

Work And Budget Plan

ES1401 Grant Agreement Period 4

01/05/2017 to 30/04/2018

Section I: Action Profile

Action General Information

Action Code	ES1401	MC Chair	Dr Andrea Morelli
Action Title	ES1401 - Time Dependent Seismology (TIDES)		
MOU	029/14	Draft MOU	oc-2013-2-16102
CSO Approval Date	2014-05-14		
Action Start Date	2014-11-03	Action End Date	2018-11-02
Science Officer	Dr Deniz Karaca	Administrative Officer	Ms Tania Gonzalez Ovin

Participating COST Members:

	ITC		Non-ITC		Total
COST Members (countries) having accepted the MoU	Number	11	Number	15	26
	% of all ITCs	42.31%	% of all non-ITCs	57.69%	
Number of Action MC members	17		25		42

COST Member and Acceptance Date		
AT 14/10/2014	IS 30/09/2015	RS 27/01/2016
BE 25/11/2015	IE 27/08/2014	SK 19/09/2014
BG 17/07/2014	IT 31/07/2014	ES 22/05/2014
CZ 27/08/2014	LU 29/09/2014	SE 09/09/2014
FI 22/10/2015	MT 14/10/2014	CH 05/09/2014
FR 26/06/2014	NL 02/06/2014	TR 02/03/2015
DE 20/05/2014	NO 10/07/2014	UK 27/05/2014
EL 16/02/2015	PL 01/04/2015	MK 17/09/2015
HU 28/03/2017	PT 03/07/2014	

Submitted : 2017-04-12 at 3:10 PM

Generated : 2017-04-18 at 5:12 PM



International cooperation

	NNC	IPC	Specific Organisation	Total
Number of entities formally approved to join Action	2	0	0	2
Number of countries	2	0	0	2

Working Groups

	WG Title	WG Leader	Number of WG members
WG1	Workflow integration of data and computing resources	Prof Heiner Igel	10
WG2	Seismic interferometry and ambient noise	Dr Martin Schimmel	10
WG3	Forward problems, High-performance computing applications	Dr Yann CAPDEVILLE	10
WG4	Seismic tomography, full waveform inversion, uncertainties	Prof Karin Sigloch	10
WG5	Applications in the natural environment and industry	Prof Christopher Bean	10

Section II: MoU objectives and Grant Agreement Period Goals and Activities

Action Objectives from MoU

Aim/primary Objective
<p>The main objective of the Action is to (1) merge expertise in academia and industry on seismic data processing and modeling for inverse problems; (2) develop the emerging field of time-dependent seismology to monitor complex Earth systems.</p>
Secondary objectives
<ol style="list-style-type: none"> 1. integration and validation of innovative data mining techniques and numerical methods 2. development of new design for massive field experiments 3. evaluation of uncertainties in full-waveform inversion and time-dependent tomography 4. development of strategies for real-time data assimilation 5. development of reliable techniques for monitoring active processes (earthquakes, volcanic eruptions, landslides,) 6. networking of top-level laboratories, coordination among academia and industry in time-dependent seismology 7. organization of effective exchange programs for early-stage researchers 8. catalysis of creative initiatives 9. stimulation of discussion with other data-driven disciplines, climate and ocean science, acoustics, geology, astrophysics

Grant Agreement Period

Grant Agreement Period Start Date	01/05/2017	Grant Agreement Period End Date	30/04/2018
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Grant Agreement Period Goals

Number	Grant Agreement Period Goal	MoU Objective(s) it relates to
GAPG 1	Following the topical development outlined in the MoU, the main theme for the 3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography.	<ul style="list-style-type: none"> • Aim/Primary objective • Secondary objective 3 • Secondary objective 5
GAPG 2	Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.	<ul style="list-style-type: none"> • Aim/Primary objective • Secondary objective 6 • Secondary objective 7 • Secondary objective 8
GAPG 3	At the reach of the third year of life of the Action, we promote a critical evaluation of Action accomplishments vs. MoU expectations. We will thus monitor the Action development and provide early planning for the last year of life, including early plans to leave a tangible legacy. The main appraisal will include an overview of possible synergy with other contiguous European projects, and consideration of further new initiatives.	<ul style="list-style-type: none"> • Aim/Primary objective • Secondary objective 6 • Secondary objective 8
GAPG 4	Dissemination of Action accomplishments, through publication on scientific literature, press releases, internet and social media, presence at conferences with specially-organised sessions, exchanges with the European Geosciences Union group of early-career scientists. Planning for final actions needs to start in this GP, as -- because of COST rescheduling of Action GPs -- the last ES1401 GP5 will only last 6 months before Action termination.	<ul style="list-style-type: none"> • Aim/Primary objective • Secondary objective 6 • Secondary objective 9

Section IV: Work and Budget Plan for the Grant Agreement Period

Work and Budget Plan Summary

A. COST Networking Tools	EUR
(1) Meetings	51,595.00
(2) Training Schools	45,218.00
(3) Short Term Scientific Missions (STSM)	11,000.00
(4) COST Action Dissemination	1,500.00
(5) Other Expenses Related to Scientific Activities (OERSA)	252.22
B. Total Science Expenditure (sum of (1) to (5))	109,565.22
C. Financial and Scientific Administration and Coordination (FSAC) (max. of 15% of B)	16,434.78
Total Grant (B+C)	126,000.00

Meetings

Overview

Meeting Title	Meeting Type	Dates	Location	ITC	Total Cost(EUR)
Meetings of MC, CG, WGs	Management Committee Meeting, Core Group Meeting, Working Group Meeting	10/07/2017 - 14/07/2017	Oxford (United Kingdom)	No	38,055.00
WG5-WG2 meeting on ocean-bottom instrumentation for measuring seismic noise	Working Group Meeting	22/09/2017 - 24/09/2017	Galway (Ireland)	No	5,050.00
WG2-WG5 meeting on glacial seismology	Working Group Meeting	10/10/2017 - 12/10/2017	Bologna (Italy)	No	3,690.00
WG1-WG4 meeting on measuring seismic wave field gradients with small arrays and rotation sensors	Working Group Meeting	07/03/2018 - 09/03/2018	Munich (Germany)	No	4,800.00
				Total	51,595.00

Details

Meeting Type	Management Committee Meeting, Core Group Meeting, Working Group Meeting
Title of the Meeting	Meetings of MC, CG, WGs
Grant Period Goal(s) it will address	<p>Following the topical development outlined in the MoU, the main theme for the 3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography. Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories. At the reach of the third year of life of the Action, we promote a critical evaluation of Action accomplishments vs. MoU expectations. We will thus monitor the Action development and provide early planning for the last year of life, including early plans to leave a tangible legacy. The main</p>

	<p>appraisal will include an overview of possible synergy with other contiguous European projects, and consideration of further new initiatives.,Dissemination of Action accomplishments, through publication on scientific literature, press releases, internet and social media, presence at conferences with specially-organised sessions, exchanges with the European Geosciences Union group of early-career scientists. Planning for final actions needs to start in this GP, as -- because of COST rescheduling of Action GPs -- the last ES1401 GP5 will only last 6 months before Action termination.</p>		
Description	<p>The MC meeting will address topics relevant to the GP such as monitoring of Action activities; implementation of COST policies; review of reports from the WG leaders; scientific and budget planning; location and dates of future activities, including the final Action Conference (that needs to be planned now in view of the short duration of the last GP5); and all other relevant business. The CG meeting will preliminary discuss the MC Agenda items to prepare the discussion in the subsequent MC meeting. All WGs will monitor activity of the members during the previous year; inform of ongoing initiatives and developments; discuss on current outstanding problems and lines of research; consider future collaborative activities and exchanges. WG1, WG2, WG3 will be involved in the Training School on Tomography as they deal with data acquisition and modelling (WG3 Leader is one of main lecturers). WG4, WG5 are also directly involved with the Training School topics, as far as inversion techniques and applications in the natural environment and for industry (WG4 Leader is one of the main lecturers).</p>		
Output(s)	<p>First draft plan for the upcoming GP5 (that will only last 6 months, so it should start with a fairly detailed schedule, until Action termination on November 2nd, 2018). The draft plan should include dates and (projected) locations of future meetings of MC and WGs. Early draft plans for legacy measures for the end of the Action -- to be finalised in the next GP5. WGs will produce reports of activity; outline of general new research directions relevant for the Action; and plan for exchanges and future activity.</p>		
Location	Oxford (United Kingdom)	ITC	No
Start Date	2017-07-10 14:00:00	End Date	2017-07-14 12:00:00
Duration	5 days		
Number of expected total participants	44	Number of participants to be reimbursed from COST funds	43
Average reimbursement(per participant)(EUR)	885.00	Total Reimbursement costs (EUR)	38,055.00
Local Organiser Support (EUR)	0.00		
Total cost of the meeting (EUR)	38,055.00		

Meeting Type	Working Group Meeting
Title of the Meeting	WG5-WG2 meeting on ocean-bottom instrumentation for measuring seismic noise
Grant Period Goal(s) it	Following the topical development outlined in the MoU, the main theme for the

will address	3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography. Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.		
Description	Joint meeting of Working Groups WG5 (Applications in the natural environment and industry) and WG2 (Seismic interferometry and ambient noise) on ocean-bottom instrumentation -- OBS and pressure sensors -- for recording seismic noise sources at sea		
Output(s)	A summary of the state of the art and perspectives in assessing the generation of seismic noise through direct observations of the wave pressure and seismic waves in situ on the ocean floor.		
Location	Galway (Ireland)	ITC	No
Start Date	2017-09-22 09:00:00	End Date	2017-09-24 17:00:00
Duration	3 days		
Number of expected total participants	20	Number of participants to be reimbursed from COST funds	5
Average reimbursement(per participant)(EUR)	980.00	Total Reimbursement costs (EUR)	4,900.00
Local Organiser Support (EUR)	150.00		
Total cost of the meeting (EUR)	5,050.00		

Meeting Type	Working Group Meeting
Title of the Meeting	WG2-WG5 meeting on glacial seismology
Grant Period Goal(s) it will address	Following the topical development outlined in the MoU, the main theme for the 3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography. Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.

Description	Joint meeting of WG2 (Seismic interferometry and ambient noise) and WG5 (Applications in the natural environment and industry) on Glacial seismology and landslide-quake modelling (including detection and modelling of glacial earthquakes, calving events, lithosphere/cryosphere interactions).		
Output(s)	A summary on the state of the art of this emerging field in seismology, with strong collaborative ties with glaciology, oceanography and tsunami science, with growing impact on global change and climate study. New plans for collaborative projects in polar/glacial science.		
Location	Bologna (Italy)	ITC	No
Start Date	2017-10-10 15:00:00	End Date	2017-10-12 12:00:00
Duration	3 days		
Number of expected total participants	15	Number of participants to be reimbursed from COST funds	6
Average reimbursement(per participant)(EUR)	590.00	Total Reimbursement costs (EUR)	3,540.00
Local Organiser Support (EUR)	150.00		
Total cost of the meeting (EUR)	3,690.00		

Meeting Type	Working Group Meeting		
Title of the Meeting	WG1-WG4 meeting on measuring seismic wave field gradients with small arrays and rotation sensors		
Grant Period Goal(s) it will address	Following the topical development outlined in the MoU, the main theme for the 3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography. Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.		
Description	Meeting of Working Groups WG1 (Workflow integration of data and computing resources) and WG4 (Seismic tomography, full waveform inversion, uncertainties) on measuring and using wavefield gradients using small arrays, array of arrays, and rotation sensors with application to tomography and seismic source inversion.		
Output(s)	A summary of the state of the art and perspectives for this emerging field of measurement, both in the industrial application field and for the study of earthquakes. Plans for new field deployments and experiments.		
Location	Munich (Germany)	ITC	No

Start Date	2018-03-07 09:00:00	End Date	2018-03-09 17:00:00
Duration	3 days		
Number of expected total participants	15	Number of participants to be reimbursed from COST funds	5
Average reimbursement(per participant)(EUR)	930.00	Total Reimbursement costs (EUR)	4,650.00
Local Organiser Support (EUR)	150.00		
Total cost of the meeting (EUR)	4,800.00		



Training Schools

Overview

Title of the Training School	Dates	Location	ITC	Total Cost(EUR)
Seismic Tomography: Theory, Inversion, Uncertainties	10/07/2017 - 14/07/2017	Oxford (United Kingdom)	No	45,218.00
			Total	45,218.00

Details

Title of the Training School	Seismic Tomography: Theory, Inversion, Uncertainties		
Grant Period Goal(s) it will address	<p>Following the topical development outlined in the MoU, the main theme for the 3rd year of life of the Action (corresponding to GP4 because of COST timing adjustments) is the determination of earth structure through seismic tomography. Consequently, a first goal for GP4 is to critically assess and strengthen capacity to image earth structure and its time variations through application of inverse theory and seismic tomography. Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories. Dissemination of Action accomplishments, through publication on scientific literature, press releases, internet and social media, presence at conferences with specially-organised sessions, exchanges with the European Geosciences Union group of early-career scientists. Planning for final actions needs to start in this GP, as -- because of COST rescheduling of Action GPs -- the last ES1401 GP5 will only last 6 months before Action termination.</p>		
Description	<p>This Advanced Training School will target methods and techniques to image earth structure with seismic tomographic techniques, with special emphasis on inverse theory and quantification of uncertainties. Open- source software tools and packages will be demonstrated by the authors with hands-on practice. Lectures will be given by world-renowned specialists in the field. Seismic instrumentation manufacturers and representatives from seismic industry will be present and provide exchanges on commercial applications and jobs. The Early Career Scientists (ECS) of the Seismology Division (SM) of the European Geosciences Union (EGU) will manage discussions and advice targeted at career-connected issues for young scientists.</p>		
Output(s)	<p>Trainees will learn about the most up-to-date tomographic and data inversion techniques and acquire skill on application to real data to map earth structure in detail, including its variation with time. Trainees will gain practical knowledge on how to use up-to-date software tools, distributed at the school. Trainees will have opportunities to learn about applications in industry.</p>		
Location	Oxford (United Kingdom)	ITC	No
Start Date	2017-07-10 09:00:00	End Date	2017-07-14 18:00:00
Number of trainers	14	Number of trainees	60

Number of trainers to be reimbursed	9	Number of trainees to be reimbursed	39
Average trainer Reimbursement(EUR)	1,002.00	Average reimbursement per trainee(EUR)	800.00
Total trainer Reimbursement(EUR)	9,018.00	Total trainee Grant(EUR)	31,200.00
Local Organiser Support (EUR)	5,000.00		
Total cost of the Training School(EUR)	45,218.00		

Short Term Scientific Missions (STSM)

Number	Average cost per STSM(EUR)	Total cost(EUR)
5	2,200.00	11,000.00
Grant Period Goal(s) it will address	Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.	
Description	Support exchange of young scientists among institutions in participating countries.	
Output(s)	Increased diffusion of expertise and improvement of networking among laboratories	

COST Action Dissemination

Title	Type	Publisher/provider	Expected date of Release	Cost(EUR)
Maintenance and continued operation of Action web and social media site	Action Website	INGV (Istituto Nazionale di Geofisica e Vulcanologia)	01/05/2017	1,500.00
Grant Period Goal(s) it will address	Seismic tomography is widely applied at different scales, from the whole globe to the scale of a reservoir. Different laboratories host excellence in such diverse applications, but all could profit from inter-operability of the techniques to find new directions. We aim at increasing awareness about techniques used in different environments -- also between academic and industrial research -- primarily to the benefit of early-stage scientists through promotion of short-term scientific missions and exchange among laboratories.,Dissemination of Action accomplishments, through publication on scientific literature, press releases, internet and social media, presence at conferences with specially-organised sessions, exchanges with the European Geosciences Union group of early-career scientists. Planning for final actions needs to start in this GP, as -- because of COST rescheduling of Action GPs -- the last ES1401 GP5 will only last 6 months before Action termination.			
Description	Hosting and basic maintenance of Action website. Updates to online information. Implementation of further functionalities. Updates on social media.			
Output(s)	Continued availability of Action website. Updated Action website, to offer further information of WG activity, open software tools, any information on research catalysed by the Action, and dissemination documents. Updated information on social media page.			

Total Disseminations	1,500.00
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Other Expenses Related to Scientific Activities (OERSA)

Item	Cost(EUR)
Bank charges	252.22