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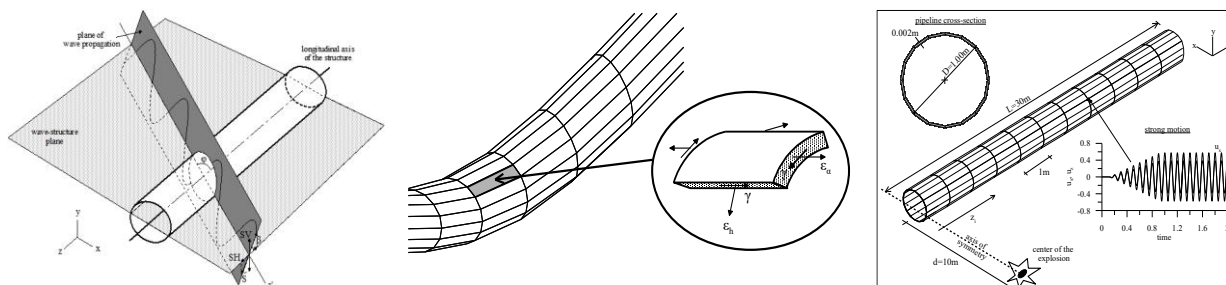
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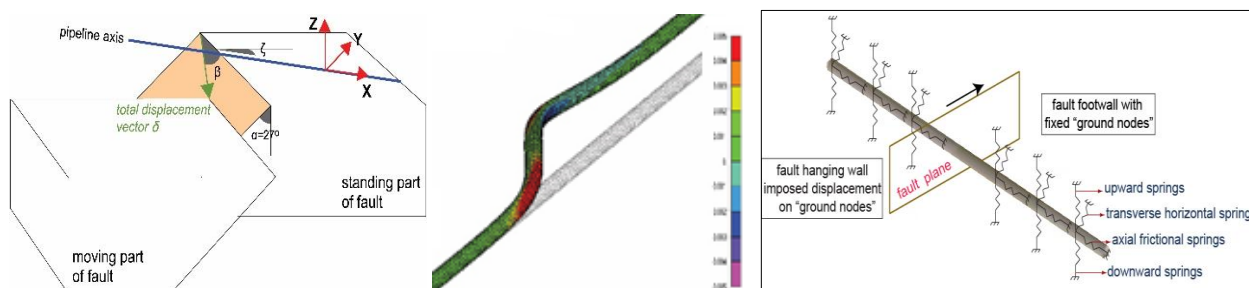
SUMMARY OF ACTIVITIES IN BURIED PIPELINES

The structural behavior and protection of buried pipelines under seismic actions and blast loading are investigated. Particular emphasis is placed on the pipeline performance in case of earthquake-induced large permanent ground displacements caused by landslide or tectonic fault offset. The evaluation of the mechanical behavior and of the effectiveness of alternative seismic countermeasures is carried out using both advanced numerical models and approximate analytical expressions, as well as small-scale experimental tests. In recent years, particular attention has been devoted to the development of innovative pipeline protection systems based on the introduction of flexible joints, aiming at transforming the structural system from continuous to segmented.

Approximate analytical calculation of pipeline response under seismic and blast wave propagation



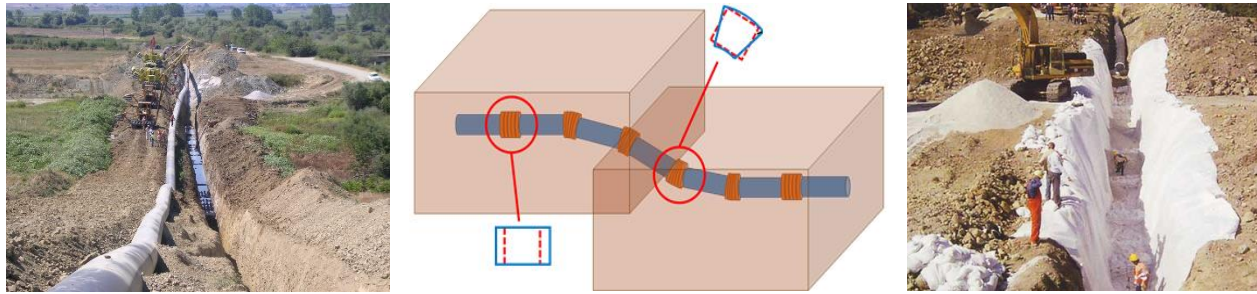
Numerical models of buried pipeline under seismic fault activation



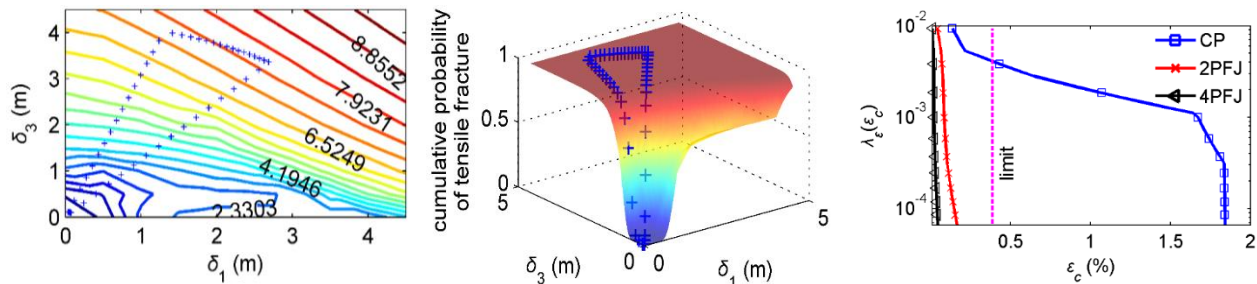
Experimental assessment of use of flexible joints for the protection of buried pipelines



Evaluation of protection measures of buried pipelines under seismic fault activation



Probabilistic assessment of the effectiveness of protection measures of buried pipelines



DESIGN AND CONSULTING ACTIVITY

- Assessment of the influence of wall dents on the strength of Trans Adriatic Pipeline (TAP), Greece (2019).
- Consultant for the structural design of a seawater supply pipeline network, part of a power generation and water desalination facility at Yanbu, Kingdom of Saudi Arabia (2011-2012).
- Participation in the verification of seismic performance of the Natural Gas Pipeline (Section Kipi-Alexandroupoli-Komotini) subjected to possible landslides and seismic fault activation, in Thrace, Greece (2003).
- Seismic design of the “Thessaloniki-Skopia Oil Pipeline” in areas of potential faults and landslides (2000-2001).
- Participation in an investigation of the effects of a potential landslide on the pipeline of the Greek natural gas transmission system at location Antinitsa, Greece (1996).

FUNDED RESEARCH PROJECTS

- “ENSSTRAM - Novel Design Concepts for Energy Related Steel Structures using Advanced Materials”, Aristeia II program, Greek Secretariat for Research and Technology, budget 296,000.00€, P.I. (2013-2015).

SUPERVISION OF DOCTORAL THESES

- Vasileios Melissianos (July 2016), “Buried Steel Pipelines with Flexible Joints under Faulting”.
doi: <http://dx.doi.org/10.26240/heal.ntua.2220>

BOOK CHAPTERS

- Melissianos, V.E. and Gantes, C.J., “Numerical Modeling Aspects of Buried Pipeline - Fault Crossing”, *Computational Methods in Earthquake Engineering - Vol. 3*, edited by M. Papadrakakis, V. Plevris and N.D. Lagaros, Springer Verlag, 2017.
doi: http://dx.doi.org/10.1007/978-3-319-47798-5_1

- Gantes, C.J., Bouckovalas, G.D., Melissianos, V.E. and Valsamis, A., “Pipeline - Fault Crossing: Structural Considerations on the Use of Flexible Joints for Mitigating a Potential Failure”, *Jubilee Volume - Andreas Anagnostopoulos: 50 Years of Service at the National Technical University of Athens*, Athens, 2015.

JOURNAL PUBLICATIONS

- Melissianos, V.E., Vamvatsikos, D. and Gantes, C.J., “Methodology for Failure Mode Prediction of Onshore Buried Steel Pipelines Subjected to Reverse Fault Rupture”, *Soil Dynamics and Earthquake Engineering*, Vol. 135, 106116, Aug. 2020.
doi: <https://doi.org/10.1016/j.soildyn.2020.106116>
- Valsamis, A.I., Bouckovalas, G.D. and Gantes, C.J., “Alternative Design of Buried Pipelines at Active Fault Crossings Using Flexible Joints”, *International Journal of Pressure Vessels and Piping*, Vol. 180, 104038, Jan. 2020.
doi: <https://doi.org/10.1016/j.ijpvp.2019.104038>
- Melissianos, V.E., Vamvatsikos, D. and Gantes, C.J., “Performance-Based Assessment of Protection Measures for Buried Pipes at Strike-Slip Fault Crossings”, *Soil Dynamics and Earthquake Engineering*, Vol. 101, pp. 1-11, Oct. 2017.
doi: <http://dx.doi.org/10.1016/j.soildyn.2017.07.004>
- Melissianos, V.E., Vamvatsikos, D. and Gantes, C.J., “Performance Assessment of Buried Pipelines at Fault Crossings”, *Earthquake Spectra*, Vol. 33, No. 1, pp. 201-218, Feb. 2017.
doi: <http://dx.doi.org/10.1193/122015EQS187M>
- Melissianos, V.E., Lignos, X.A., Bachas, K.K. and Gantes, C.J., “Experimental Investigation of Pipes with Flexible Joints under Fault Rupture”, *Journal of Constructional Steel Research*, Vol. 128, pp. 633-648, Jan. 2017.
doi: <http://dx.doi.org/10.1016/j.jcsr.2016.09.026>
- Gantes, C.J. and Melissianos, V.E., “Evaluation of Seismic Protection Methods for Buried Fuel Pipelines Subjected to Fault Rupture”, *Frontiers in Built Environment*, Vol. 2, Article 34, Dec. 2016.
doi: <http://dx.doi.org/10.3389/fbuil.2016.00034>
- Melissianos, V.E., Korakitis, G.P., Gantes, C.J. and Bouckovalas, G.D., “Numerical Evaluation of the Effectiveness of Flexible Joints in Buried Pipelines Subjected to Strike-Slip Fault Rupture”, *Soil Dynamics and Earthquake Engineering*, Vol. 90, pp. 395-410, Nov. 2016.
doi: <http://dx.doi.org/10.1080/15397734.2016.1165117>
- Melissianos, V.E. and Gantes, C.J., “Buckling and Post-buckling Behavior of Beams with Internal Flexible Joints Resting on Elastic Foundation Modeling Buried Pipelines”, *Structures*, Vol. 7, pp. 138-152, Aug. 2016.
doi: <http://dx.doi.org/10.1016/j.istruc.2016.06.007>
- Gantes, C.J. and Bouckovalas, G.D., “Seismic Verification of High Pressure Natural Gas Pipeline Komotini-Alexandroupolis-Kipi in Areas of Active Fault Crossings”, *Structural Engineering International*, Vol. 23, Number 2, pp. 204-208, May 2013.
doi: <http://dx.doi.org/10.2749/101686613X13439149157164>
- Kouretzis, G.P., Bouckovalas, G.D. and Gantes, C.J., “Analytical Calculation of Blast-Induced Strains to Buried Pipelines”, *International Journal of Impact Engineering*, Vol. 34, Issue 10, pp. 1683-1704, Oct. 2007.
doi: <http://dx.doi.org/10.1016/j.ijimpeng.2006.08.008>

- Kouretzis, G.P., Bouckovalas, G.D. and Gantes, C.J., “3-D Shell Analysis of Cylindrical Underground Structures under Seismic Shear (S) Wave Action”, *Soil Dynamics and Earthquake Engineering*, Vol. 26, Issue 10, pp. 909-921, Oct. 2006.
doi: <http://dx.doi.org/10.1016/j.soildyn.2006.02.002>
- Gantes, C.J. and Gerogianni, D.S., “Infinitely Long Buried Pipelines under Bending and Internal Pressure”, *Journal of the International Association for Shell and Spatial Structures (IASS Journal)*, Vol. 43, n. 139, pp. 101-114, Aug. 2002.
- Gantes, C.J. and Gerogianni, D.S., “The Effects of Finite Length and Axial Force for Buried Pipelines in Bending”, *Journal of the International Association for Shells and Spatial Structures (IASS Journal)*, Vol. 43, n. 139, pp. 115-123, Aug. 2002.

CONFERENCE PUBLICATIONS

- Melissianos, V.E., Vamvatsikos, D.J. and Gantes, C.J., “Empirical Relation to Predict Buckling Failure of Buried Pipelines under Inverse Fault Activation”, *4th PSAMTS, 4th Hellenic Conference of Earthquake Engineering and Technical Seismology*, Athens, 5-7 Sep. 2019 (in Greek).
- Melissianos, V.E. and Gantes, C.J., “Protection Measures for Buried Steel Pipelines Subjected to Fault Rupture”, *ICONHIC2019 - 2nd International Conference on Natural Hazards & Infrastructure, Workshop on Natural Hazards & Pipeline Infrastructure*, Chania, Greece, 23-26 Jun. 2019.
- Melissianos, V.E., Vamvatsikos, D.J. and Gantes, C.J., “Performance Assessment of Protection Measures of Buried Pipelines under Activation of Seismic Fault”, *2nd Young Researchers Workshop ETAM - NTUA “Earthquake Engineering through the Scientific Viewpoint of Young Researchers and Engineers”*, NTUA School of Civil Engineering, 3 Nov. 2017 (abstract only, in Greek).
- Karvelis, A.C., Melissianos, V.E. and Gantes, C.J., “Local Buckling Investigation of Buried Steel Pipelines due to Seismic Fault Activation”, *9th Hellenic National Conference on Steel Structures*, Larissa, Greece, 5-7 Oct. 2017 (in Greek with English summary).
- Melissianos, V.E., Vamvatsikos, D.J. and Gantes, C.J., “Probabilistic Assessment of Innovative Mitigating Measures for Buried Steel Pipeline - Fault Crossing”, *2015 ASME Pressure Vessels & Piping Conference*, Boston, Massachusetts, Jul. 19-23, 2015.
doi: <http://dx.doi.org/10.1115/PVP2015-45345>
- Melissianos, V.E. and Gantes, C.J., “Failure Mitigation of Buried Steel Pipeline under Strike-Slip Fault Offset Using Flexible Joints”, *SECED 2015 Conference: Earthquake Risk and Engineering towards a Resilient World*, Cambridge, U.K., Jul. 9-10, 2015.
- Melissianos, V.E., Vamvatsikos, D.J. and Gantes, C.J., “Probabilistic Assessment of Pipeline - Fault Crossing”, *COMPADYN 2015 - 5th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*, M. Papadrakakis, V. Papadopoulos, V. Plevris (eds.), Crete Island, Greece, 25-27 May 2015.
doi: <https://doi.org/10.7712/120115.3519.612>
- Melissianos, V.E. and Gantes, C.J., “On the Efficiency of Flexible Joints in Mitigating the Consequences of Seismic Fault Activation on Buried Pipelines”, *ARC'14 - Qatar Foundation Annual Research Conference*, Doha, Qatar, Nov. 18-19, 2014.
- Melissianos, V.E., Gantes, C.J. and Kalfantis, P.P., “Upheaval Buckling Risk Assessment of Buried Steel Pipelines due to Reverse Seismic Fault Activation”, *8th Greek National Steel Structures Conference*, Tripoli, 2-4 Oct. 2014 (in Greek with English summary).
- Melissianos, V.E. and Gantes, C.J., “Upheaval Buckling of Onshore Buried Steel Pipelines with Flexible Joints”, *IASS-SLTE 2014 Symposium*, Brasilia, Brazil, Sep. 15-19, 2014.

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- Melissianos, V.E., Vamvatsikos, D. and Gantes, C.J., “Seismic Risk Assessment of Buried Pipelines at Active Fault Crossings”, *2ECEES - 2nd European Conference on Earthquake Engineering and Seismology*, M.A. Ansal and M. Nurlu (eds.), Istanbul, Turkey, Aug. 24-29, 2014.
- Gantes, C.J. and Melissianos, V.E., “Buckling and Post-Buckling Behavior of Beams on Elastic Foundation Modeling Buried Pipelines”, *International Conference CESARE’14 - Civil Engineering for Sustainability and Resilience*, C.C. Baniotopoulos and K.M. Abdalla (eds.), Amman, Jordan, Apr. 24-27, 2014.
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- Gantes, C.J., Bouckovalas, G.D., and Koumouisis, V.K., “Slope Failure Verification of Buried Steel Pipelines”, *10th International Conference on Applications of Advanced Technologies in Transportation*, Athens, Greece, 27- 31 May 2008.
- Kouretzis, G.P., Bouckovalas, G.D. and Gantes, C.J., “Strain Analysis of Buried Pipelines due to Blast-Induced Ground Shock Waves”, *4th International Conference on Earthquake Engineering*, Thessaloniki, Greece, Jun. 25-28, 2007.
- Kouretzis, G.P., Bouckovalas, G.D. and Gantes, C.J., “Seismic Analysis of Flexible Underground Structures with 3-D Shell Theory”, *5th Greek National Geotechnical Engineering Conference*, Xanthi, 31 May-2 Jun. 2006 (in Greek with English summary).
- Kouretzis, G.P., Bouckovalas, G.D. and Gantes, C.J., “Analytical Simulation of Stresses in Underground Pipelines due to Surface Explosions”, *5th Greek National Geotechnical Engineering Conference*, Xanthi, 31 May-2 June 2006 (in Greek with English summary).
- Gantes, C.J., Boukavalas, G.D., Kouretzis, G., Lemonis, M.E., and Pnevmatikos, N., “Earthquake Study of Natural Gas Pipeline Kipi - Alexandroupoli - Komotini at Fault Crossings”, *5th Greek National Steel Structures Conference*, Xanthi, 29 Sep.-2 Oct. 2005, E. Galousis, I. Ermopoulos, Ch. Calfas Eds., Vol. II, pp. 85-92 (in Greek with English summary).
- Koumouisis, V.K., Gantes, C.J., Bouckovalas, G.D., Dimou, C., and Lemonis, M. “Seismic Design of Thessaloniki-Skopje Oil Pipeline at Locations of Active Faults”, *4th Greek National Conference on Steel Structures*, Patra, Greece, 24-25 May 2002.
- Gantes, C.J. and Gerogianni, D.S., “Investigation of the Brazier Effect for Buried Pipelines under Internal Pressure, Bending Moment and Axial Force”, *IASS-IACM 2000 - 4th International Colloquium on Computation of Shell & Spatial Structures*, Chania, Crete, Greece, 5-7 Jun. 2000.
- Gantes, C.J. and Gerogianni, D.S., “The Brazier Effect for Buried Steel Pipelines of Finite Length”, *6th International Colloquium on Stability and Ductility of Steel Structures*, Timisoara, Romania, Sep. 9-11, 1999.
- Gantes, C.J., Bouckovalas, G.D. and Gerogianni, D.S., “Safety of Buried Steel Pipelines Subjected to Explosions”, *EuroSteel ’99, 2nd European Conference on Steel Structures*, Praha, Czech Republic, May 26-29, 1999.
- Gerogianni, D.S. and Gantes, C.J., “Implications of the Brazier Effect for Buried Pipelines”, *5th Greek National Conference on Mechanics*, Ioannina, 27-30 Aug. 1998.