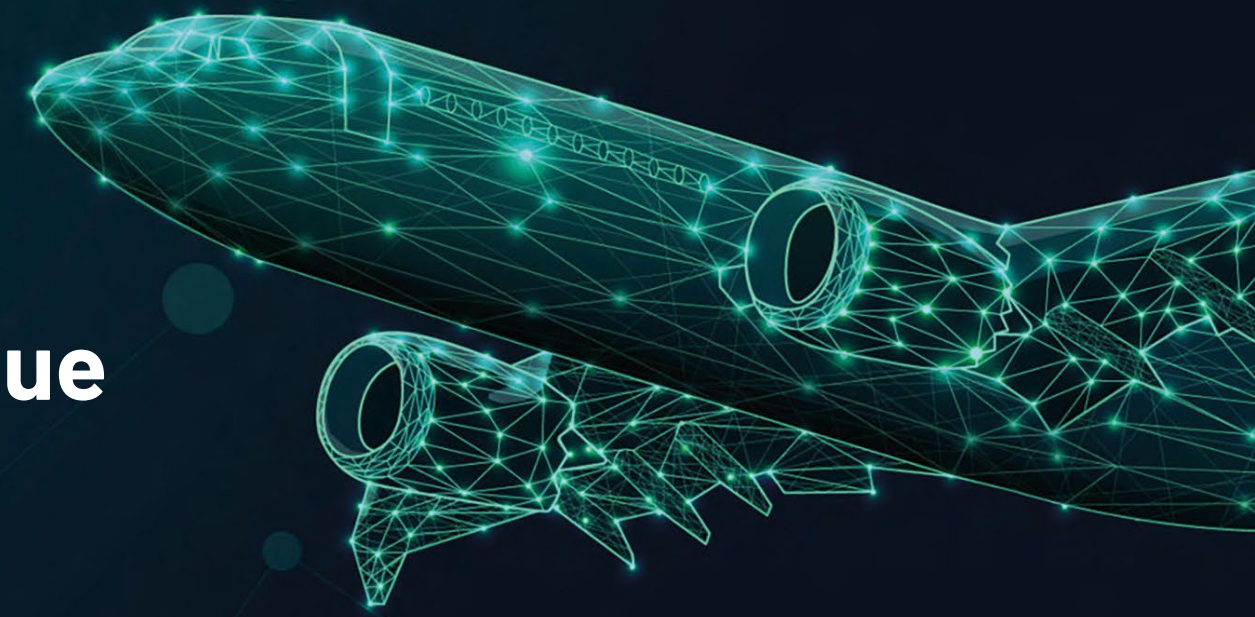


The Hygrothermal Effects on Mode I Fatigue delamination

F.M. Monticeli, J.A. Pascoe, Y. Mosleh



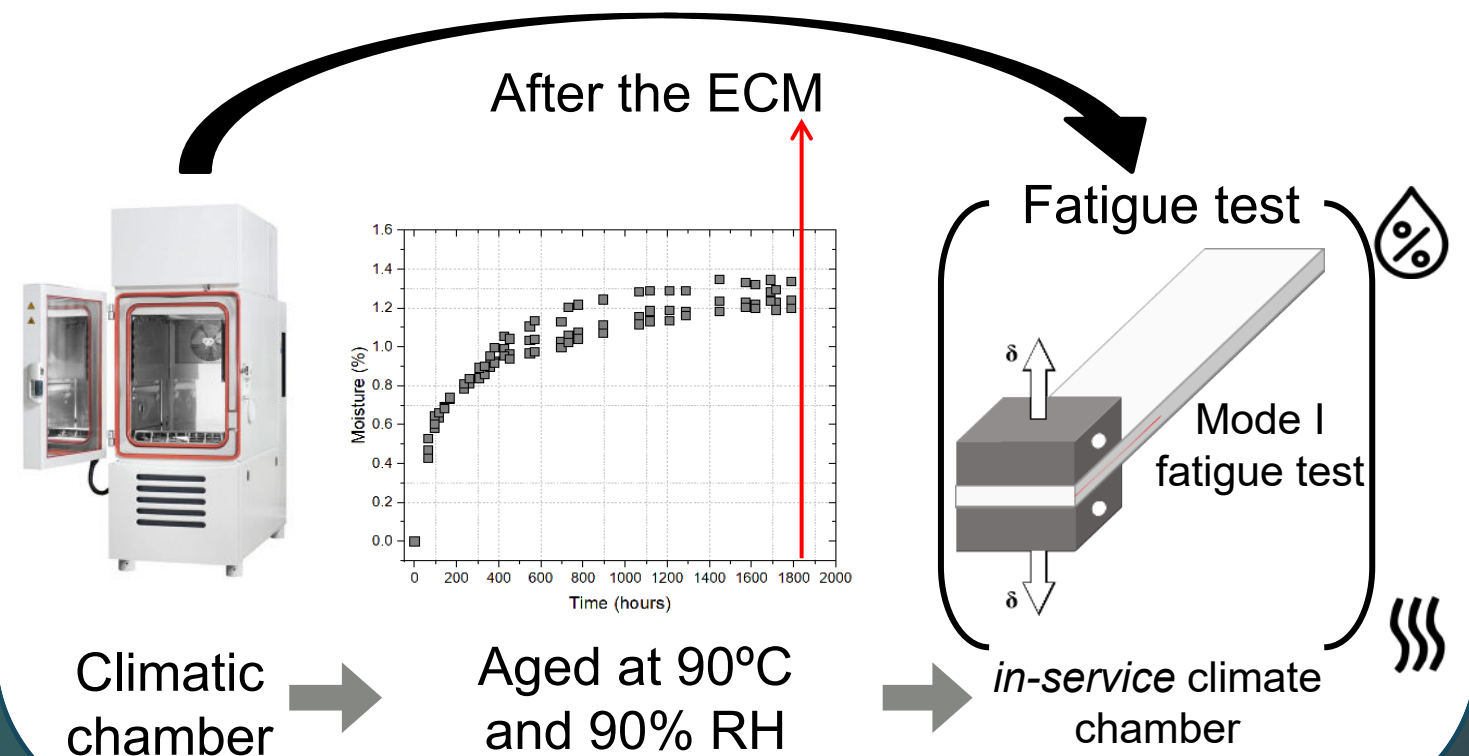
MOTIVATION & RESEARCH QUESTIONS

The mechanical properties of composites are affected by the humidity and temperature of the environment in which they are operating. Consequently, ageing within structural components results from the concomitant effects and interactions of environmental factors and mechanical loading.

What is the influence of hygrothermal degradation during crack propagation leading to delamination?

What is the impact of in-service hygrothermal conditions between out-of-service testing scenarios?

METHODOLOGY



RESULTS

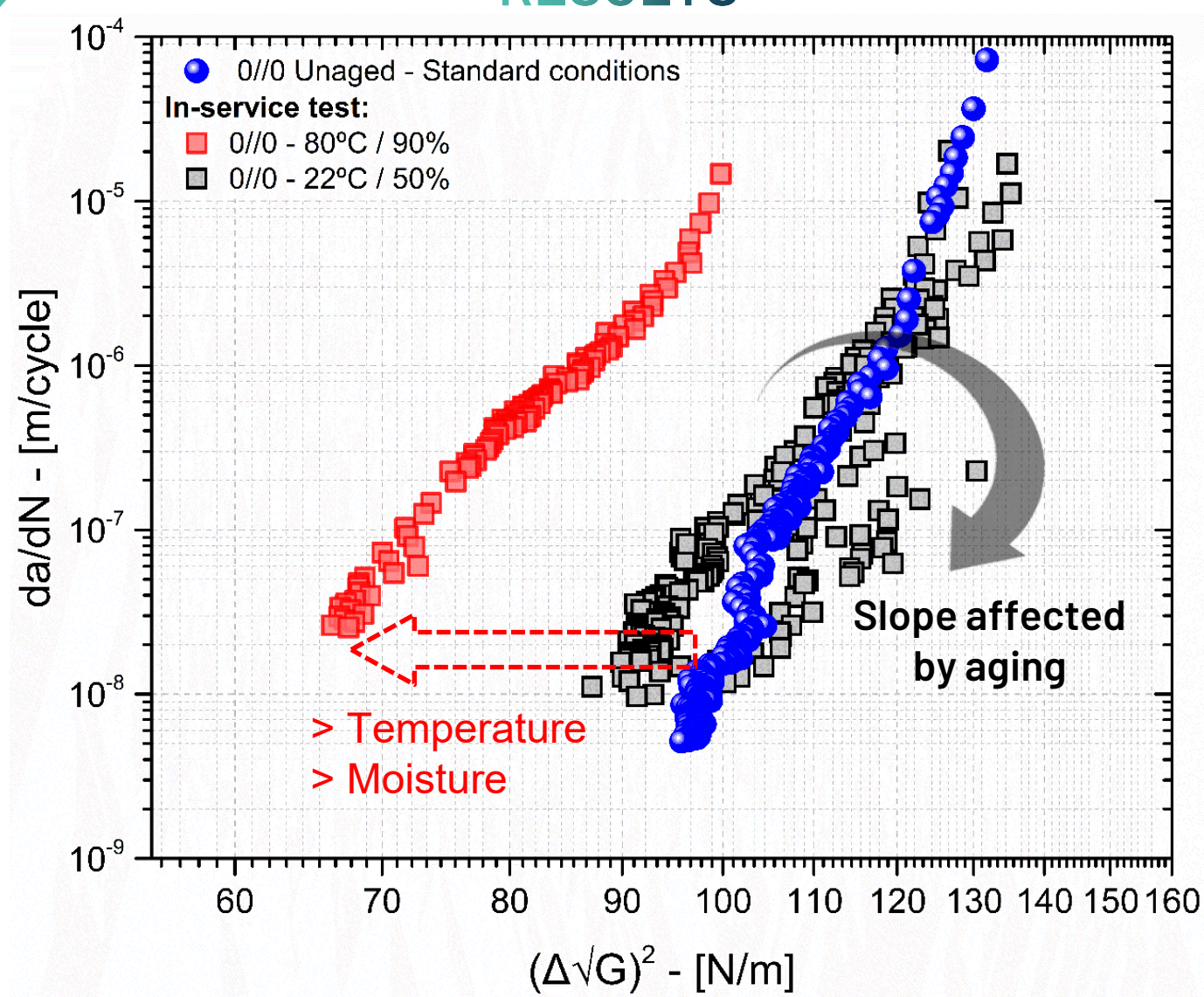


Figure 1. Hygrothermal effect on mode I Paris curve

PARIS MODEL CONSTANTS

Table 1. Constant of Paris model equation $(da/dN) = C (\Delta\sqrt{G})^\beta$

Conditions	C	β
Standard conditions (unaged)*	8.12×10^{-60}	25.69
22°C - 50% (aged, in-service)	1.17×10^{-44}	18.09
80°C - 90% (aged, in-service)	3.05×10^{-31}	12.70

CONCLUSIONS

- Hygrothermal ageing changes the slope of the curve, increasing the fracture toughness behavior.
- The prolonged exposure induced by hygrothermal degradation shifts the curve to a lower energy region. This results in a lower energy requirement for crack propagation.
- The use of the in-service climatic chamber during fatigue testing provides controlled operational settings, allowing a more accurate assessment of the hygrothermal effect.

CONSORTIUM



DISCOVER MORE

Corresponding author:

f.m.monticelli@tudelft.nl

D-STANDART project

contact@d-standart.eu

Coordinator:

Marco Nawijn, NLR



d-standart.eu



LinkedIn