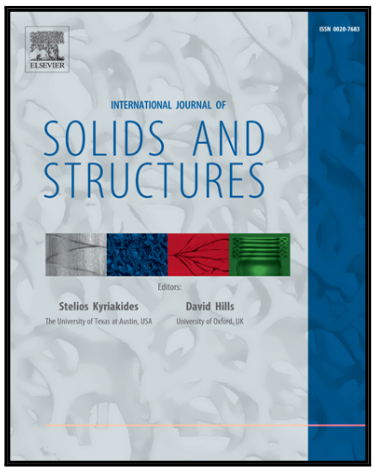

A Decomposition Method for Obtaining Global Mean Green Gperators of Gnclusions Patterns. Application to Parallel Infinite Beams in at Least Transversally Isotropic Media

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A DECOMPOSITION METHOD FOR OBTAINING GLOBAL MEAN GREEN OPERATORS OF INCLUSIONS PATTERNS. APPLICATION TO PARALLEL INFINITE BEAMS IN AT LEAST TRANSVERSALLY ISOTROPIC MEDIA

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Abstract - Modified Green operator integrals are essential quantities in inclusion or homogenization problems, from microstructural to macro-engineering scales, that concern estimating stress/strain fields or effective properties in heterogeneous materials and structures. In several successive papers, the author and co-workers have presented analytical forms of global mean such "Green operators" for various inclusion shapes and patterns obtained from fully taking benefit of the geometrical nature of the Radon transform and of its inversion formula. This paper presents and exemplifies a direct consequence of this RT/IRT method that simplifies further accessing to the mean operators of inclusion patterns: the mean pair interaction Green operator (mpiGo) between any two inclusions in infinite media can be formally decomposed into an algebraic average of the mean interior Green operators (miGos) over 4 domains that are i) the convex hull of the element pair and ii) the 3 sub-domains of it that are obtained in suppressing either one or both inclusions from the hull. In the simplest cases, this decomposition can allow to obtaining the global mean Green operators (gmGos) of many patterns from the knowledge of a single miGo type. So are here analytically provided the gmGos of planar n-alignments of parallel infinite beams with rectangular cross section (when embedded in media with properties that are at least isotropic transversally to the beams infinite direction) from having derived the miGo of such a "rectangular beam" with any cross section aspect ratio. This beam type has particular interest since its flat shape limit is a laminate layer which is conversely the compact limit of infinite such beam planar alignments. Next are shown extensions of this (D) method to patterns of other parallel polygonal beams and are explicated the solutions it provides for the gmGo of hollow (or double) beams and for laminate layers with aligned parallel holes (or second phase tubes). More specific applications are out of this scope.

Keywords *– Green operators, Eshelby tensors, inclusion interactions, infinite beams, properties of composites.*

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