

**IGF Video recordings**

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**2nd IJFatigue & FFEMS  
Joint Workshop**



# Workshop

## Second IJFatigue & FFEMS Joint

April 15-17, 2013 – Malaga, Spain



**UNIVERSITY OF MALAGA  
(SPAIN)**



Second IJFatigue & FFEMS  
Joint Workshop

### **Characterisation of Crack Tip Stress Fields**

Malaga (Spain)  
[www.malagaturismo.com](http://www.malagaturismo.com)  
15-17 April 2013

#### **Background**

Single parameter characterisation of the crack/notch tip field using fracture mechanics parameters like  $K$ ,  $J$  or  $CTOD$  has been extremely powerful in advancing predictive technologies for critical or sub-critical crack growth. It has also become clear over the last 40 years that single parameter approaches have limitations particularly in dealing with crack growth phenomena arising from crack tip shielding, often resulting from the plastic enclave surrounding a crack. Influences of this enclave on the crack tip stress field ahead of the crack are maximised during cyclic loading. In the case of a parameter like stress intensity factor,  $K$ , which characterises the crack tip field via an elastic approximation, it is not surprising that any set of plasticity-induced circumstances which perturb the size of the plastic enclave and its associated strain field lead to predictive difficulties. Over the last 30 years, notable areas of activity related to such difficulties include short cracks, plasticity-induced closure, variable amplitude and multiaxial loading and notch effects.

Thus an increasing number of authors and research groups, particularly in Europe, are working on the topic of characterisation of crack tip stresses using more than one fracture mechanics parameter. Attention has been directed, for example, towards incorporating the  $T$ -stress into life prediction methods. The  $T$ -stress is the second term in a Williams-type expansion of the crack tip stresses and it affects the extent and shape of crack tip plasticity. It would therefore be expected to be influential in plasticity-related crack growth phenomena and a number of publications have demonstrated this to be true. The situation is further complicated where a crack experiences multiaxial loading and Modes II and III fracture mechanics parameters are also necessary. Other research groups have focussed attention on incorporating additional elastic fracture mechanics parameters into crack/notch tip characterisation, which describe the effects of an Eshelby-type 'plastic inclusion' on an elastic stress field. The first highly successful workshop on this topic was held in Forni di Sopra, Udine, Italy in March 2011 and the proceedings were published as a joint-Special Issue of IJFatigue and FFEMS.

The organisers of this second workshop believe that it offers a unique opportunity for invited scientists and engineers from the fatigue and fracture research community to present and exchange new data and cutting edge ideas related to the characterisation of crack/notch tip stress fields in an informal, interactive format at an excellent venue in a beautifully scenic area.

## VIDEO-PRESENTATIONS

Presentation title	Authors	DOI
Subsurface metals fatigue cracking without and with crack tip	A. Shanyavskiy	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.1">https://doi.org/10.53255/IGFTUBE.WS2013.1</a>
Application of thermoelastic stress analysis for the experimental evaluation of the effective stress intensity factor	F.A. Díaz, E.A. Patterson, J.R. Yates	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.2">https://doi.org/10.53255/IGFTUBE.WS2013.2</a>
Characterisation of crack tip fields under non uniform fatigue loading	D. Nowell, M.E. Kartal, P.F.P. de Matos	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.3">https://doi.org/10.53255/IGFTUBE.WS2013.3</a>
Combining experimental and numerical analysis to estimate stress fields along the surface crack front	A.S. Chernyatin, Yu. G. Matvienko, I.A. Razumovsky	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.4">https://doi.org/10.53255/IGFTUBE.WS2013.4</a>
Crack propagation mechanism and life prediction for very high cycle fatigue of a structural steel in different environmental medias	G. Qian, C. Zhou, Y. Hong	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.5">https://doi.org/10.53255/IGFTUBE.WS2013.5</a>
Effect of crack propagation on crack tip fields	F.V. Antunes, A.G. Chegini, L.M. Correia, A.L. Ramalho	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.6">https://doi.org/10.53255/IGFTUBE.WS2013.6</a>
Extension of the CJP model to mixed mode I and mode II	C.J. Christopher, G. Labovicute, M. N. James, E.A. Patterson	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.7">https://doi.org/10.53255/IGFTUBE.WS2013.7</a>
Gradient enriched linear elastic crack tip stresses to estimate the static strength of cracked engineering ceramics	H. Askes, L. Susmel	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.8">https://doi.org/10.53255/IGFTUBE.WS2013.8</a>
Growth of shear mode fatigue cracks from closure- free precracks	J. Pokluda, T. Vojtek, A. Hohenwarter, R. Pippan	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.9">https://doi.org/10.53255/IGFTUBE.WS2013.9</a>
High magnification crack tip field characterisation under biaxial conditions	B. Moreno, P. Lopez-Crespo, J. Zapatero	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.10">https://doi.org/10.53255/IGFTUBE.WS2013.10</a>
In situ 3D characterization of fatigue cracks displacement fields	J. Lachambre, J. Y. Buffiere, J. Rethore, A. Weck	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.11">https://doi.org/10.53255/IGFTUBE.WS2013.11</a>

Presentation title	Authors	DOI
Initiation and growth behavior of very-long microstructurally short fatigue cracks	P. Lorenzino, A. Navarro	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.12">https://doi.org/10.53255/IGFTUBE.WS2013.12</a>
Is notch sensitivity a stress analysis problem?	J.T.P. de Castro, M.A. Meggiolaro	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.13">https://doi.org/10.53255/IGFTUBE.WS2013.13</a>
Multi parameter crack tip stress state description for estimation of fracture process zone extent in silicate composite WST specimens	V. Vesely, J. Sobek, L. Sestakova, P. Frantik, S. Seiti	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.14">https://doi.org/10.53255/IGFTUBE.WS2013.14</a>
Near tip strain evolution under cyclic loading	J. Tong, Y.W. Lu, B. Lin, Y.H. Tai, J.R. Yates	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.15">https://doi.org/10.53255/IGFTUBE.WS2013.15</a>
On a kinked crack model to describe the influence of material microstructure on fatigue crack growth	A. Spagnoli, A. Carpinteri, S. Vantadori	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.16">https://doi.org/10.53255/IGFTUBE.WS2013.16</a>
On numerical integration for effective stress assessment at notches	E. Maggiolini, P. Livieri, R. Tovo	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.17">https://doi.org/10.53255/IGFTUBE.WS2013.17</a>
Pearlitic ductile cast iron damaging micromechanisms at crack tip	F. Iacoviello, V. Di Cocco, A. Rossi, M. Cavallini	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.18">https://doi.org/10.53255/IGFTUBE.WS2013.18</a>
Plastic zone evolution near a crack tip and its role in environmentally assisted cracking	J. Toribio, V. Kharin	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.19">https://doi.org/10.53255/IGFTUBE.WS2013.19</a>
Role of plasticity induced crack closure in fatigue crack growth	J. Toribio, V. Kharin	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.20">https://doi.org/10.53255/IGFTUBE.WS2013.20</a>
Sharp contact corners, fretting and cracks	D. A. Hills, R. C. Flicek, D. Dini	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.21">https://doi.org/10.53255/IGFTUBE.WS2013.21</a>
Study of overload effects in bainitic steel by synchrotron X-ray diffraction	P. Lopez-Crespo, P.J. Withers, J.R. Yates, A. Steuwer, T. Buslaps, Y.H. Tai	<a href="https://doi.org/10.53255/IGFTUBE.WS2013.22">https://doi.org/10.53255/IGFTUBE.WS2013.22</a>

