

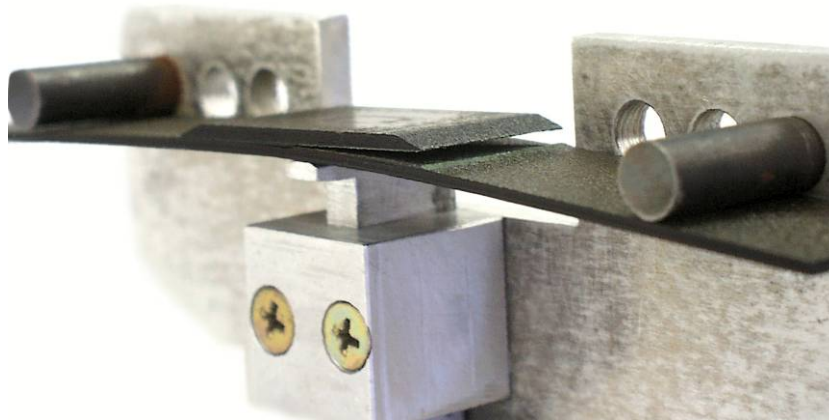
**COMPTEST2006**

FEUP FACULDADE DE ENGENHARIA  
UNIVERSIDADE DO PORTO

**COMPOSITES TESTING  
AND MODEL IDENTIFICATION**

# Composites Testing and Model Identification 2006

## Conference Programme



10<sup>th</sup>-12<sup>th</sup> April, 2006

Faculdade de Engenharia da Universidade do Porto

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Instituto de Engenharia Mecânica e Gestão Industrial – INEGI.

Association Française de Mécanique – AFM.

American Society for Composites – ASC.

Institute of Materials, Minerals and Mining – IOM<sup>3</sup>.

Association pour les Matériaux Composites – AMAC.

Asociación Española de Materiales Compuestos – AEMAC.



**3<sup>RD</sup> INTERNATIONAL CONFERENCE ON  
COMPOSITES TESTING AND MODEL IDENTIFICATION**

10, 11 and 12 April 2006  
Faculdade de Engenharia da Universidade do Porto, Portugal

**SESSION PROGRAMME**

MONDAY, 10<sup>TH</sup> APRIL

**08.00 – 08.30 Registration**

**08.30 – 08.45 Conference Opening and Welcome to Porto**

**08.45 – 10.25 Session 1 – NOVEL METHODS AND RESIDUAL STRESSES I**  
Chair: Prof. Fabrice Pierron, ENSAM Chalons, France

**10.25 – 11.10 Coffee Break + Poster Session 1**

**11.10 – 12.50 Session 2 – FRACTURE I**  
Chair: Prof. Ivana Partridge, Cranfield University, United Kingdom

**12.50 – 14.00 LUNCH**

**14.00 – 15.40 Session 3 – STRUCTURES**  
Chair: Dr. Carlos G. Dávila, NASA Langley Research Center, USA

**15.40 – 16.25 Coffee Break + Poster Session 2**

**16.25 – 18.05 Session 4 – FABRIC COMPOSITES**  
Chair: Prof. Stepan V. Lomov, Katholieke Universiteit Leuven, Belgium

**18.30 Reception at Círculo Universitário**

TUESDAY, 11<sup>TH</sup> APRIL

- 08.30 – 10.35 Session 5 – FATIGUE AND DURABILITY**  
Chair: Prof. Manuel de Freitas, Technical University of Lisbon, Portugal
- 10.35 – 11.15 Coffee Break + Poster Session 3**
- 11.15 – 12.55 Session 6 – DAMAGE MODELS I**  
Chair: Dr. Christophe Cluzel, Laboratoire de Mécanique et Technologie, France
- 12.55 – 14.00 LUNCH**
- 14.00 – 15.40 Session 7 – FULL FIELD TECHNIQUES**  
Chair: Dr. William Broughton, National Physics Laboratory, United Kingdom
- 15.40 – 16.20 Coffee Break + Poster Session 4**
- 16.20 – 18.00 Session 8 – TESTING**  
Chair: Prof. Josep Costa, University of Girona, Spain
- 18.30 Conference Dinner at the Cellars of Port Wine in Vila Nova de Gaia**

WEDNESDAY, 12<sup>TH</sup> APRIL

- 08.30 – 10.35 Session 9 – SCALE EFFECTS AND JOINTS**  
Chair: Prof. Michael Wisnom, University of Bristol, United Kingdom
- 10.35 – 11.15 Coffee Break + Poster Session 5**
- 11.15 – 12.55 Session 10 – NOVEL METHODS AND RESIDUAL STRESSES II**  
Chair: Prof. John Botsis, Swiss Federal Institute of Technology, Switzerland
- 12.55 – 14.00 LUNCH**
- 14.00 – 15.40 Session 11 – FRACTURE II**  
Chair: Prof. Janis Varna, Lulea University of Technology, Sweden
- 15.40 – 16.00 Coffee Break**
- 16.00 – 17.15 Session 12 – DAMAGE MODELS II**  
Chair: Dr. Silvestre T. Pinho, Imperial College, United Kingdom
- 17.15 Conference Closes**

**3<sup>RD</sup> INTERNATIONAL CONFERENCE ON  
COMPOSITES TESTING AND MODEL IDENTIFICATION**

10, 11 and 12 April 2006

Faculdade de Engenharia da Universidade do Porto, Portugal

FULL PROGRAMMEMONDAY, 10<sup>TH</sup> APRIL**08.00 – 08.30 Registration****08.30 – 08.45 Conference Opening and Welcome to Porto****SESSION 1 NOVEL METHODS AND RESIDUAL STRESSES I**

Chair: Prof. Fabrice Pierron, ENSAM Chalons, France

08.45 – 09.10 Aleksandar Sekulic, A. Curnier, École polytechnique fédérale de Lausanne (EPFL), Switzerland  
*An epoxy-stamp on glass-disc specimen exhibiting stable debonding for identifying adhesive properties*

09.10 – 09.35 Abul Rahim A. Arafath, Reza Vaziri, Anoush Poursartip, The University of British Columbia, Canada  
*A hierarchical finite element approach to modelling process-induced deformations in composite structures*

09.35 – 10.00 Simon Jones, Kevin Potter, Michael Wisnom, University of Bristol, UK  
*Measurements of frictional processes in the processing of advanced composites and their importance in modelling cure and residual stresses / distortions*

10.00 – 10.25 Gabriel Dunkel, Laurent Humbert, John Botsis, École polytechnique fédérale de Lausanne (EPFL), Switzerland  
*Identification of interfacial properties using FBG sensors in a fibre pull-out test*

**10.25 – 11.10 COFFEE BREAK + POSTER SESSION 1**

Joan A. Mayugo, Pere Maimí, Pedro P. Camanho, Carlos G. Dávila, Universitat de Girona, Spain/ Universidade do Porto, Portugal/ NASA Langley Research Center, USA  
*A micromechanics-based periodic damage model for laminated composites*

Jin-Hwan Kim, Fabrice Pierron, Kashif Syed-Muhamad, Michael R. Wisnom, Michel Grédiac, Evelyne Toussaint, ENSAM and IFMA, France/ University of Bristol, UK  
*Identification of the local stiffness reduction of a damaged composite plate using the virtual fields method*

Daniel Trias, Joan A. Mayugo, Albert Turon, Norbert Blanco, Josep Costa, Universitat de Girona, Spain  
*Simulation of the effects of residual stresses on matrix cracking probability of unidirectional lamina of carbon reinforced epoxies*

Carla McGregor, Reza Vaziri, Anoush Poursartip, The University of British Columbia, Canada  
*Simulation of progressive damage development in braided composite tubes undergoing axial crushing*

Hugo Faria, Marcelo F. S. F. de Moura, Rui M. Guedes, Instituto de Engenharia Mecânica e Gestão Industrial and Universidade do Porto, Portugal  
*2D numerical simulation of GRP pipes' failure under ring load condition*

Fangming Zhao, Frank Jones, The University of Sheffield, UK  
*Identifying the effect of shear residual stresses on stress transfer in single short fibre composites using photoelasticity*

Giangiaco Minak, Andrea Zucchelli, Facoltà di Ingegneria Università degli Studi di Bologna, Italy  
*Residual strength of laminated graphite-epoxy composite circular plates damaged by transversal load*

Alain Prenleloup, Thomas Gmür, Philippe Bonhôte, John Botsis, École polytechnique fédérale de Lausanne (EPFL), Switzerland  
*Experimental and numerical strength analysis of mixed metal-composite crimped or adhesively bonded joints*

Danilo Bardaro, Orazio Manni, Paolo Corvaglia, Rossella Modarelli, Teresa Primo, CETMA Consortium, Italy  
*Experimental study and numerical modelling of solid and hollow FRP-confined concrete members*

**SESSION 2 FRACTURE I**

Chair: Prof. Ivana Partridge, Cranfield University, United Kingdom

- 11.10 - 11.35 Stefanie Feih, R. Sweeting, Z. Mathys, A.G. Gibson, A.P. Mouritz, Royal Melbourne Institute of Technology, CRC-ACS and Platform Sciences Laboratory, Australia/ University of Newcastle-upon-Tyne, UK  
*Failure of load-carrying polymer composites in fire*
- 11.35 - 12.00 Silvestre T. Pinho, Paul Robinson, Lorenzo Iannucci, Imperial College, UK  
*Measuring the fracture toughness for different failure modes in laminated composites*
- 12.00 - 12.25 Josep Costa, Jordi Renart, E. González, Albert Turon, S. Lazcano, Universitat de Girona and AIRBUS España, Spain  
*Influence of the geometry of the specimen on the occurrence of delamination during adhesive joint testing*
- 12.25 - 12.50 Rosa Marat-Mendes, Manuel de Freitas, Escola Superior de Tecnologia de Setúbal and Instituto Superior Técnico, Portugal  
*Experimental and numerical studies of mode I, II, III and mixed-mode I-II energy release rate in laminates*

**12.50 - 14.00 LUNCH****SESSION 3 STRUCTURES**

Chair: Dr. Carlos G. Dávila, NASA Langley Research Center, USA

- 14.00 - 14.50 **INVITED LECTURE 1**  
Didier Baptiste, ENSAM École nationale supérieure d'arts et métiers, France  
*Multiscale analysis of the strain rate effect on the behaviour and damage of composite materials*
- 14.50 - 15.15 Jérôme Molimard, Alain Vautrin, Jean-Marc Béraud, P. Henrat, École Nationale Supérieure des Mines de Saint-Étienne and Hexcel Reinforcements, France  
*Contribution to composite 'T' beam design in industrial environment by using the grid technique*
- 15.15 - 15.40 Nicolas Baral, P. Davies, D. Cartié, C. Baley, Trimaran GROUPAMA, IFREMER and Université de Bretagne Sud, France/ Cranfield University, UK  
*Optimization of composite materials and structures for racing multi-hull yachts*

**15.40 - 16.25 COFFEE BREAK + POSTER SESSION 2**

Kim Branner, Risø National Laboratory, Denmark  
*Static testing of cross-section of wind turbine blade*

Daniel P. N. Vlasveld, Stephen J. Picken, Harald E. N. Bersee, Delft University of Technology, Netherlands

*Continuous fibre composites with a nanocomposite matrix*

Christian Lundsgaard-Larsen, Rasmus C. Østergaard, Bent F. Sørensen, Christian Berggreen, Technical University of Denmark and Risø National Laboratory, Denmark

*Fracture toughness of skin/core interfaces in sandwich materials under mixed mode loadings*

Norbert Blanco, Josep Costa, E. Kristofer Gamstedt, Leif E. Asp, University of Girona, Spain/Royal Institute of Technology and SICOMP AB, Sweden

*Experimental analysis of the variable mixed-mode fatigue delamination in a carbon fibre-epoxy laminate*

Robin Olsson, Imperial College, UK

*Initial study of impact damage stiffness by full field optical method*

Leonardo Pagnotta, Giambattista Stigliano, University of Calabria, Italy

*Elastic characterization of anisotropic plates by genetic algorithms and interferometric techniques*

Francisco J. Bernardo, Abílio M. Jesus, José J. Morais, Victor M. Filipe, João M. Barroso, Universidade de Trás-os-Montes e Alto Douro, Portugal

*Identification of foundation modulus of bolted timber joints using full-field displacement measurements*

Filipe Teixeira-Dias, Joaquim P. Cruz, António A. Campos, João A. Oliveira, Universidade de Aveiro, Portugal

*Variable-step feedback damping optimisation of the viscoplastic constitutive modelling of metal matrix composites*

#### **SESSION 4 FABRIC COMPOSITES**

Chair: Prof. Stepan V. Lomov, Katholieke Universiteit Leuven, Belgium

16.25 - 16.50 Roberts Joffe, David Mattsson, Luleå University of Technology, Sweden

*Methodology for characterization of internal structure of NCF composite and its influence on mechanical properties*

16.50 - 17.15 Fredrik Edgren, Leif E. Asp, SICOMP AB, Sweden

*Determination of strength parameters for NCF composites*

17.15 - 17.40 Giuseppe Dell'Anno, Denis D Cartié, Giuliano Allegri, Ivana K Partridge, Amir Rezai, Cranfield University and BAE Systems, Advanced Technology Centre, UK

*Exploring mechanical property balance in tufted carbon fabric/epoxy composites*

17.40 - 18.05 Yuichiro Aoki, Yosuke Nagao, Takashi Ishikawa, Fumihito Takeda, Japan Aerospace Exploration Agency and Mitsubishi Heavy Industries, LTD, Japan

*Experimental evaluation and consideration of numerical method of zanchor CFRP laminates*

**18.30 Reception at Círculo Universitário**

TUESDAY, 11<sup>TH</sup> APRIL**SESSION 5 FATIGUE AND DURABILITY**Chair: Prof. Manuel de Freitas, Technical University of Lisbon,  
Portugal08.30 - 09.20 **INVITED LECTURE 2**Paul Robinson, Department of Aeronautics, Imperial College  
London, UK*Delamination Research: Progress in the last two decades and  
the challenges ahead*09.20 - 09.45 Gregory A. Schoeppner, Kishore V. Pochiraju, G. P. Tandon,  
Air Force Research Laboratory, Steven's Institute of  
Technology and University of Dayton Research Institute, USA  
*Long-term aging and durability of high temperature polymer  
composites*09.45 - 10.10 Masamichi Kawai, M. Koizumi, University of Tsukuba, Japan  
*Nonlinear constant fatigue life diagrams for CFRP laminates*10.10 - 10.35 Elena Correa, E. K. Gamstedt, F. París, Universidad de Sevilla,  
Spain/ KTH Solid Mechanics, Sweden  
*Fibre-matrix debonding in transverse cyclic loading of  
unidirectional composite plies***10.35 - 11.15 COFFEE BREAK + POSTER SESSION 3**Rim Zouari, Abdelwahed Ben Hamida, H el ene Dumontet, Universit e Pierre et Marie Curie,  
France*A micromechanical modelling for prediction of behaviour and damage of polydisperse  
syntactic foams*Janice M. Dulieu-Barton, T. R. Emery, P.R. Cunningham, University of Southampton, UK  
*Assessing fatigue damage in GRP components using infrared techniques*Jos e T. San-Jos e, Pere Roca, Pilar Prendes, Juan M. Mieres, Fundaci n Labein, Universidad  
Polit cnica de Catalu na, GAIRESA and NECSO, Spain  
*Evaluation of the anchorage behaviour of the FRP wet lay-up laminates applied to concrete  
substrates*Cl udio S. Lopes, Pedro P. Camanho, Zafer G rdal, Universidade do Porto, Portugal and Delft  
University of Technology  
*Failure Analysis of Tow-Placed, Variable-Stiffness Composite Panels*Rui Ant nio S. Moreira, J. Dias Rodrigues, Universidade de Aveiro and Universidade do Porto,  
Portugal  
*A plate finite element with through-thickness stiffness for sandwich structures modelling*Maria Antonietta Aiello, Paolo Corvaglia, Adolfo Fortunato, Orazio Manni, Federica Pedone,  
University of Lecce, Consorzio CETMA and Politecnico di Milano, Italy  
*Testing and modelling of the bond behaviour between CFRP sheet and curved masonry  
substrate*

Josep Vicens, Norbert Blanco, Benigne Corbella, Josep Costa, I. Baraibar, F. Cabrerizo, J.M. Pintado, A. Fernández-Canteli, J. Viña, A. Argüelles, Universitat de Girona, Instituto Nacional de Técnica Aeroespacial and Universidad de Oviedo, Spain  
*New mechanical fixtures for load introduction in DCB tests: design and performance*

Joaquim P. Cruz, J.A. Oliveira, António A. Campos, Filipe Teixeira-Dias, Universidade de Aveiro, Portugal  
*Two-scale modelling of the thermomechanical behaviour of metal matrix composites*

**SESSION 6      DAMAGE MODELS I**

Chair: Dr. Christophe Cluzel, Laboratoire de Mécanique et Technologie, France

11.15 - 11.40 Janis Varna, Johannes Eitzenberger, Modris Megnis, Luleå University of Technology, Sweden/ OSTBY AB, Latvia  
*Damage evolution in composite laminates with matrix cracks and fiber breaks*

11.40 - 12.05 Amir Tabaković, Ciaran McNally, L. G. Sorelli, Amanda Gibney, Michael D. Gilchrist, University College Dublin, Ireland  
*Development of a combined micromechanics & damage mechanics model for the design of asphalt pavements*

12.05 - 12.30 Ireneusz Lapczyk, Juan Hurtado, Abaqus, Inc., USA  
*Progressive damage modeling in fiber-reinforced materials*

12.30 - 12.55 Jens Wiegand, Ben Elliott, Nik Petrinic, University of Oxford, UK  
*Physically based failure criteria for prediction of damage evolution in composite materials subjected to impact loading*

**12.55 - 14.00      LUNCH****SESSION 7      FULL FIELD TECHNIQUES**

Chair: Dr. William Broughton, National Physics Laboratory, United Kingdom

14.00 - 14.25 Fangming Zhao, Frank Jones, The University of Sheffield, UK  
*Photoelastic characterisation of the stress transfer at fibre-break in model composites*

14.25 - 14.50 Michel R. C. Fouinneteau, Anthony K. Pickett, Ralf Lichtenberger, Cranfield University, UK/ LIMESS Messtechnik & Software GmbH, Germany  
*Identification of elastic and damage parameters using digital image correlation technique for braid reinforced composites*

14.50 - 15.15 Marie-Pierre Moutrille, Katell Derrien, Didier Baptiste, Michel Grédiac, Xavier Balandraud, LIM - UMR CNRS and French Institute for Advanced Mechanics, France  
*Trough-thickness strain field measurement in a composite/aluminium adhesive joint*

15.15 – 15.40 Fabrice Pierron, Ben Green, Michael R. Wisnom, ENSAM –  
LMPF, France/ Bristol University, UK  
*Optical full-field assessment of the damage progression in a  
composite open-hole tension test*

**15.40 – 16.20 COFFEE BREAK + POSTER SESSION 4**

Yutaka Iwahori, Takashi Ishikawa, Naoyuki Watanabe, Japan Aerospace Exploration Agency  
and Tokyo Metropolitan University, Japan  
*Experimental evaluation of interlaminar strength properties under out-of-plane load for  
Kevlar® stitched CFRP laminates*

António A. Campos, Joaquim P. Cruz, João A. Oliveira, Filipe Teixeira-Dias, Universidade de  
Aveiro, Portugal  
*The effect of fibre reinforcement on the thermally induced residual stress fields of metal  
matrix composites*

Yves Perrot, Peter Davies, Christophe Baley, Grégoire Dolto, Université de Bretagne Sud,  
IFREMER and Fédération des Industries Nautiques, France  
*Characterization of mechanical properties of glass/polyester composites for boat  
construction*

Silvio Pappadà, Rocco Rametta, Maria Antonietta Aiello, Alfonso Maffezzoli, Consorzio  
CETMA and University of Lecce, Italy  
*Study of a composite-to-metal tubular joint*

Corine Florens, Etienne Balmès, Franck Cléro, Ecole Centrale Paris and DDSS/CAV, France  
*Estimation of honeycomb sandwich properties through numerical homogenization*

Hugo Faria, Rui M. Guedes, António T. Marques, Instituto de Engenharia Mecânica e Gestão  
Industrial and Universidade do Porto, Portugal  
*Durability of GFRP pipes under ring-deflection conditions*

M. Cristina S. Ribeiro, Paulo J. R. O. Nóvoa, António T. Marques, António J. M. Ferreira,  
Instituto de Engenharia Mecânica e Gestão Industrial and Universidade do Porto, Portugal  
*Mechanical behaviour of lightweight wood fibre-modified polymer concrete*

**SESSION 8 TESTING**

Chair: Prof. Josep Costa, University of Girona, Spain

- 16.20 - 16.45 Dmitry Ivanov, Stepan Lomov, Ignaas Verpoest, Alexander Zisman, Katholieke Universiteit Leuven, Belgium  
*Noise reduction of strain mapping data and identification of damage initiation of carbon-epoxy triaxial braided composite*
- 16.45 - 17.10 Jean-Denis Mathias, Xavier Balandraud, Michel Grédiac, French Institute for Advanced Mechanics and Blaise Pascal University, France  
*Experimental study of composite patches subjected to a thermal loading*
- 17.10 - 17.35 Daniel Hartung, M. Kintscher, L. Kärger, A. Wetzel, DLR Institute of Composite Structures and Adaptive Systems, Germany  
*Stiffness and failure behaviour of folded sandwich cores under combined transverse shear and compression*
- 17.35 - 18.00 Find Moelholt Jensen, Paul M. Weaver, Luca S. Cecchini, Henrik Stang, Risoe National Laboratory and Technical University of Denmark, Denmark/ University of Bristol, UK  
*On aspects of non-linear bending behaviour of a wind-turbine blade under full-scale testing*
- 18.30 Conference Dinner at the Cellars of Port Wine**

WEDNESDAY, 12<sup>TH</sup> APRIL**SESSION 9 SCALE EFFECTS AND JOINTS**

Chair: Prof. Michael Wisnom, University of Bristol, United Kingdom

08.30 - 09.20 **INVITED LECTURE 3**

David Mollenhauer, Air Force Research Laboratory, Dayton, OH, USA

*Interlaminar Deformation Along the Cylindrical Surface of a Hole in Laminated Composites*

09.20 - 09.45

Lars Christian T. Overgaard, Pedro P. Camanho, Erik Lund, Aalborg University, Denmark/ Universidade do Porto, Portugal

*Structural response analyses of Vestas V52 wind turbine blade*

09.45 - 10.10

Raymond Esnault, Serge Maison-Le Poec, EADS Corporate Research Centre, France

*Experimental identification of the behaviour of thick composites in biaxial and bearing tests*

10.10 - 10.35

William Broughton, L. Crocker, M. Gower, R. Shaw, National Physical Laboratory, UK

*Validation of FEA predictions of bonded and bolted T-joints***10.35 - 11.15 COFFEE BREAK + POSTER SESSION 5**Nuno Dourado, S. Morel, M.F.S.F. de Moura, G. Valentin, J. Morais, Universidade de Trás-os-Montes e Alto Douro and Universidade do Porto/ LRBB, France  
*Influence of the specimen size on the R-curve behaviour in wood*Faustino Mujika, Neftalí Carbajal, Jesús María Romera, Ainhoa Arrese, Polytechnical University College, Spain  
*Thermal stresses in unsymmetric cross-ply composite beams*Arlindo Silva, João Lopes, Pedro Almeida, Luis Reis, Marco Leite, Instituto Superior Técnico, Instituto Politécnico de Setúbal and Instituto Politécnico de Tomar, Portugal  
*Experimental testing of a natural cork-based composite – shear behaviour comparison with other materials for sandwich applications*João A. Oliveira, Joaquim P. Cruz, António A. Campos, Filipe Teixeira-Dias, Universidade de Aveiro, Portugal  
*Modelling the elastic behaviour of composite materials with asymptotic expansion homogenisation*Feng H. Wang, Helmuth Toftegaard, Peter V Hendriksen, Bent F Sørensen, Northwestern Polytechnical University, Xi'an, P R China/ Riso National Laboratory, Denmark  
*Tensile mechanical properties of bi-layer structure for solid oxide fuel cells*

Mehdi Haghshenas, Reza Vaziri, Anoush Poursartip, The University of British Columbia, Canada

*Shear flow simulation of fibre-reinforced thermoset composites during the early stages of processing*

Kevin Potter, University of Bristol, UK

*Measurements of the snap-through behaviour and snap-through fatigue performance of bistable unsymmetric composite structures*

**SESSION 10 NOVEL METHODS AND RESIDUAL STRESSES II**

Chair: Prof. John Botsis, Swiss Federal Institute of Technology, Switzerland

11.15 - 11.40 Marco Matter, Thomas Gmür, Joël Cugnoni, Alain Schorderet, École polytechnique fédérale de Lausanne (EPFL), Switzerland  
*Modal identification of the elastic properties in composite sandwich structures*

11.40 - 12.05 Antonio Claret Palerosi, Sergio Frascino Muller de Almeida, Instituto Nacional de Pesquisas Espaciais and Instituto Tecnológico de Aeronáutica, Brasil  
*Experimental and numerical analyses of non-symmetric composite laminates curvatures*

12.05 - 12.30 Kevin Potter, Chris Setchell, Imetrum Ltd. Bristol. UK  
*Point to point non-contact video extensometry for composite materials and structures - a comparison with full-field methods*

12.30 - 12.55 Falk Hähnel, Klaus Wolf, Technische Universität Dresden, Germany  
*Evaluation of the material properties of resin-impregnated NOMEX® paper as basis for the simulation of the impact behaviour of honeycomb sandwich*

**12.55 - 14.00 LUNCH**

**SESSION 11 FRACTURE II**

Chair: Prof. Janis Varna, Lulea University of Technology,  
Sweden

14.00 - 14.25 Carlos G. Dávila, Albert Turon, Pedro P. Camanho, Universitat de Girona, Spain/ Universidade do Porto, Portugal/ NASA Langley Research Center, USA  
*Decohesion elements for shell analysis*

14.25 - 14.50 Larissa Sorensen, T. Gmür, J. Botsis, École polytechnique fédérale de Lausanne (EPFL), Switzerland  
*Delamination propagation measurement in AS4/PPS using long gauge-length FBG sensors*

14.50 - 15.15 Bent F. Sørensen, Torben K. Jacobsen, Risø National Laboratory and LM Glasfiber A/S, Denmark  
*A j integral approach for the determination of mixed mode cohesive laws*

15.15 - 15.40 Albert Turon, Josep Costa, Pedro P. Camanho, Carlos G. Dávila, Universitat de Girona, Spain/ Universidade do Porto, Portugal/ NASA Langley Research Center, USA  
*Simulation of delamination under high cycle fatigue in composite materials*

**15.40 - 16.00 COFFEE BREAK****SESSION 12 DAMAGE MODELS II**

Chair: Dr. Silvestre T. Pinho, Imperial College, United Kingdom

16.00 - 16.25 David Vernet, Christophe Cluzel, Olivier Allix, LMT Cachan, France  
*Modeling and identification of adhesive behaviour for marine composite application: a dedicated approach*

16.25 - 16.50 Nathalie Pentecôte, Alastair F. Johnson, German Aerospace Center (DLR), Germany  
*Determination of composites damage properties for impact modelling*

16.50 - 17.15 George C. Papanicolaou, N.K. Anifantis, Th.V.Kosmidou, University of Patras, Greece  
*Numerical and analytical investigation of interphasial stress and strain fields in particulates by means of the hybrid interphase concept*

**17.15 Conference Closes**