

ASTARTE

Assessment, STrategy And Risk Reduction for Tsunamis in Europe

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 Organisation name of lead contractor: IPMA
 Coordinator: Maria Ana Baptista

Deliverable 3.16

GIS database of risk-driving offshore active faults, tsunamigenic landslides, eruptive volcanoes, and their parameters.

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Lead beneficiary of this deliverable:	CNRS			
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Dissemination Level	
PU Public	
PP Restricted to other programme participants (including the Commission Services)	X
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)	

1. A GIS DATABASE OF TSUNAMI SOURCES

Deliverable 3.16 is a GIS (Geographic Information System) database of risk-driving (potential future) offshore active faults, landslides, and volcanoes used in the ASTARTE project. The aim is to build a unified GIS database resulting from Task 3.4 “Integration and harmonization of tsunami sources”, with inputs from Tasks 3.1-3.3 (characterisation of the sources). D3.16 thus contains updated information on all tsunami sources investigated within ASTARTE.

The table below lists ASTARTE contributions on tsunami sources. It is extracted from deliverable 3.12 “Risk-driving tsunami sources for other WPs – parameters, sensitivity, and uncertainties”.

Type of source	Location	Contributors
Earthquake faults	Atlantic Ocean	1-IPMA
Earthquake faults	Aegean Sea and Eastern Mediterranean	3-METU
Earthquake faults	Northern Algerian margin and Ligurian Sea	5-CEA
Earthquake faults	Crustal and subduction sources, Ionian Sea and Hellenic Arc	7-UNIBO
Earthquake faults	Hellenic and Calabrian Arc subduction zones	8-INGV
Earthquake faults	Hellenic Arc and Sea of Crete	12-NOA
Earthquake faults	Active faults in the Black Sea area	20-INCDP-RA
Earthquake grid	Eastern Mediterranean and its Connected Seas (Aegean and Black Seas)	4-BOUN
Earthquake grid Earthquake zonation	Central Mediterranean Sea	8-INGV
Landslide sources	Hyblaeon-Malta escarpment	7-UNIBO
Landslide sources	Amorgos basin	12-NOA
Landslide sources	Lofoten, Orkdalsfjorden, Trondheimsfjorden, Var Delta	15- UBREMEN
Landslide sources	Trænadjupet Continental landslide, Lyngen rockslide	16-NGI
Landslide sources	Rockall Trough	178-NUID-UCD
Landslide sources	Icod Canary Islands Landslide	18-NERC
Landslide sources	El Golfo Volcanic Island Landslide	18-NERC

Landslide sources	Trænadjupet and Nyk Continental landslides	18-NERC
Volcano sources	Kolumbo volcano, Aegean Sea	6-CNRS
Volcano sources	Thera (Santorini), Aegean Sea	12-NOA
Volcano sources	Campi Flegrei Caldera, Italy	6-CNRS & 8-INGV

The GIS data is supplied in the ESRI shapefile format (suite of mandatory files with shp, shx, dbf, and prj extensions), coordinate system is latitude/longitude with Datum WGS 84 (EPSG:4326; <http://spatialreference.org/ref/epsg/wgs-84/>), and units are decimal degrees. Each contributor has provided a single shapefile suite per type of source (earthquake fault, landslide, etc.) and lead beneficiary (CNRS) builds the final files and the GIS database in collaboration with INGV for earthquake sources and NGI for landslides. Guidelines for contributors were similar to those recommended for preparing deliverable 3.12. Shapefiles are provided with a QGIS project file (D3-16.qgs) including the structure, styles and relief background. QGIS is an open-source GIS software.

2. SHAPEFILES INFORMATION

2.1. Earthquake sources: individual fault models (rectangles).

IPMA: 1, Instituto Portugues do Mar e da Atmosfera

- 80 faults.
- 15 Fields: PartnerID Smallint; PartnerName Char (254); ID Integer; SourceZone Char (64); Mw Char (10); Scenario Char (6); SegCoord Char (254); LxW_km Char (7); Strike Char (11); Dip Char (10); Slip_m Char (10); Rake Char (10); DepTop_km Char (10); mu_E10_Pa Char (10); LatLon Char (254).
- Files: IPMA_Faults.shp; shx, dbf, prj.

METU: 3, Middle East Technical University

- 93 faults.
- 12 Fields: PartnerID Smallint; PartnerName Char (254); Name Char (4); Lon Float; Lat Float; Strike Float; Depth_km Float; Dip Float; Rake Float; L_km Float; W_km Float; D_m Float.
- Files: METU_Faults.shp; shx, dbf, prj.

NOA: 12, National Observatory of Athens

- 15 faults.
- 22 Fields: PartnerID Smallint; PartnerName Char (254); ID Smallint; Name Char (2); JointID Char (4); Lon1 Float; Lat1 Float; Lon2 Float; Lat2 Float; Lon3 Float; Lat3 Float; Lon4 Float; Lat4 Float; L_km Float; W_km Float; D_km Float; Slip_m Float; Strike Float; Dip Float; Rake Float; Mw Float; Reference Char (35).
- Files: NOA_Faults.shp; shx, dbf, prj.

UNIBO: 7, Alma Mater Studiorum-Università di Bologna

- 7 faults. One fault is a combination of two fault planes.
- 13 Fields: PartnerID Smallint; PartnerName Char (254); Id Integer; Name Char (7); LonLatDep Char (254); L_km Char (14); W_km Char (14); Slip_m Char (14); Strike Char (14); Dip Char (14); Rake Char (14); Mw Char (14); References Char (254).
- Files: UNIBO_Faults.shp; shx, dbf, prj.

CEA: 5, Commissariat a L'Energie Atomique et aux Energies Alternatives.

- 30 faults.
- 15 Fields: PartnerID Smallint; PartnerName Char (254); ID Char (7); Zone Char (21); Name1 Char (18); Name2 Char (7); Lon Float; Lat Float; Depth_km Float; Slip_m Float; Strike Float; Dip Float; Rake Float; Length_km Float; Width_km Float.
- Files: CEA_Faults.shp; shx, dbf, prj.

2.2. Earthquake sources: grid models (points).

INGV: 8, Istituto Nazionale di Geofisica e Vulcanologia.

- Total number of elements in table: 4,320; for each elements there are 1,296 scenarios. Total number of scenarios: 5,598,720.
- 22 Fields: PartnerID Smallint; PartnerName Char (254); ID Smallint; LonCentre Float; LatCentre Float; Lon1 Float; Lat1 Float; Lon2 Float; Lat2 Float; Lon3 Float; Lat3 Float; Lon4

Float; Lat4 Float; Elevation Smallint; Mw Char (54); Length Char (51); Width Char (47); Slip Char (47); Strike Char (52); Dip Char (28); Rake Char (23); Depth Char (116).

- Files: INGV_Grid.shp; shx, dbf, prj.

BOUN: 4, Bogazici Universitesi.

- Total number of points: 1,751. At many locations there are several coincident grid points corresponding to multiple fault models with different parameters.
- 16 Fields: PartnerID Smallint; PartnerName Char (254); ID Float; LAT Float; LON Float; strike Smallint; dip Smallint; rake Smallint; depth Float; Mw Float; L Float; W Float; D Float; Ref_sdrd Char (25); Ref_LWD Char (63); Ref_Mw Char (12).
- Files: BOUN_Grid.shp; shx, dbf, prj.

2.3. Earthquake sources: subduction zone (triangular mesh).

INGV: 8, Istituto Nazionale di Geofisica e Vulcanologia.

- Subduction model, complex 3D geometry composed by oriented triangles. Total number of ruptures in table: 4,585.
- 9 Fields: PartnerID Smallint; PartnerName Char (254); SubductionZone Char (32); ID Integer; LonCentre Float; LatCentre Float; Magnitude Float; Rigidity Char (32); Propagation Integer.
- Files: INGV_Complex.shp; shx, dbf, prj.

2.4. Landslide sources (points).

- **Contributors: NGI, U-BREMEN, NOC, NUID-UCD, NOA, UNIBO.**
- Data compiled by NGI.
- Number of features: 24 landslides (each landslide corresponding to a point).
- 19 fields: PartnerID; PartnerName; Name; Long; Lat; ScenarioID; RealizID; RelProb; TypeID; Dim; Length; Width; Thickness; Area; Volume; Param; Model; ModelRef; Notes.
- Files: landslide.shp; shx; dbf; prj.

2.5. Volcano sources.

Caldera collapse: CNRS-LMV, NOA.

- Data compiled by CNRS-LMV.
- Number of features: 15 polygon features, corresponding to the geographic extent of the caldera collapse. Two case-studies: Kolumbo and Santorini (Aegean Sea).
- 10 fields: PartnerID; PartnerNam; CC_ID; Long; Lat; Realiz_ID; Depth_top; Depth_base; Duration; Ref.
- Files: CC.shp; shx; dbf; prj.

Pyroclastic flows: CNRS-LMV.

- Data compiled by CNRS-LMV.
- Number of features: 11 polygon features, corresponding to the geographic extent of the pyroclastic flow deposits (from numerical simulations). One case-study: Kolumbo submarine volcano (Aegean Sea).
- 11 fields: PartnerID; PartnerNam; PF_ID; Long; Lat; Realiz_ID; Volume; Flux; Density; Velocity; Ref.
- Files: PF.shp; shx; dbf; prj.

Underwater explosions: CNRS-LMV, INGV.

- Data compiled by CNRS-LMV.
- Number of features: 55 points features + 55 buffer features (the size of the buffer being scaled from the diameter of the water cavity generated by the explosion). Two case-studies: Kolumbo submarine volcano (Aegean Sea) and Phlegrean Fields caldera (Italy).
- 12 fields: PartnerID; PartnerNam; UWE_ID; Long; Lat; Realiz_ID; Energy; water_diam; vent_diam; depth; n0; Ref.
- Files: UWE_buffer.shp; shx; dbf; prj and UWE_points.shp; shx; dbf; prj.

3. SNAPSHOTS OF THE GIS DATABASE

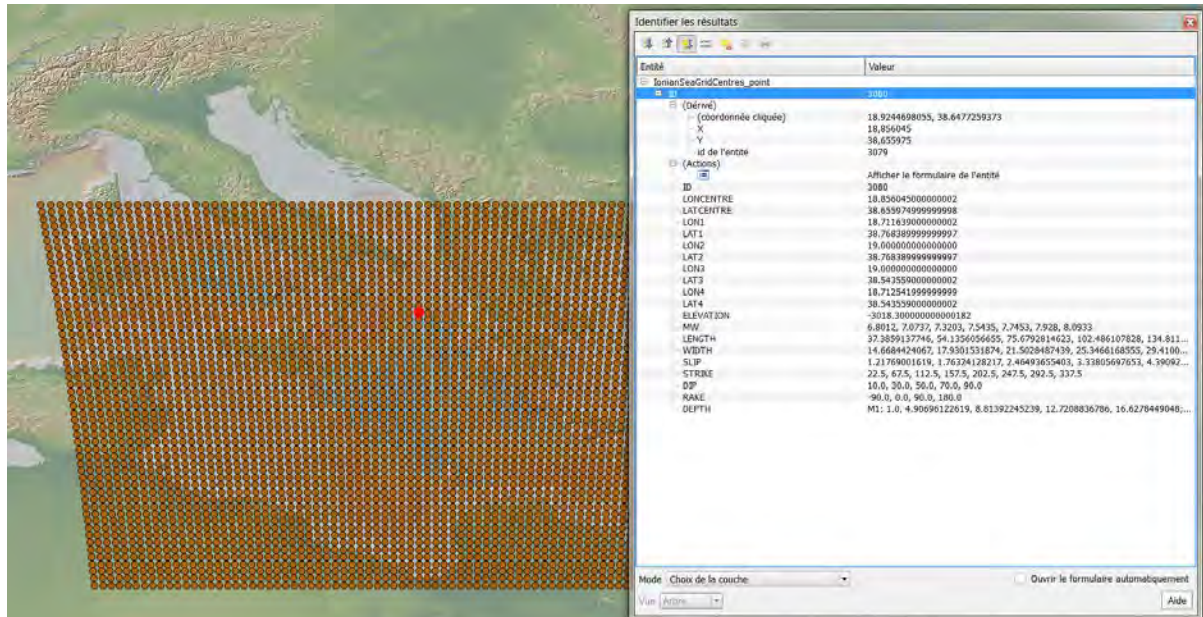


Fig. 1 – Snapshot of the Earthquake grid file provided by INGV (partner 8). Each point corresponds to a possible earthquake location, with different characteristics. Different values of Mw, length, width, slip, strike, dip, rake and depth are listed for each point location in the table of attributes (QGIS).

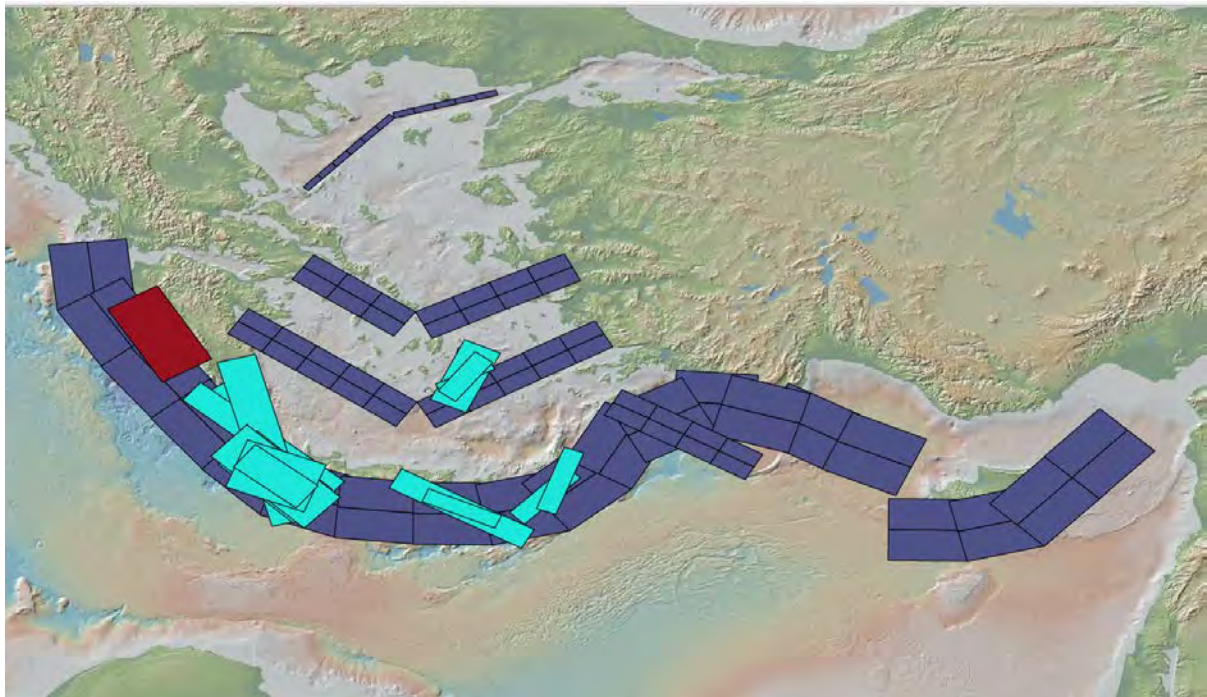


Fig. 2 – Individual fault models in the Eastern Mediterranean. Each rectangle correspond to a fault model. Colors refer to different contributors (partners).



Fig. 3 – Triangular mesh models of subduction zones provided by INGV (partner 8).

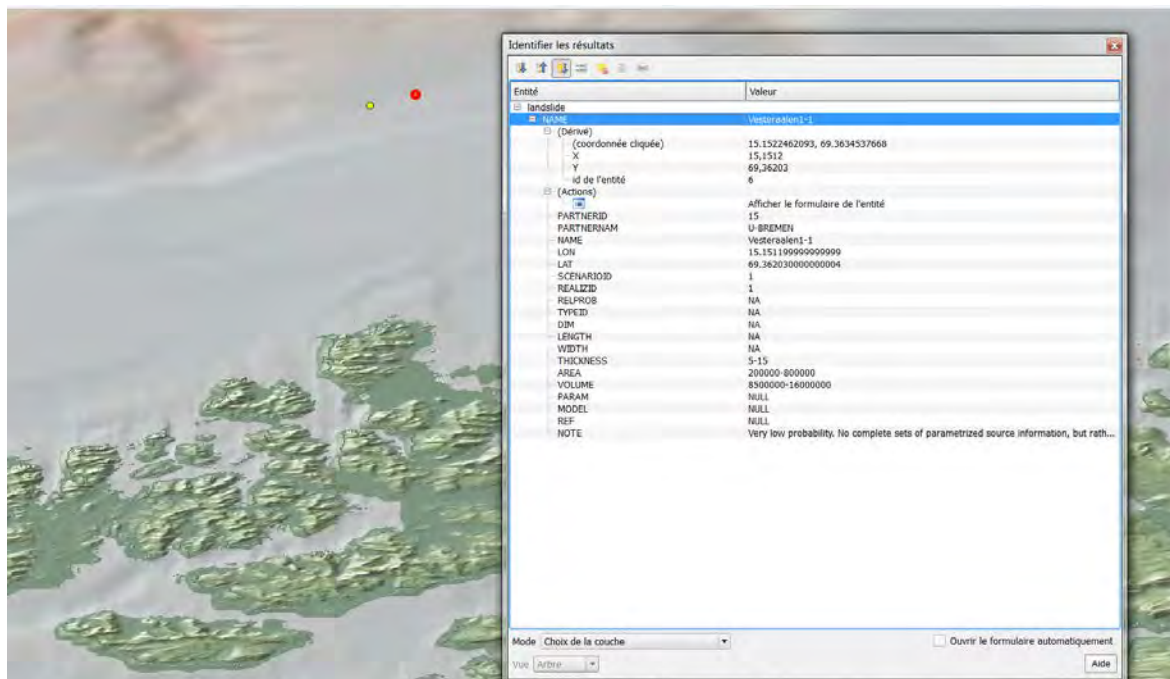


Fig. 4 – Snapshot of the landslide database and related table of attributes for a case-study in Norway (Vesteraalen landslide).

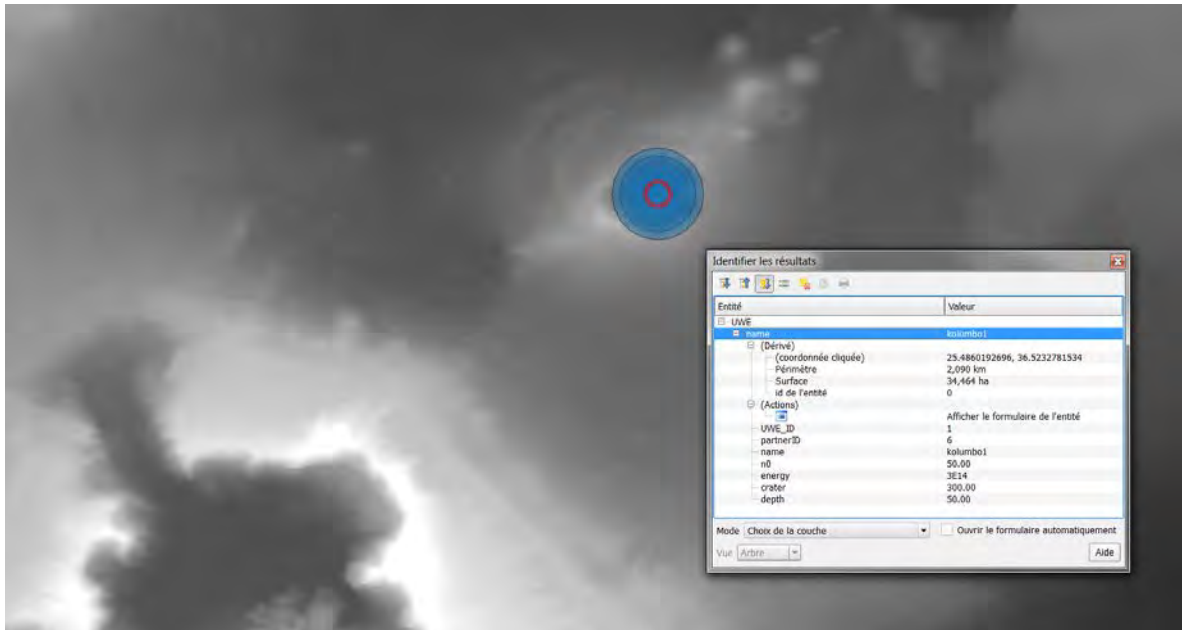


Fig. 5 – Snapshot of the UWE shapefile (underwater explosion) with QGIS freeware. Case-study is Kolumbo submarine volcano, Aegean Sea (UWE_ID = 1). The feature selected corresponds to an explosion energy $E = 3 \times 10^{14}$ J generating an initial deformation $n_0 = 50$ m. Circles are buffers scaled from the diameter of the water crater produced by the explosion.



Fig. 6 – Same data as for figure 1, but visualised in Google Earth. Yellow circles correspond to underwater explosions of different energies.