# GROSS SCALE EFFECTS OF ATOMIC REARRANGEMENTS IN QUASICRYSTALS: WAVELET ANALYSIS

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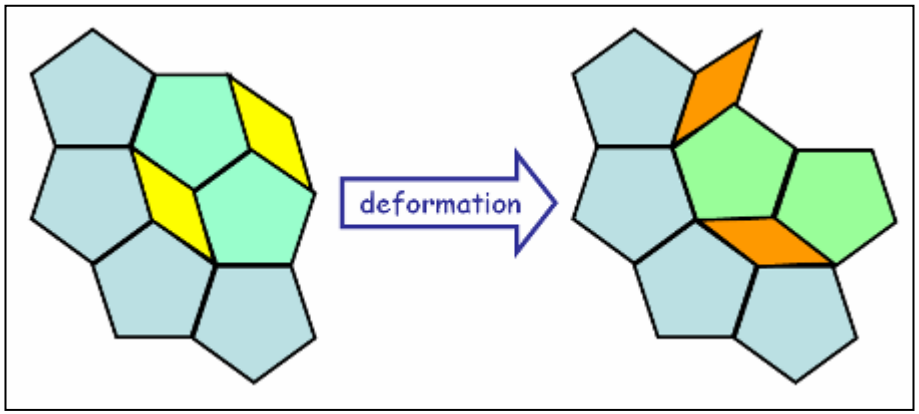
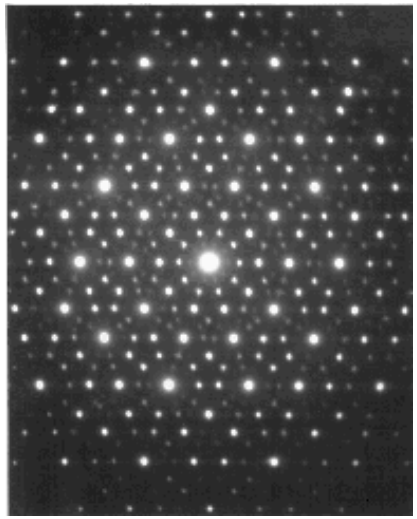
# **Quasicrystals:** *aluminum based alloys with quasiperiodic arrangements of atoms*

Irregularities assuring quasiperiodicity

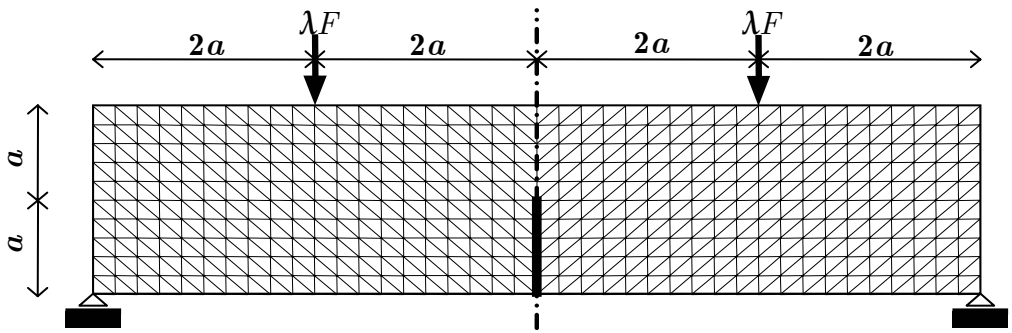



*(worms)*



Diffraction pattern under *x-ray* beam excitation

**HOW THE ATOMIC REARRANGEMENTS INFLUENCE THE GROSS DEFORMATIONS?**




**We performed a wavelet analysis of data obtained by a numerical simulation of a metallic alloy subjected to a couple of impulsive forces**

*Non-linear mechanics developed in* ***Mariano P.M., Mechanics of quasi-periodic alloys, J. Nonlinear Science (2006)***

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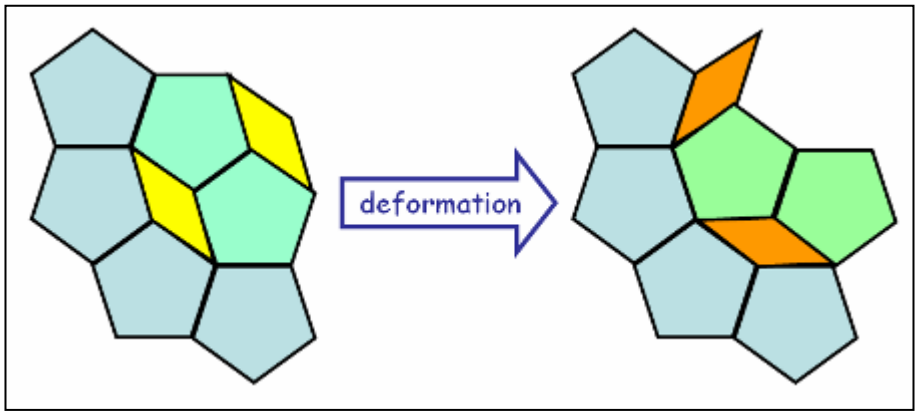


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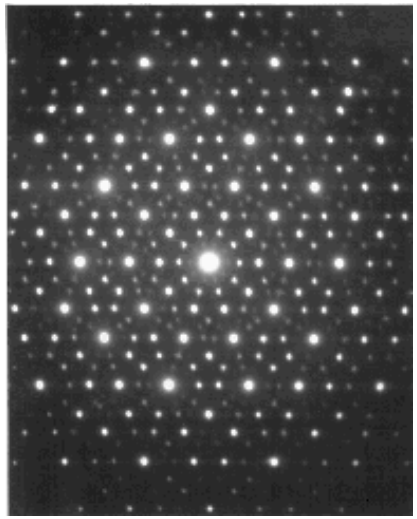

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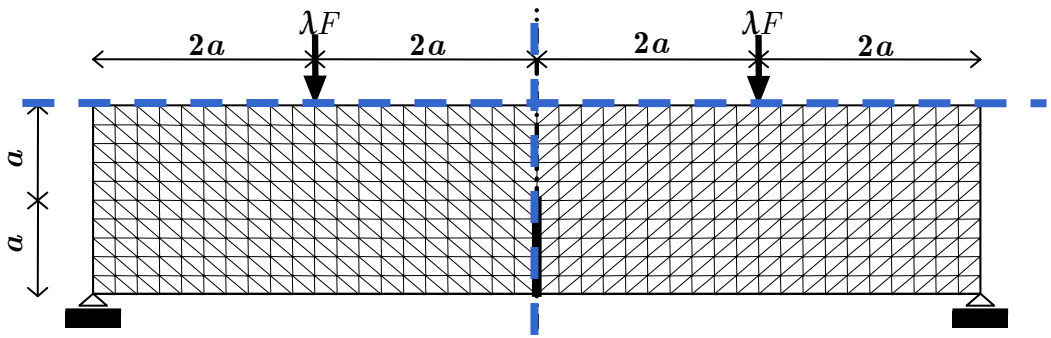


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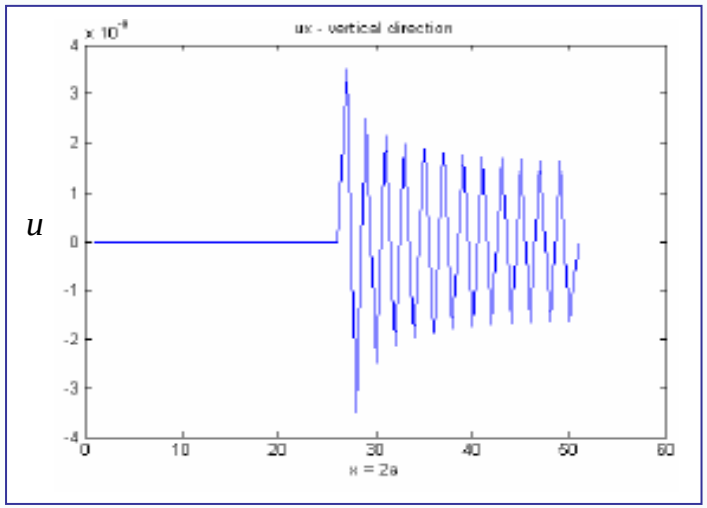
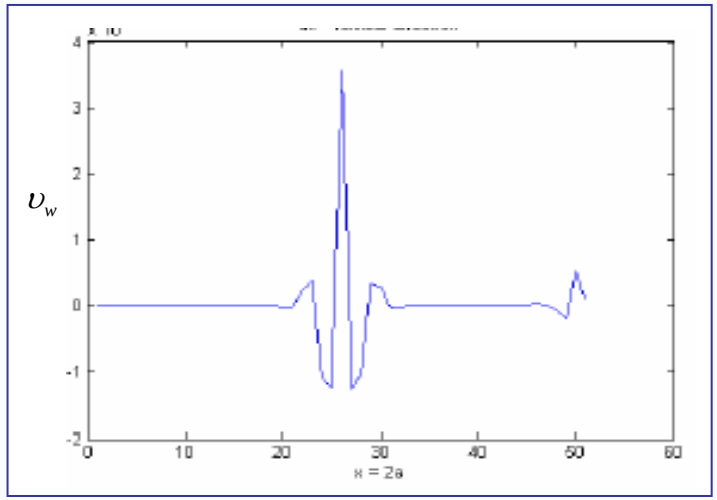
**Gross Displacement** $x \to u(x,t)$




**Phason Activity within each crystalline cell** $x \to \upsilon_w(x,t)$




Analyses performed in both cases along the crack (vertical section)

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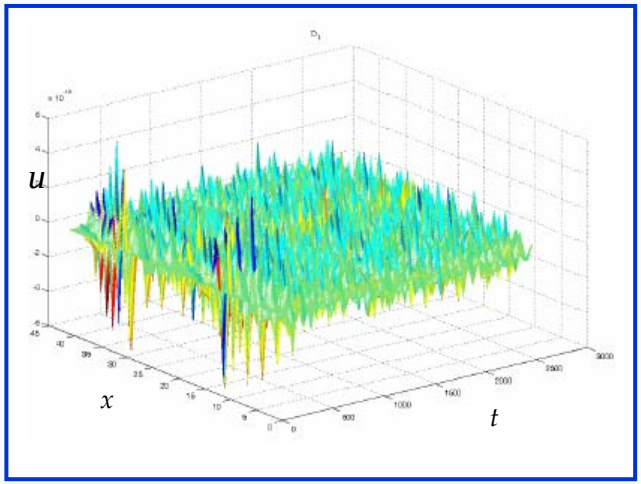


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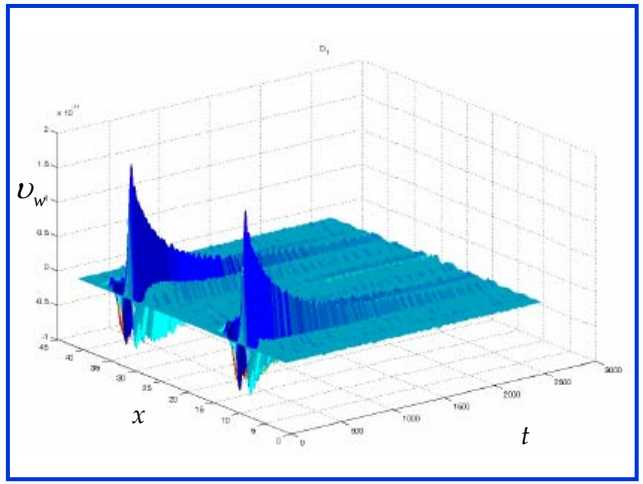
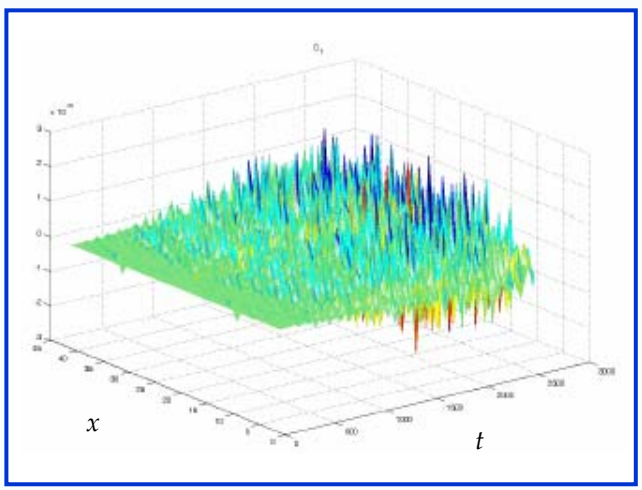



Analyses performed in both cases in the section at the top of the plate

## Difference in gross displacements calculated in a simple elastic body and in a quasicrystal

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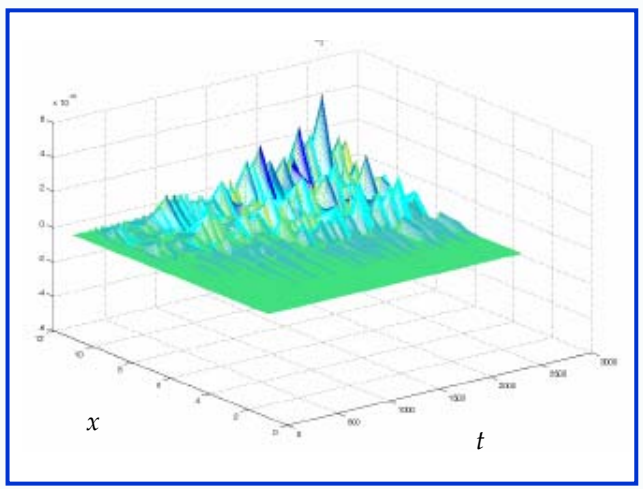


Analysis performed along the crack

## Research directions:

- **Model and analysis of polarizable quasicrystals i.e. Al-Mn alloys with rare metals *(under completion)***

- **Analysis of material instabilities**

- **Use of quasicrystals in health monitoring due to their unusual conduction proprieties**