

*2° Riunione Gruppo Materiali AIMETA (GMA08)
Genova, 29 febbraio - 1° marzo 2008*

Dynamics of piecewise homogeneous, periodic beams: filtering properties and localized modes

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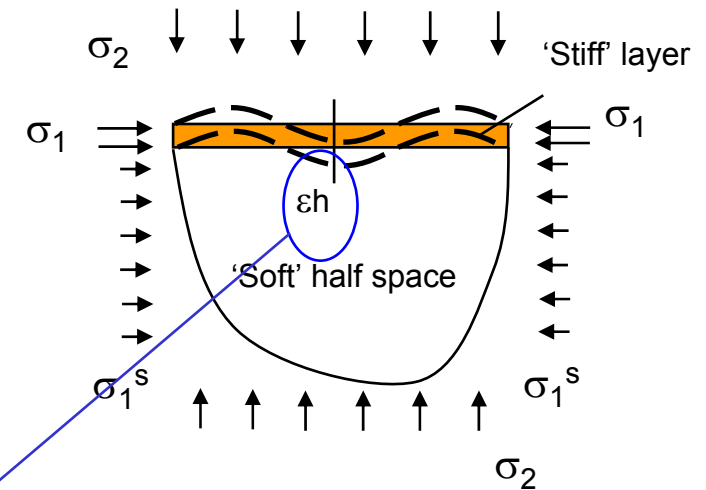
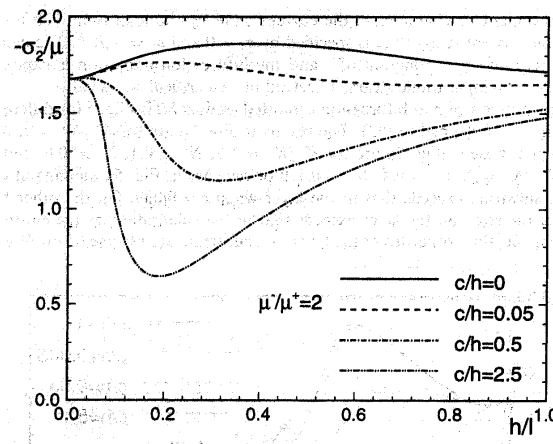
***University of Liverpool, U.K.*

Acknowledgement: MIUR PRIN 2005 “Resistenza e degrado di interfacce in materiali e sistemi strutturali”

SCIENTIFIC CONTEXT

- Mechanics of pre-stressed materials (failure, instability, dynamic response)

[Bigoni et al. 1997, Bigoni and Gei 2001, Gei et al. 2004, Gei 2007]



- Application of asymptotic methods to get simplified eqs valid under certain hypotheses: long-wavelength vibrations: expansion w.r.t. to ε

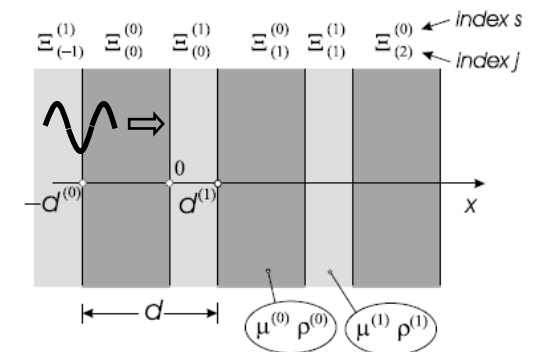
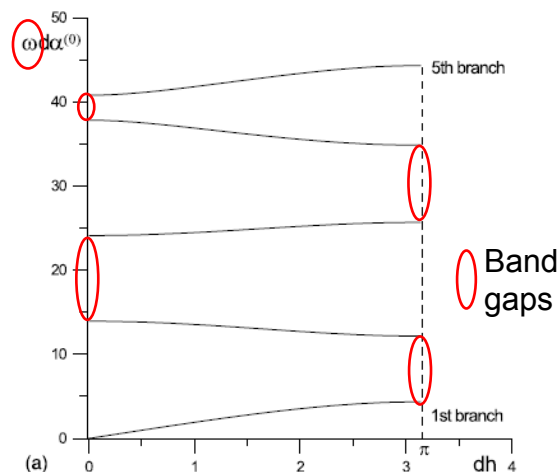
[Bigoni, Gei, Movchan, 2008]

$$\mathbf{v} = \varepsilon^{-2} \begin{pmatrix} v_1^{(I,0)} \\ 0 \end{pmatrix} + \varepsilon^{-1} \mathbf{v}^{(I,1)} + \varepsilon^{-4} \begin{pmatrix} 0 \\ v_2^{(II,0)} \end{pmatrix} + \varepsilon^{-3} \mathbf{v}^{(II,1)} + \varepsilon^{-2} \mathbf{v}^{(II,2)} + \varepsilon^{-1} \mathbf{v}^{(II,3)} + \mathbf{V},$$

Displacements in the layer

- Bloch-Floquet technique for periodic structures (in dynamics): evaluation of pass bands and band gaps

[Bigoni and Movchan 2002]

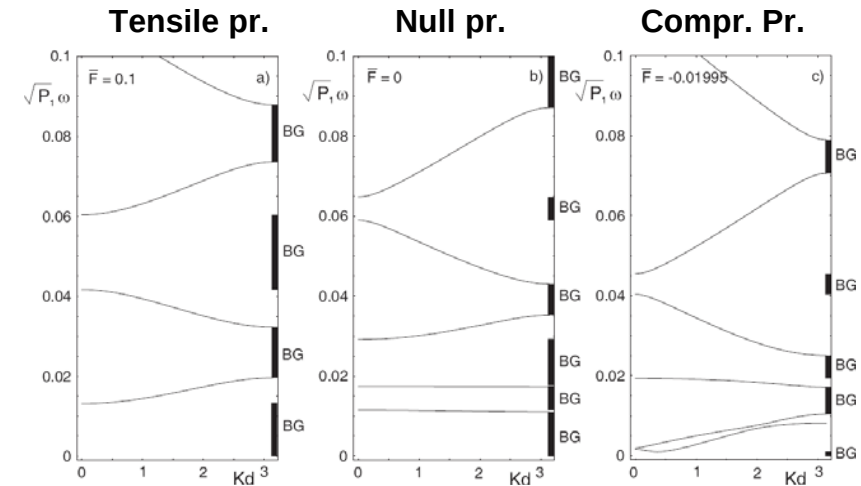
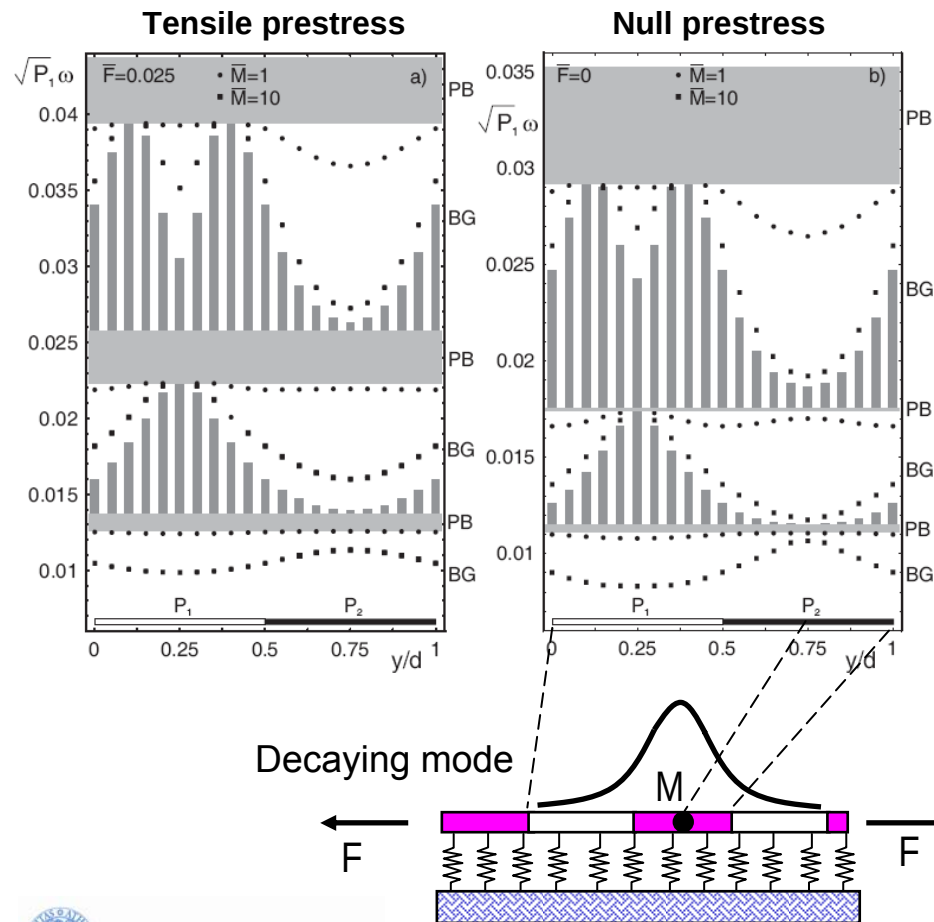


RESULTS

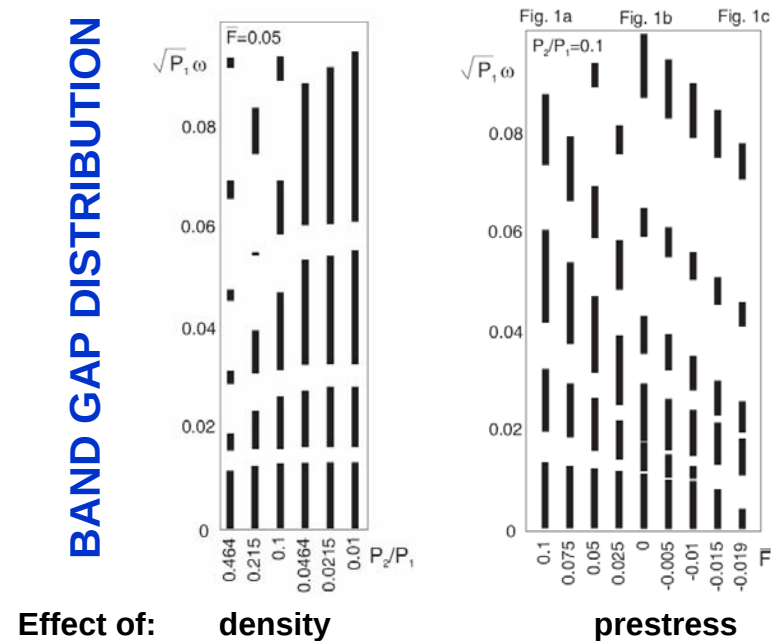
- Bigoni, Gei, Movchan (2008) *J. Mech. Phys. Solids*, in press
- Gei, Movchan, Bigoni (2008) submitted
- Gei (2008) in preparation

DISPERSION DIAGRAMS

LOCALIZED MODES

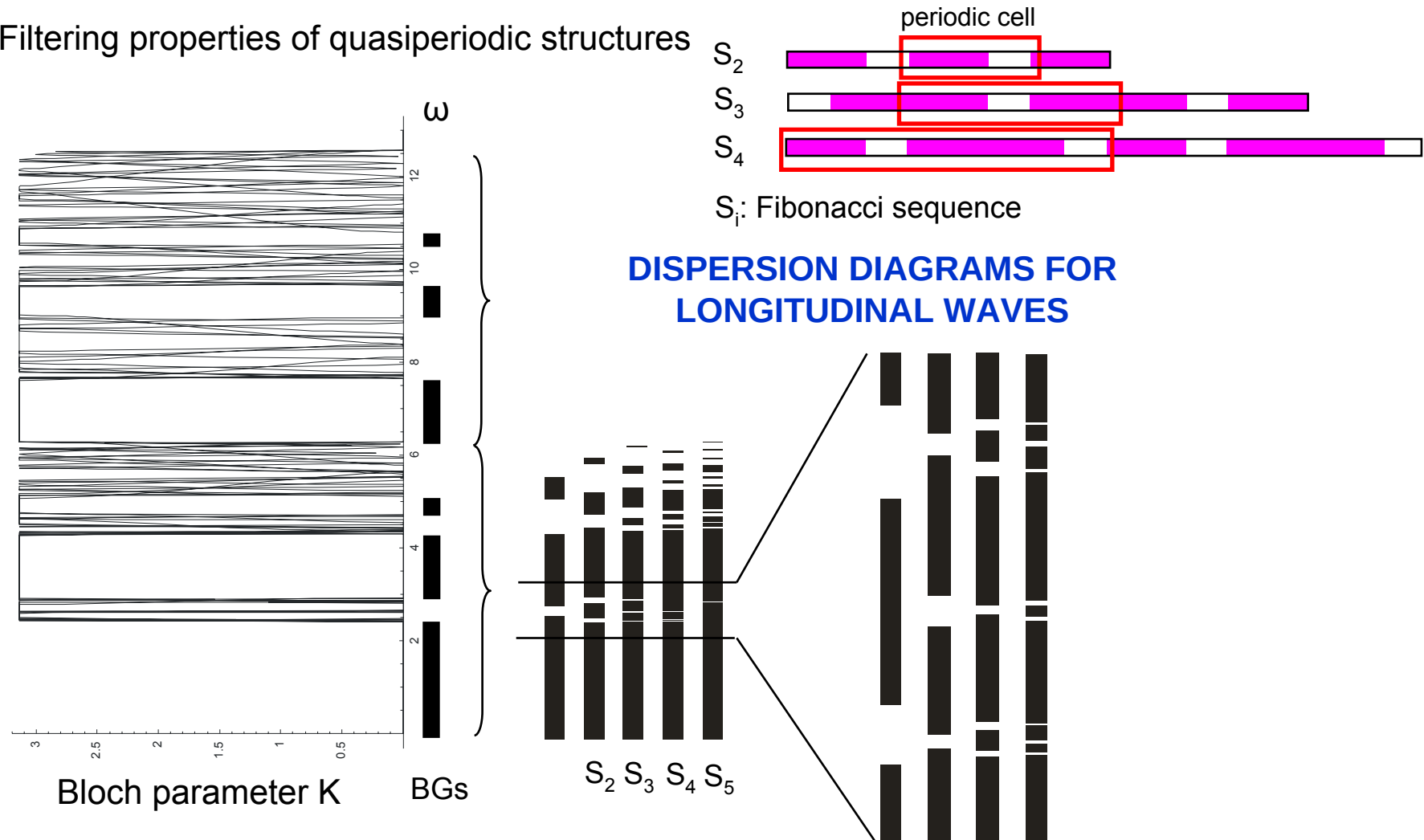


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ONGOING AND FUTURE WORK

- Filtering properties of quasiperiodic structures



- Applying the method of Green's function to obtain a general approach to 'defect modes'