results obtained. The coordinator or work package members will present the idea and results of the whole project at relevant conferences and exhibitions. Press releases will be produced at the beginning of the project and at the end, and in context of the field work in Greenland, or at other stages in the project if relevant and of interest to the public. Some university-based scientists from GRACE will aim to give public lectures at their home university, reporting in an easy comprehensible manner about the work and findings within the project, and seeking to better make aware of the problem of oil contamination in general and in particular in cold climates. Some partners will organise an open day to inform the public on-site about GRACE and allow people to experience hands-on research for fighting oil contaminants.

Published and planned press releases:

- Project assembled by SYKE granted EU funding for the development of Arctic oil spill response (SYKE 16.2.2016)
- Smart Buoy will bring real time measurement of oil in Arctic area conditions to oil spill response (SYKE 15.11.2016)
- Real-time monitoring of oil compounds installed in Tallinn-Stockholm ferry Press release 2017-03-24 at 10:03
- New method of sea bottom remediation to be studied in Töölö Bay Press release 2017-08-11 at 10:41

In situ burning work Summer 2017

Project final seminar Summer 2019

Films/Videos

Film about SmartBuoy installation (on grace webpage)

Film about functionality of the Ferrybox system, uploaded to YouTube https://www.youtube.com/watch?v=BU1UZ8efwls&t=5s

GRACE image film. RWTH AACHEN is producing an image film with the focus on WP3 and WP4 in collaboration with the communications department of their institute. The image film will be put on the GRACE web page when ready and on the youtube channel of RWTH AACHEN