

CHAPTER 4

Technical Documentation and Contributions



GEER/EERI/ATC Cephalonia, Greece 2014

Report Version 1

4 Documentation and Contributions

The 2014 Cephalonia events revealed invaluable technical information in a broad range of topics of interest to earthquake engineering and public safety. In this chapter, we explain the technical information obtained through reconnaissance and how this information is presented in this report.

The 2014 Cephalonia GEER/EERI/ATC reconnaissance efforts were a collaboration of a multidisciplinary team of more than 70 members affiliated with different institutions, universities and private companies. The Greek earthquake engineering community practically came together for this effort, either as participant in the field, co-author or co-editor of the report, or external reviewer. This community is highly qualified and has historically made significant contributions to the field of earthquake engineering. An impressive number of members of GEER (13), EERI (32), ATC (3), SSA (15) and Greek ETAM (25) were included, many in leadership positions in these organizations.

The amount of information collected was substantial, so chapters were divided in sections with specific technical focus within the topic of the chapter. The technical part of the report is essentially covered in chapters 2 and 5 to 12. The content of each technical chapter and its sections are presented here, along with the names of the dedicated people who contributed with authorship capacity in its preparation. Contributing authors of each section are listed with their institution affiliation. The institutions appear in alphabetical order, and the names of contributing authors are listed in the order provided by their institutions to the editors. Where co-editors are listed as co-authors, it means that their work went beyond the editorial task into an actual contribution in the content of a section. External reviewers are listed at the end of their section, with the editorial note that in large part the external review work is ongoing and will be completed in the next version. In many sections, the contributions were large and complex enough to grant the need to have dedicated leaders that put the material together before it was delivered to the editors. For these sections, the leader or co-leaders are indicated by an asterisk (*).

CHAPTER 2 – CEPHALONIA HISTORY AND AREAS COVERED

This chapter gives background on the Cephalonia island including a roadmap to names, location, and coordinates of the towns that were the focus of reconnaissance, prepared by:

GATECH	Dominic Assimaki
MRCE	Sissy Nikolaou, Nonika Antonaki, Dimitrios Iliadelis
UMICH	Dimitrios Zekkos

CHAPTER 5 – SEISMIC HISTORY AND HAZARD

Section 5.1 presents a review of history of earthquakes, their impact and seismic hazard mapping of Cephalonia. Section 5.2 is in progress and will present comparisons of intensity distributions to regional probabilistic hazard studies. Chapter 5 is authored by:

EPPO – ITSAK Christos Papaioannou

CHAPTER 6 – GEOLOGY AND SEISMOTECTONICS

6.1 Geology and Geomorphology. The geology, geomorphology, faulting, and sea reclamation history of Cephalonia island are provided with contributing authors:

AUTH	Alexandros Chatzipetros (*), Spyros Pavlides (*)
MRCE	Sissy Nikolaou, Menzer Pehlivan

External reviewer:

MRCE	Cheryl J. Moss
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6.2 Seismotectonics. This section is in progress regarding seismotectonic mechanisms, geometry of ruptured area, and epicenter locations. The authors of this section are:

EPPO-ITSAK	Basil Margaris
AUTH	Costas Papazachos

CHAPTER 7 – SEISMOLOGICAL AND STRONG MOTION ASPECTS

7.1 First Main Event of January 26, 2014. The station network and strong ground motion records are presented. Section 7.2 is underway with seismological details of the 2nd event of February 3, 2014 (currently plots of selected records are shown, provided by P. Pelekis and G. Athanasopoulos). The co-authors of Sections 7.1 and (upcoming) 7.2 are:

ASPETE	Panagiotis Pelekis
EPPO-ITSAK	Basil Margaris, Christos Papaioannou, Alexandros Savvaidis and Nikos Theodouldis
NOA-IG	Ioannis Kalogeras, Nicos Melis, Christos Evangelidis
UCLA	Jonathan Stewart
UPATRAS	George Athanasopoulos, George Mylonakis, Vasileios Vlachakis, Anastasios Batilas

7.3 Remote Sensing Interferometry. Remote sensing interferometry after the 2nd main event are presented in this section, with lead author I. Parcharidis in collaboration with:

HUA	Issaak Parcharidis (*)
MRCE	Lysandra Lincoln, Menzer Pehlivan
NTUA	George Gazetas

For Chapter 7, external reviewer is:

DREXEL	Aspasia Zerva
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CHAPTER 8 – GEOTECHNICAL OBSERVATIONS

8.1 Site Effects. Possible amplification and topographic effects based on few data and comparisons with codes were compiled by lead authors D. Assimaki and G. Gazetas, with:

AUTH	George Papathanasiou
GATECH	Dominic Assimaki (*)
MRCE	Menzer Pehlivan, Sissy Nikolaou
NTUA	George Gazetas (*)
UTH	Achilleas Papadimitriou

External reviewers:

DREXEL	Aspasia Zerva
ILLINOIS	Youssef Hashash

8.2 Liquefaction, Ports and Waterfront. Observations with focus on the ports of Lixouri, Argostoli, and Sami and the broader Paliki peninsula are compiled under the leadership of D. Zekkos, G. Athanasopoulos, and G. Mylonakis, with their co-authors:

ASPETE	Panagiotis Pelekis
AUTH	George Papathanasiou, Sotiris Valkaniotis, Spyros Pavlides
AUTH-LSDGEE	Kyriazis Pitilakis, Dimitris Pitilakis, Anna Karatzetzou, Konstantinos Mouratidis
EPPO-ITSAP	Konstantia Makra, Manos Rovithis, Alexandros Savvaidis
GATECH	Dominic Assimaki
GENG	Vasiliki Dimitriadi
MRCE	Menzer Pehlivan, Sissy Nikolaou
NOA-IG	Athanasios Ganas, Marios Papanikolaou
NTUA	George Gazetas, Evangelia Garini, Kostas Rouchotas
ROUCH	Lefteris Rouchotas
UMICH	Dimitrios Zekkos (*)
UPATRAS	George Athanasopoulos (*), George Mylonakis (*), Anastasios Batilas, Xenia Karatzia, Vasileios Kitsis, Fotini Lyrantzaki, Stavroula Skafida, Olga Theofilopoulou, Vasileios Vlachakis
UTH	Achilleas Papadimitriou

External reviewers:

NTUA	George Bouckovalas
UMICH	Adda Athanasopoulos-Zekkos

8.3 Earth Retaining Structures. Section 8.3 summarizes the performance of earth, masonry, and concrete retaining walls, compiled by:

AUTH-LSDGEE	Dimitris Pitilakis, Anna Karatzetzou, Konstantinos Mouratidis
DUTH	Nikolaos Klimis, Manos Psaroudakis
EPPO-ITSAP	Manos Rovithis and Konstantia Makra
MRCE	Jesse Richins
NTUA	George Gazetas and Evangelia Garini
UMICH	Dimitrios Zekkos (*)
UPATRAS	George Athanasopoulos (*), Olga Theofilopoulou, Vasileios Kitsis, Stavroula Skafida, Vasileios Vlachakis, Anastasios Batilas, Costas Papantonopoulos, Eva Agapaki, Elpida Katsiveli, George Mylonakis
UTH	Achilleas Papadimitriou

External reviewer:

TU Kaiserslautern	Christos Vrettos
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8.4 Landslides and Rockfalls. Earth landslides, embankment settlements and rock failures were prepared by leaders C. Papantonopoulos and G. Mylonakis with co-authors:

AUTH-LSDGEE	Dimitris Pitilakis
DUTH	Nikolaos Klimis, Manos Psaroudakis
EPPO-ITSAP	Manos Rovithis, Konstantia Makra
GATECH:	Dominic Assimaki
MRCE	Jesse Richins, Sissy Nikolaou
NTUA	George Gazetas, Evangelia Garini, Telemachos Beriatos
UPATRAS	Costas Papantonopoulos (*), George Mylonakis (*), Eva Agapaki, Elpida Katsiveli
UTH	Achilleas Papadimitriou

External reviewer:

NTUA	George Bouckovalas
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8.5 Bridges. Observations compiled by A. Papadimitriou and contributions by:

AUTH-LSDGEE	Kyriazis Pitilakis
EPPO-ITSAP	Manos Rovithis, Konstantia Makra
GATECH:	Dominic Assimaki
MRCE	Sissy Nikolaou, Menzer Pehlivan
UTH	Achilleas Papadimitriou (*)

External reviewers:

DREXEL	Aspasia Zerva
HDR	Chris Sklavounakis

8.6 Embankments and Landfills. Road embankments and landfills observations were compiled by A. Papadimitriou with his co-authors:

AUTH-LSDGEE	Dimitris Pitilakis, Anna Karatzetzou
DUTH	Nikolaos Klimis, Manos Psaroudakis
EPPO-ITSAP	Manos Rovithis, Konstantia Makra
MRCE	Jesse Richins, Nonika Antonaki
UMICH	Dimitrios Zekkos
UPATRAS	George Athanasopoulos, Olga Theofilopoulou, Vasileios Kitsis
UTH	Achilleas Papadimitriou (*)

External reviewer:

TU Kaiserslautern	Christos Vrettos
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8.7 Settlement and Soil-Structure Interaction. Performance of 10 documented structures with focus on SSI effects were prepared under the leadership of G. Mylonakis with the following co-authors:

AUTH-DSE	Anastasios Sextos
DIA	Katerina Sypsa
EF	Dimitri Kopanos
MRCE	Sissy Nikolaou
UMICH	Dimitrios Zekkos
UPATRAS	George Mylonakis (*), George Athanasopoulos, Anastasios Batilas, Xenia Karatzia, Vasileios Kitsis, Fotini Lyrantzaki, Olga Theofilopoulou, Vasileios Vlachakis
UTH	Achilleas Papadimitriou

External reviewer:

TU Kaiserslautern	Christos Vrettos
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CHAPTER 9 – RIGID BLOCKS

Chapter 9 presents a synthesis of the findings of all reconnaissance teams regarding rigid block response including types of damage, controlling parameters and spatial distribution of damage compiled under the leadership of George Gazetas with contribution of the following co-authors:

AUTH-LSDGEE	Dimitris Pitilakis, Anna Karatzetzou, Konstantinos Mouratidis
DIA	Fotis Pantelis, Dionysios Moschonas, Katerina Sypsa
DUTH	Nikolaos Klimis and Manos Psaroudakis
EPPO-ITSAK	Manos Rovithis, Konstantia Makra
MRCE	Sissy Nikolaou, Menzer Pehlivan
NTUA	George Gazetas (*), Evangelia Garini, Telemachos Beriatos, Kostas Rouchotas
UMICH	Dimitrios Zekkos
UPATRAS	George Mylonakis, George Athanasopoulos, Costas Papantonopoulos, Eva Agapaki, Olga Theofilopoulou, Elpida Katsiveli, Vasileios Kitsis
UTH	Achilleas Papadimitriou

9.2 Detailed Reconnaissance; 9.3 Statistics of Failures in Cemeteries. These sections of Chapter 9 present detailed reconnaissance data from cemeteries and monuments. The above team members are co-authors in their compilation, prepared under the leadership of:

AUTH-LSDGEE Dimitris Pitilakis (*), Anna Karatzetzou, Konstantinos Mouratidis

For Chapter 9, external reviewer is:

UPATRAS Nicos Makris

CHAPTER 10 – INFRASTRUCTURE NETWORKS

10.1 Potable and Wastewater Networks. Section 10.1 presents the EYDAP Organization, the action plan, and restoration of damaged potable and wastewater networks after both events. Contributing authors of this section are as listed below:

EYDAP Kostas Papadakis, Cleio Eleutheriou

Translation and editorial compilation was performed by:

MRCE Dimitrios Iliadelis, Sissy Nikolaou
UMICH Dimitrios Zekkos

External reviewers are:

CORNELL Thomas D. O'Rourke
ILLINOIS Youssef Hashash

10.2 Transportation Road Network. Section 10.2 presents observations related to road transportation network performance and traffic disruptions during the two main seismic events and their aftershocks. Contributing authors of this section are as listed below:

MRCE Dimitrios Iliadelis, Sissy Nikolaou
UTH Achilleas Papadimitriou (*)

External reviewer is:

HDR Chris Sklavounakis

CHAPTER 11 – STRUCTURAL OBSERVATIONS

The multiple contributions in Chapter 11, particularly Sections 11.1 to 11.7, were edited by P. Tsopelas of UTH prior to submittal to the editors.

11.1 Main Structural Observations. Typical structural damage in Paliki peninsula by:

NTUA Ioannis Psycharis

11.2 Building Inventory and Construction Types. This section presents building types according to load bearing system by co-authors:

EPPO-ITSAK Vassilis Lekidis, Thomas Salonikios, Christos Karakostas,
Kostas Morfidis

11.3 Damage Assessment. Surveys and assessment data are summarized by:

GMS Ramon Gilsanz, Eugene Kim, Joseph Mugford
MRCE Dimitrios Iliadelis, Lysandra Lincoln
OTM Aris Gazetas
UPATRAS Stefanos Dritsos (*)
UTH Marina Moretti (*)

11.4 Typical Damage Patterns by Construction Type. Section 11.4 presents structural observations for masonry, reinforced concrete, and other buildings per era of construction with contributions by:

NTUA Ioannis Psycharis (*), Elli Vintzilaou (*), Alkis Papathanasiou
GMS Ramon Gilsanz, Eugene Kim, Joseph Mugford
MRCE Dimitrios Iliadelis, Sissy Nikolaou
UTH Panos Tsopelas

11.5 Structural Behavior Based on Seismic Codes. A brief review of Greek seismic codes with comparison to US codes is presented, along with observations based on seismic code effective at year of construction. Contributing authors of this section are:

AUTH-DSE Anastasios Sextos
ASPETE Vagelis Plevris
EPPO-ITSAK Thomas Salonikios, Vassilis Lekidis, Christos Karakostas,
Kostas Morfidis
GMS Ramon Gilsanz, Eugene Kim, Joseph Mugford
MRCE Dimitrios Iliadelis, Sissy Nikolaou, Mojtaba Malek
UTH Panos Tsopelas (*), Marina Moretti (*)

11.6 Special Cases of Structural Interest. This section presents structural observations for structures with multiple additions, public low income housing, typical available drawings and building instrumentation, by the following co-authors:

ASPETE Vagelis Plevris
AUTH-DSE Anastasios Sextos
EPPO-ITSAK Vassilis Lekidis, Christos Karakostas
DIA Fotis G. Pantelis
GMS Ramon Gilsanz, Eugene Kim, Joseph Mugford
MRCE Dimitrios Iliadelis, Sissy Nikolaou
UTH Panos Tsopelas (*), Marina Moretti

11.7 Public Buildings. Reconnaissance information for public administrative, critical, and school structures are compiled by the lead author A. Sextos and his co-authors:

AUTH-DSE	Anastasios Sextos (*)
GMS	Ramon Gilsanz, Eugene Kim, Joseph Mugford
LEEPKA	Antonis Petropoulos
MRCE	Sissy Nikolaou, Dimitrios Iliadelis
UTH	Marina Moretti

11.8 Churches. Classification, damage rating, and performance of churches are compiled by H. Mouzakis and participation of his co-authors:

AUTH	Anastasios Sextos
EPPO-ITSAK	Vassilis Lekidis, Thomas Salonikios, Kostas Morfidis
LEEPKA	Antonis Petropoulos
NTUA	Haris Mouzakis (*), Elli Vintzilaiou, Vasilis Tsouras

11.9 Nonstructural Components. Observations of damage to nonstructural components in buildings that did not have significant damage with contributions by:

DIA	Fotis G. Pantelis, Dionysios Ch. Moschonas, Katerina Ch. Sypsa
EF	George Tsakalias (*), Dimitris Kopanos, Angeliki Psychogiou
GMS	Ramon Gilsanz, Eugene Kim, Joseph Mugford
MRCE	Sissy Nikolaou, Lysandra Lincoln, Peter Deming
OTM	Aris Gazetas

For the entire Chapter 11, external reviewers are:

ATC/MAS	Philip J. Richter
NYCDOB	Gus Sirakis
UB	Michael Constantinou
UB	Andrew Whittaker

CHAPTER 12 – COMMUNITY PREPAREDNESS AND RESPONSE

Chapter 12 presents results of damage assessment surveys, government response and offered financial aid, earthquake insurance data, and provided community housing and support. Contributing authors of this section are as listed below:

EF	George Tsakalias, Angeliki Psychogiou
GATECH	Dominic Assimaki
GMS	Ramon Gilsanz
MRCE	Nonika Antonaki, Sissy Nikolaou, Dimitrios Iliadelis
UMICH	Dimitrios Zekkos
UPATRAS	Stefanos Dritsos
UTH	Marina Moretti

