

Action Items Status & Upcoming Deliverables

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Upcoming Deliverables

| Deliverable (number) | Deliverable name | Work package number | Short name of lead participant | Type | Dissemination level | Delivery date |
|-----------------------------|--------------------------------|----------------------------|---------------------------------------|-------------|----------------------------|----------------------|
| 3.1 | Reference Frame Product Report | 3 | UL | R | PU | M10 |
| 7.2 | EGSIEM Brochure | 7 | UBERN | DEC | PU | M14 |
| 7.3 | Teaser Lecture | 7 | UBERN | DEC | PU | M15 |
| 2.2 | GRACE/GRACE-FO Product Report | 2 | TUG | R | PU | M18 |
| 4.1 | Concept of Scientific service | 4 | UBERN | R | PU | M18 |

Upcoming Milestones

| Milestone number | Milestone name | Related work package(s) | Estimated date | Means of verification |
|------------------|---------------------------------------|-------------------------|----------------|---|
| 1 | Finalisation of Processing Standards | WP 3 | 2 | D2.1 is available |
| 2 | Implementation and preparation Review | WP 2,3,5 | 10 | Implementation and preparation work finished, T2.2, T3.1, T3.2 finished, T5.2 and T5.4 implementations finished |
| 3 | Service Readiness | WP4,5,6 | 18 | Scientific, NRT and Hydrological service set up, T4.1, T5.1 finished, T5.2 and T5.4 ready for service run |
| 4 | Operational NRT Service Readiness | WP5,6 | 27 | Preparation work for operational NRT service finished |
| 5 | Final Review | WP 1-7 | 36 | All work packages finished |

Still open !!

| | | | | | | | | |
|---------------------------------------|------------------------|----|-------------------------------------|------------|-----|------|-----|-----|
| Work package number | 2 | | Start Date or Starting Event | | | | | M01 |
| Work package title | Gravity field analysis | | | | | | | |
| Participant number | 1 | 2 | 3 | <u>4</u> | 5 | 6 | 7 | 8 |
| Short name of participant | UBERN | UL | GFZ | <u>TUG</u> | LUH | CNES | DLR | G&C |
| Person/months per participant: | 24 | 18 | 10 | 18 | 10 | 17 | | |

Objectives

- Critical analysis of GRACE processing standards, background models, reference frames and algorithms.
- Consistent orbit parameter estimation process and gravity model reprocessing for a time frame of two years by five gravity ACs
- Establishment of a realistic GRACE-FO instrumental error behavior to be used in GFZ's E2E gravity data simulator to investigate the gain for hydrological applications which can be expected from GRACE-FO or Next Generation Gravity Missions using LRI observations.

Description of work

T2.1 Processing Standards and Models UBERN, UL, GFZ, TUG, CNES M01-M02

Input: *GRACE release 05 processing standards*

The current GRACE release 05 processing standards (e.g. IERS2010 conventions), background models (e.g. ocean tides or atmospheric and oceanic short-term mass variations), and algorithms (e.g. interpolation methods) will be critically analyzed. The results from this review shall be consistently applied to a large extent by all gravity ACs within this proposal to enable a consistent gravity model reprocessing at different centers and later combination of these harmonised individual solutions in WP 4. Additionally we will define realistic error measures for background models to be used as input for the E2E simulation (see T2.4)
Output: *D2.1*

T2.2 Improved processing tools UBERN, UL, GFZ, TUG, LUH, CNES M01-M10

Input: *D2.1*

Systematic errors will be reduced by re-processing two years of existing GRACE data with harmonised standards and improved sensor data and analysis methods. They are based on recent findings and the treasure of almost twelve years of GRACE data. This will result in better tools to analyze and improve the pre-processing of the sensor data and the gravity and orbit parameter estimation processes. We will in particular implement improved stochastic modelling and study space-time parameterizations in the established processing chains to achieve a better separation of gravitational and non-gravitational contributions in the satellite data, and to effectively reduce aliasing effects from rapid mass changes. The sum of these activities will significantly contribute to the effective scientific exploitation of the GRACE mission and will prepare the involved ACs for GRACE-FO.

Updates of the individual processing centres:

- UBERN: Enhancements are expected from improved standards and models as well as from advanced empirical error modelling using sophisticated constraints
- UL: Enhancement concerning numerical differentiation issues and the combination of the relative ranges and rates, orientation data and the positions derived by the GNSS receiver
- GFZ: Enhancements are expected from improved standards and models as well as from experience related to instrument parameterization gained during last RL05 reprocessing
- TUG: Improvements especially regarding the findings of the noise behaviour of the different sensors. A tailored stochastic modelling with an auto adapting strategy will be developed. The de-

- aliasing problem is faced by improved space-time representation of the time variable gravity field
- LUH: Enhancements are expected from improved pre-processing methods for sensor data
- CNES: Enhancements are expected from a refined weighting of the different data types (GPS/KBR)

T2.3: Data analysis UBERN, UL, GFZ, TUG, LUH, CNES M11-M18

Input: *D2.1, Reference frame data from T3.1, SLR normal equations from T3.2, GRACE Level-1B data*

- Re-processing of two years of Level-1B sensor data; LUH
- Re-processing of two years of kinematic GRACE orbit positions (to be used by several EGSIEM ACs) and generation of auxiliary products (e.g. antenna phase centre variation maps); UBERN

Re-processing of two years of existing GRACE data for gravity field determination:

- Celestial Mechanics Approach; UBERN
- Acceleration Approach; UL
- Direct Approach; GFZ
- Short-Arc Approach; TUG
- Direct Approach; CNES

Output: *Re-processed Level-1B sensor data, GRACE kinematic orbits and five different series of monthly gravity field solutions, D2.2*

T2.4: Instrumental behaviour and End-to-End Simulator LUH, GFZ M06-M18

Input: *GRACE L1B data, Simulated instrument noise series for E2E*

The new Laser Ranging Interferometer (LRI), to be flown on GRACE-FO, is expected to substantially improve the science results. We will assess the space-time parameterization to address the aliasing problem and will also investigate still existing problems with the non-gravitational accelerations. Here, the EGSIEM consortium will also benefit from the expertise through the associated member Technische Universität München (TUM), which will share their experience for meeting the numerical challenges posed by the greatly improved measurement precision of the LRI observations.

In parallel we will update and use our E2E (end-to-end) data simulator for future space data to investigate, based on above harmonised processing standards and models, the gain for hydrological applications which can be achieved with GRACE-FO or Next Generation Gravity Missions.

Output: *Deliverable 2.2*

Deliverables

| | |
|-------------------------------------|-----|
| 2.1 Processing Standards and Models | M02 |
| 2.2 GRACE/GRACE-FO Product Report | M18 |

Timeline



European Gravity Service for Improved Emergency Management



| EGSIEM | Duration in months | Year 1 | | | | | | | | | | | | Year 2 | | | | | | | | | | | | Year 3 | | | | | | | | | | | |
|--|--------------------|---|---|---|---|---|---|---|---|---|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| WP1 Management | 36 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.1 Legal and financial Management | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.2 Scientific Coordination | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP2 Gravity field analysis | 18 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.1 Processing Standards and Models | 2 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.2 Improved processing tools | 10 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.3 Data analysis | 8 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.4 Instrumental behaviour and End-to-End Simulator | 13 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP3 Integration of complementary data | 36 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.1 Reference frame reprocessing | 8 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.2 SLR normal equations | 3 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.3 NRT reference frame processing | 4 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.4 Operational NRT reference frame processing | 6 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.5 Validation of GRACE gravity products with GNSS site displacements | 18 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.6 Validation of GRACE gravity products with Ocean Bottom Pressure | 12 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.7 Preparation of Hydroweb data | 4 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.8 GIA for Hydrology | 26 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.9 Compilation of representative historical flood situations | 10 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP4 Scientific service | 27 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.1 Design and concept | 12 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.2 Operation | 15 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.3 External Validation | 15 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP5 Near realtime and regional service | 36 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.1 Requirements and Concept | 3 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.2 NRT Solutions: Processing | 24 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.3 Operational NRT Solutions: Processing | 6 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.4 Regional Solutions: Processing | 24 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.5 Generation of Area Mean Values | 18 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.6 Validation/Feedback | 18 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP6 Hydrological service | 36 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.1 Evaluation of historical flood events | 24 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.2 Develop. & evaluation of gravity-bas. ind. for flood & drought forecast | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.3 Rapid mapping concept | 30 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP7 Dissemination and Exploitation | 36 | [Solid blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.1 Project information | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.2 GRACE plotter | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.3 Competition | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.4 Public education | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.5 Dedicated sessions at conferences | 36 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.6 Summer school | 12 | [Solid grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| General Assembly meetings | | [Red vertical bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Consortium meetings | | [Red vertical bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advisory Board meetings | | [Red vertical bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP meetings | | [Red vertical bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Periodic reports | | [Red vertical bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



HORIZON 2020

| | | | | | | | | |
|---------------------------------------|-----------------------------------|----|-------------------------------------|-----|-----|------|-----|-----|
| Work package number | 3 | | Start Date or Starting Event | | | | | M01 |
| Work package title | Integration of complementary data | | | | | | | |
| Participant number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Short name of participant | UBERN | UL | GFZ | TUG | LUH | CNES | DLR | G&C |
| Person/months per participant: | 16 | 6 | 3 | | | 1 | 10 | |

Objectives

- Pre-processing of all necessary supplementary data which are needed for the gravity field analysis in WP 2 and the combination with the gravity data and hydrological models in WP 4-6.
- Loading estimates derived from GNSS station time series are used for validation of the combined global, the near real-time and the regional gravity field solutions.
- Lake and river levels from the Hydroweb project are used together with hydrological models in WP 6 as well as Glacial Isostatic Adjustment (GIA) models for separating the hydrological trend.

Description of work

T3.1: Reference Frame reprocessing UBERN

M03-M10

Input: *D2.1, IGS and ILRS data*

SLR and GNSS observations collected by the terrestrial tracking networks of the ILRS and the IGS will be reprocessed for two years for generating fully consistent input products for gravity field recovery, in particular GNSS satellite orbits and satellite clock corrections. With such a set of products kinematic trajectories for LEOs will be derived in T2.3, which are fully consistent to the GNSS and geodetic SLR orbits and to the reference frame represented by the ensemble of used ground stations. The task will provide coordinates of the SLR and GNSS tracking stations. GNSS and geodetic SLR satellite orbits, Earth rotation parameters, and GNSS satellite clock corrections. Since the number of reference stations is limited to nearly globally but sparsely distributed 250 stations, we will extend (densify) the coverage for the validation in T3.5 by processing other existing regional networks using the GNSS products generated in this task.

Output: *D3.1, Reference frame data*

T3.2: SLR normal equations UBERN

M07-M09

Input: *D2.1, ILRS data*

SLR data to the satellites LAGEOS, Starlette, Stella, and AJISAI will be processed to realise the combination of the SLR tracking with the GNSS station network for T3.1. Low-degree gravity field coefficients shall be set up in the SLR analysis in addition to station coordinates, Earth orientation parameters, and satellite orbit parameters. Normal equations based on the SLR measurements will be established using D2.1. Provided that all common parameters are consistently set up, the resulting normal equations may be correctly combined in T3.1 using local ties.

Output: *SLR normal equations*

T3.3 NRT Reference Frame processing UBERN

M03-M06

Input: *D2.1, Reference frame data from T3.1, IGS data*

GNSS observations collected by the terrestrial tracking networks of the IGS will be processed with a latency of one day to generate input products for the NRT service.

Output: *NRT reference frame data*

T3.4 Operational NRT Reference Frame processing UBERN

M28-M33

Input: *D2.1, IGS data*

Operational NRT reference frame processing for the duration of the operational test run phase of T5.3.

Output: *Operational NRT reference frame data*

T3.5 Validation of GRACE gravity products with GNSS site displacements UL

M19-M36

Input: *D2.1, Reference frame data, Combined Solution from T4.2*

The establishment of a consistent reference frame in T3.1 will also yield consistent GNSS station time series which can be used for validation. The basic concept is described in Sect. 1.3.4. Mass redistributions cause site displacements which can be observed by GNSS. The gravity field solutions from WP 4 are validated by converting these representations of mass redistributions to site displacements. Atmospheric and ocean-contributions will be added using state-of-the-art models according to D2.1. Alternative models will be tested. The site displacements can be compared to the GNSS station time series.

Output: *D3.2, D3.3*

T3.6 Validation of GRACE gravity products with Ocean Bottom Pressure GFZ

M25-M36

To aid in the validation of gravity change data over the oceans, we will also use OBP data as estimated by the OMCT model and used for operational generation of the AOD1B RL05 dealiasing product.

Output: *D3.2, D3.3*

T3.7: Preparation of Hydroweb data CNES

M07-M10

Input: *Altimetry data*

For comparison and integration purposes within WP6, altimetry-based water levels are needed. The Hydroweb data provides lake, reservoir and river levels for various basins worldwide. The task comprises the preparation and delivery of lake level data from merged satellite altimetry data and river level data of virtual stations defined at the intersection of satellite tracks.

Output: *Lake level data*

T3.8: GIA for Hydrology LM (covered by SLA, see Sect. 3.3.4)

M11-M36

Input: *D2.1, Gravity field solutions from T2.3, combined solution from T4.2, NRT solutions from T5.2 and T5.3, regional solutions from T5.4*

Efficient monitoring tools of the available water resources on regional and local scales need to take global interactions into account. In northern latitudes, e.g. in Fennoscandia, the tilting due to the GIA will be modelled by applying the latest GIA models. This is necessary because it strongly affects groundwater flow and lake surface control. The consortium will benefit from the latest developments in GIA modelling through the associated member Lantmäteriet (LM; the Swedish mapping, cadastral and land registration authority).

Output: *GIA models*

T3.9: Compilation of representative historical flood situations DLR

M01-M10

For the validation of the GRACE derived flood and drought indices, historical flooding situations are derived based on records of suitable databases and services (ZKL, DFO, and the International Charter "Space and Major Disasters"). They are based on the following parameters: a) concurrent availability of GRACE data and medium to high resolution satellite data (mainly from Copernicus contributing missions), b) considerations of scale and flood size/extent, c) flood regime and hydrological/environmental settings. SAR satellite data will be mainly acquired via ESA's GMES Coordinated Data Access System and 2-D flood masks from medium to high resolution SAR and optical satellite data will be extracted.

Output: *List of selected historical flooding situations, 2-D flood masks*

Deliverables

- 3.1 Reference frame product report
- 3.2 Scientific product validation report
- 3.3 NRT product validation report

M10
M36
M36

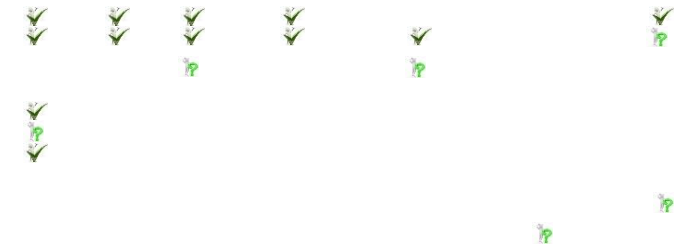
Timeline



European Gravity Service for Improved Emergency Management



| EGSIEM | Duration in months | Year 1 | | | | | | | | | | | | Year 2 | | | | | | | | | | | | Year 3 | | | | | | | | | | | |
|--|--------------------|------------------------------------|---|---|---|---|---|---|---|---|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| WP1 Management | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.1 Legal and financial Management | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.2 Scientific Coordination | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP2 Gravity field analysis | 18 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.1 Processing Standards and Models | 2 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.2 Improved processing tools | 10 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.3 Data analysis | 8 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.4 Instrumental behaviour and End-to-End Simulator | 13 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP3 Integration of complementary data | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.1 Reference frame reprocessing | 8 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.2 SLR normal equations | 3 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.3 NRT reference frame processing | 4 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.4 Operational NRT reference frame processing | 6 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.5 Validation of GRACE gravity products with GNSS site displacements | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.6 Validation of GRACE gravity products with Ocean Bottom Pressure | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.7 Preparation of Hydroweb data | 4 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.8 GIA for Hydrology | 26 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.9 Compilation of representative historical flood situations | 10 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP4 Scientific service | 27 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.1 Design and concept | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.2 Operation | 15 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.3 External Validation | 15 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP5 Near realtime and regional service | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.1 Requirements and Concept | 3 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.2 NRT Solutions: Processing | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.3 Operational NRT Solutions: Processing | 6 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.4 Regional Solutions: Processing | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.5 Generation of Area Mean Values | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.6 Validation/Feedback | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP6 Hydrological service | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.1 Evaluation of historical flood events | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.2 Develop. & evaluation of gravity-bas. ind. for flood & drought forecastir | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.3 Rapid mapping concept | 30 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP7 Dissemination and Exploitation | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.1 Project information | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.2 GRACE plotter | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.3 Competition | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.4 Public education | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.5 Dedicated sessions at conferences | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.6 Summer school | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| General Assembly meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Consortium meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advisory Board meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Periodic reports | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



HORIZON 2020

| | | | | | | | | |
|---------------------------------------|--------------------------|----|-------------------------------------|------------|-----|------|-----|-----|
| Work package number | 5 | | Start Date or Starting Event | | | | | M01 |
| Work package title | NRT and regional Service | | | | | | | |
| Participant number | 1 | 2 | <u>3</u> | 4 | 5 | 6 | 7 | 8 |
| Short name of participant | UBERN | UL | <u>GFZ</u> | <u>TUG</u> | LUH | CNES | DLR | G&C |
| Person/months per participant: | | 3 | <u>26</u> | 33 | | | | |

Objectives

- Provision of NRT mass redistribution products for all areas of interest
- Provision of regional gravity field solutions with increased spatial resolution

Description of work

T5.1: Requirements and Concept GFZ, TUG

M01-M03

Input: *D2.1*

We will investigate the requirements and needs for NRT gravity processing regarding instrument data (e.g. availability of GRACE Q/L Level-1B data), background models (e.g. short-term atmospheric and oceanic mass variations) and auxiliary data (e.g. IGS orbit products, Earth rotation parameters) and will setup necessary interfaces to other WPs or to the GRACE Science Data System.

Output: *NRT service requirements and D5.1*

T5.2: NRT Solutions: Processing TUG, GFZ

M04-M27

Input: *D2.1, NRT service requirements from T5.1 and D5.1, NRT reference frame data from T3.3, List of historical flooding situations and 2-D flood masks from T3.9*

We will improve current methods based on either (TUG) daily Kalman filter modelling (up to degree 40) or (GFZ) alternative and experimental representations of the gravity field (e.g. radial base functions) to derive NRT mass transport solutions with daily updates and will reprocess these models using NRT input data and models at least for all GRACE data since 2006 (first time availability of L1B Q/L solutions at JPL) for all areas of interest.

Output: *D5.2*

T5.3: Operational NRT Solutions: Processing TUG, GFZ

M28-M33

Input: *D2.1, NRT service requirements from T5.1, operational NRT reference frame data from T3.4*

Operational test run phase of NRT service

Output: *D5.3*

T5.4: Regional Solutions: Concept and Processing TUG, GFZ

M04-M27

Input: *D2.1, NRT reference frame data from T3.3, List of historical flooding situations and 2-D flood masks from T3.7*

GFZ and TUG will improve current methods based on alternative representations of the gravity field (e.g. radial base functions) to derive regional mass transport solutions and will process these alternative and experimental models for the complete mission period for all areas of interest.

Output: *D5.4*

T5.5: Generation of Area Mean Values GFZ

M19-M36

Input: *D2.2, D4.2, D5.2, D5.4, 2-D flood masks of WP3*

We will derive for all areas of interest and all flooded regions area mean values (AMV) based on

gridded equivalent water heights of gravity field time series derived in WPs 2, 4 and 5 and masks defined in WP3. Resulting AMVs will be used in WP6 e.g. for derivation of flooding indicators and will be visualised in WP7.

Output: *area mean values for all selected areas of interest*

T5.6: Validation/Feedback UL

M19-M36

Input: *D2.1, NRT reference frame data from T3.3, gravity field solutions from T5.2, T5.3, T5.4*

The gravity field solutions from T5.2, T5.3, T5.4 are validated with hydrological models, e.g. GLDAS, WGHM, and with independent GNSS loading time series. For the latter approach the representations of mass redistributions are converted to site displacements. Atmospheric and ocean-contributions will be added using state-of-the-art models according to D2.1. The procedure will be automated to allow for a just-in-time validation of the NRT service products.

Output: *D5.5*

Deliverables

5.1 Concept of NRT Service

M03

5.2 NRT Service product report

M27

5.3 Operational NRT Service product report

M33

5.4 Regional solution product report

M27

5.5 NRT validation report

M36

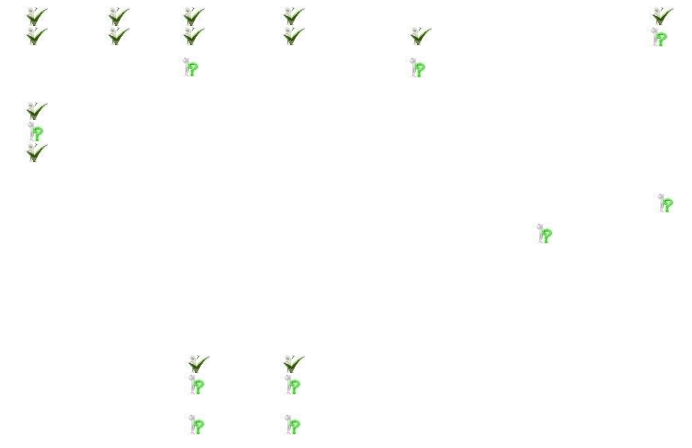
Timeline



European Gravity Service for Improved Emergency Management



| EGSIEM | Duration in months | Year 1 | | | | | | | | | | | | Year 2 | | | | | | | | | | | | Year 3 | | | | | | | | | | | |
|--|--------------------|------------------------------------|---|---|---|---|---|---|---|---|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| WP1 Management | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.1 Legal and financial Management | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T1.2 Scientific Coordination | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP2 Gravity field analysis | 18 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.1 Processing Standards and Models | 2 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.2 Improved processing tools | 10 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.3 Data analysis | 8 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2.4 Instrumental behaviour and End-to-End Simulator | 13 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP3 Integration of complementary data | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.1 Reference frame reprocessing | 8 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.2 SLR normal equations | 3 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.3 NRT reference frame processing | 4 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.4 Operational NRT reference frame processing | 6 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.5 Validation of GRACE gravity products with GNSS site displacements | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.6 Validation of GRACE gravity products with Ocean Bottom Pressure | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.7 Preparation of Hydroweb data | 4 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.8 GIA for Hydrology | 26 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3.9 Compilation of representative historical flood situations | 10 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP4 Scientific service | 27 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.1 Design and concept | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.2 Operation | 15 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T4.3 External Validation | 15 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP5 Near realtime and regional service | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.1 Requirements and Concept | 3 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.2 NRT Solutions: Processing | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.3 Operational NRT Solutions: Processing | 6 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.4 Regional Solutions: Processing | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.5 Generation of Area Mean Values | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T5.6 Validation/Feedback | 18 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP6 Hydrological service | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.1 Evaluation of historical flood events | 24 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.2 Develop. & evaluation of gravity-bas. ind. for flood & drought forecast | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T6.3 Rapid mapping concept | 30 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP7 Dissemination and Exploitation | 36 | [Blue bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.1 Project information | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.2 GRACE plotter | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.3 Competition | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.4 Public education | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.5 Dedicated sessions at conferences | 36 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T7.6 Summer school | 12 | [Grey bar] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| General Assembly meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Consortium meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advisory Board meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WP meetings | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Periodic reports | | [Red bars at months 1, 13, 25, 37] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



HORIZON 2020

Goal for first Milestone



*First EGSIEM Milestone being closed
before first EGSIEM Review
on 7 March 2016*

Action Items Status

| Action Item Status List (open and new AI's) | | | | |
|---|------------|-------------|---|------------|
| A.I. | Originator | Actionee | Action Description | Due Date |
| 006 | EGSIEM | WP Managers | Collect ideas for paper topics to set up a publication plan | 31.05.2015 |
| 007 | EGSIEM | LUH | EGSIEM Brochure | 31.8.2015 |
| 008 | EGSIEM | UBERN, TUG | Send slides of UBERN and TUG investigations about the analysis of the CSR data screening to Srinivas. Ask for more details about the screening procedure and for an additional, more problematic month of data. | 30.06.2015 |
| 009 | EGSIEM | TUG | Further elaborate on the proposal to add back the monthly mean of all gravitational accelerations reduced during the processing before combination by numerical examples. Explain why background models should be added with a mean over the entire month, even if there are data gaps. | 31.12.2015 |



Action Items Status

| | | | | |
|-----|--------|------------------------------|--|------------|
| 010 | EGSIEM | CNES | Clarify the availability of FES2014 for the EGSIM ACs | 30.06.2015 |
| 011 | EGSIEM | GFZ (AG), DLR, CNES | Establish the interfaces between ZKI, Hydrology, and CNES to clarify the possibility to derive flood volumes and the potential role of altimetry (Hydroweb). | 30.09.2015 |
| 012 | EGSIEM | EGSIEM ACs | Each AC to provide a test SINEX file of a monthly GRACE solution (NEQ information). | 31.07.2015 |
| 013 | EGSIEM | GFZ (FF), UL, GFZ (AG) | Compile a list of EGSIM L3 products Compile a list of sources for degree 1 terms and C20 | 30.09.2015 |
| 014 | EGSIEM | CNES | Validation of GRACE solutions over oceans using altimetry and ocean surface topography | 31.12.2015 |
| 015 | EGSIEM | UL | Check availabilities of GRACE movies and possibilities (persons) to update them | 31.12.2015 |



Availability this year:
When exactly?

