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1er étage, Bât. J. Jacquard

- 2011 – 2014 : licence en acoustique, Université du Maine, Le Mans
- 2014 –2016 : Master recherche en acoustique, Université du Maine, Le Mans
  - Ondes dans les solides et les fluides
  - Imagerie ultrasonore
  - Psychoacoustique
  - Traitement du signal
  - Informatique scientifique

Méthodes inverses avec approche bayésienne pour l'identification de sources aéroacoustique

depuis juillet 2017

Direction : Jérôme Antoni (LVA), Chritophe Bailly (LMFA), Quentin Leclère (LVA)

Financements : CeLyA + INSAVALOR (projet européen **AD**vanced **A**eroacoustic **P**rocessing **T**echniques, ADAPT)

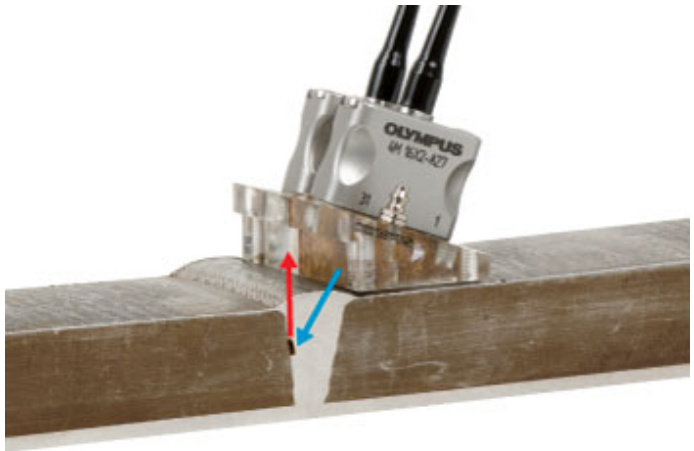
Contexte : réduction du bruit aérodynamique des avions (turbomachines et profil)
Nature des sources :
-parcimonieuses spatialement
-large bande fréquentielle (not. domaine de l'audible)
-mesures empreintes de bruit aérodynamique

Problématiques :
-extraction des composantes tonales, cyclostationnaires et aérodynamiques
-localisation et quantification des sources

Master internship at Institut des Sciences de la Terre (ISTerre), Grenoble
Full Waveform Inversion for Ultrasonic Imaging,
Flaw detection in steel weld
Institut des Sciences de la Terre :
nb permanents axes de recherche : Détailler context (labo, seiscope, ...)

NDT for Welds

Pipeline test*



Echo mode testing**

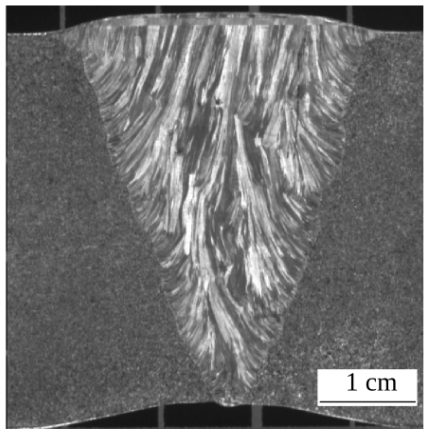
Non destructive testing for weld in :

- nuclear reactors (cooling system)
- oil and gaz pipelines

→ porosity, cracks, lack of fusion, corrosion, inclusions,. . .

Pictures from *Davidmack & **Olympus

NDT for Welds



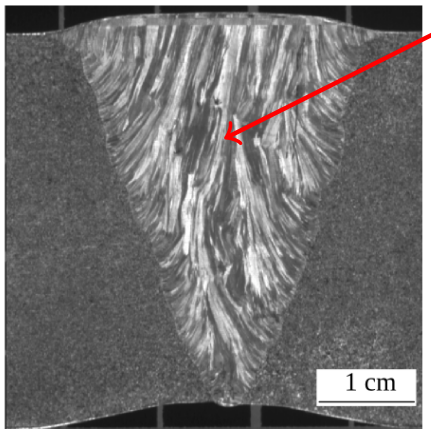
Macrography of a weld*

- delay and sum methods
- decomposition of covariance matrix (DORT)

Pictures from *Chassignole 2000, PhD thesis & **Gardahaut *et al.* 2014

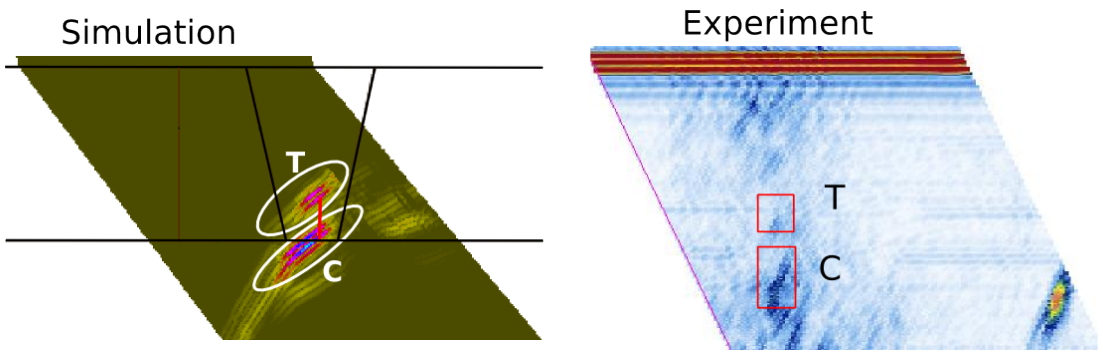
NDT for Welds

Strong unknown anisotropy



Macrography of a weld*

↪ distorsion and splitting of the beam



Comparison of ray based model and experiment result**

- delay and sum methods
- decomposition of covariance matrix (DORT)

→

✗ need to know c a priori

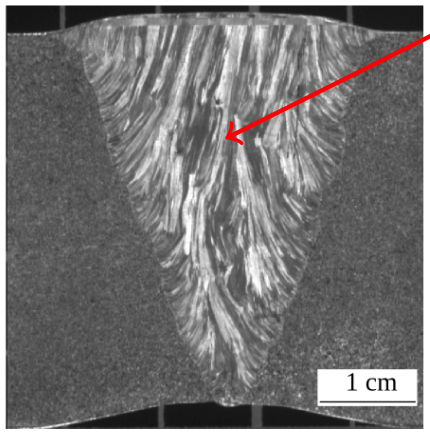
✗ strong artefacts

Pictures from *Chassignole 2000, PhD thesis & **Gardahaut *et al.* 2014

NDT for Welds

Strong unknown anisotropy

$\hookrightarrow$ distorsion and splitting of the beam



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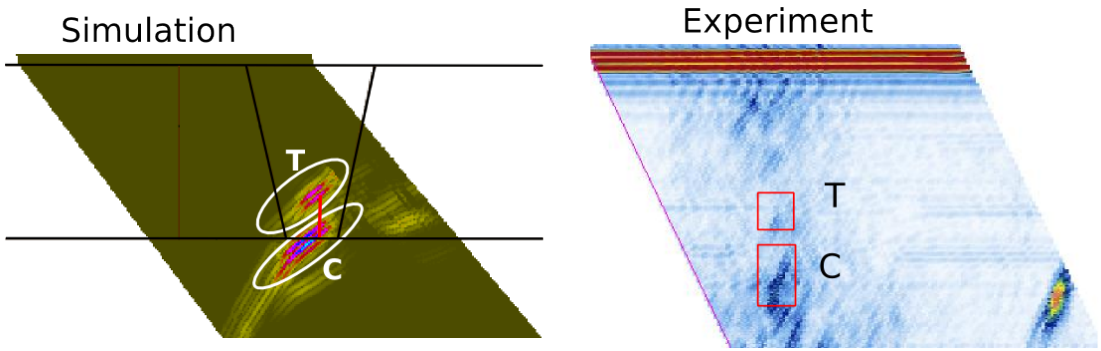


Comparison of ray based model and experiment result**

- delay and sum methods
- decomposition of covariance matrix (DORT)

$\rightarrow$

✗ need to know c a priori

✗ strong artefacts

- solving NL optimization problem

$\rightarrow$

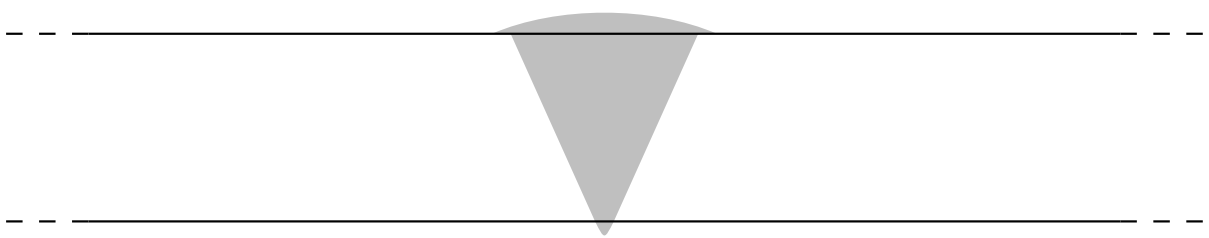
▶ contour reconstruction : *Dominguez et al.*, *Rodriguez et al.*

✓ C_{ij} reconstruction : FWI

Pictures from *Chassignole 2000, PhD thesis & **Gardahaut *et al.* 2014

What is specific to weld imaging ?

- 2 free surfaces : more information $\leftrightarrow$ non-linear inversion



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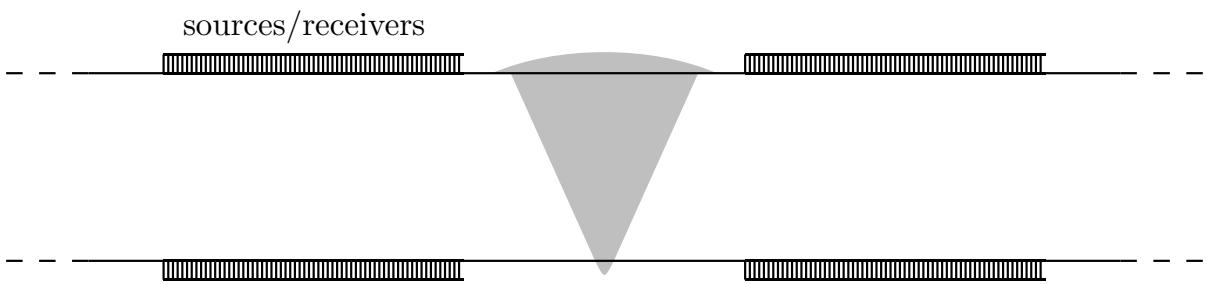
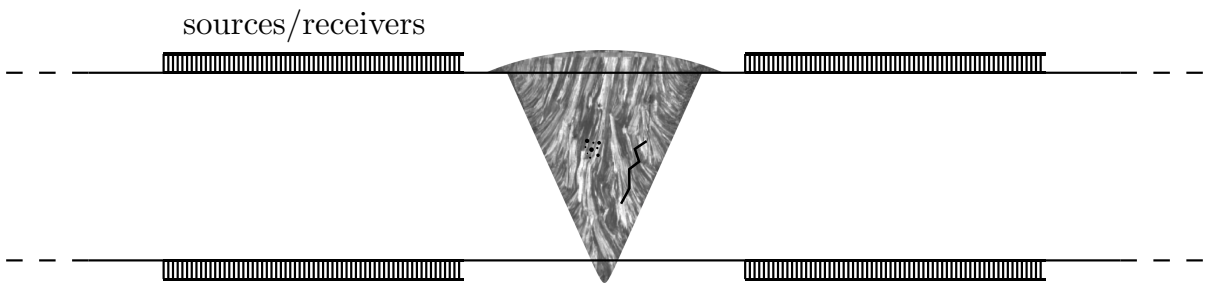
- 2 free surfaces : more information $\leftrightarrow$ non-linear inversion
- surface acquisition only



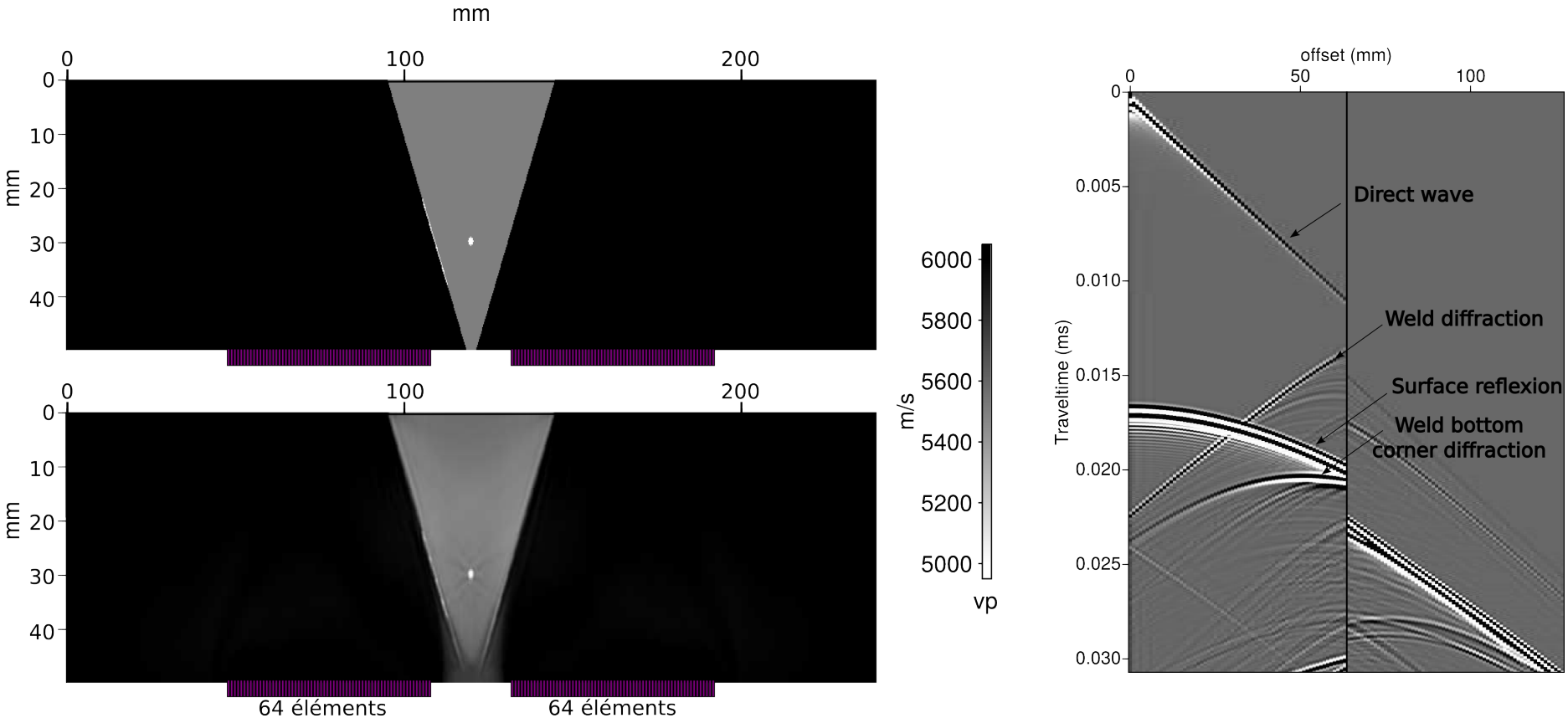
What is specific to weld imaging ?

- 2 free surfaces : more information $\leftrightarrow$ non-linear inversion
- surface acquisition only
- anisotropy $\rightarrow$ multi-parameter inversion
  ($C_{ij} \times 6$: weld + defects)



To do

- 2D acoustic approximation (mono/multiparameter)
  - isotropic weld ($\boxed{v_p}$, $\boxed{\rho}$)
  - transverse isotropic weld (v_p, ρ, $\boxed{\epsilon}$, δ, θ)
- 3D elastic inversion (mono/multiparameter : $C_{ij} \times 6$)
  - isotropic weld : $\boxed{v_p}$
  - anisotropic weld
  - real data



2D isotropic case : monoparameter inversion of v_p
100kHz $\rightarrow$5MHz

To do

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