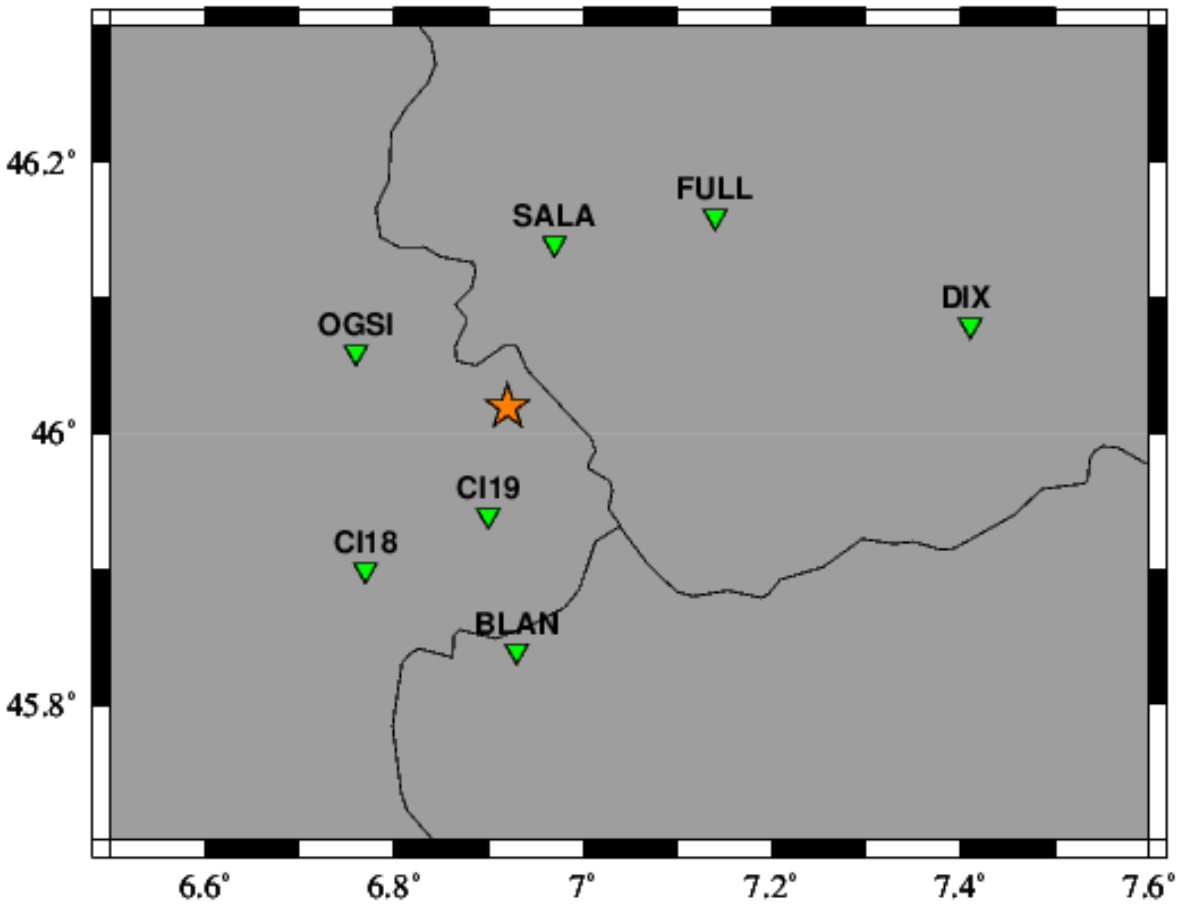
Analyse du séisme du 23 juin 2020 à 06h25 UTC de Ml 3.8
Vallorcine (proche Chamonix)

Bertrand Delouis, Géoazur, 24 juin 2020

- Inversion de la localisation hypocentrale avec différents modèles de vitesse
- Mécanisme au foyer à partir des sens de premiers mouvements de l'onde P (polarités)
- Inversion des formes d'ondes FMNEAR avec filtrage ajusté manuellement et deux modèles de vitesse

Stations proches utilisées pour la localisation hypocentrale

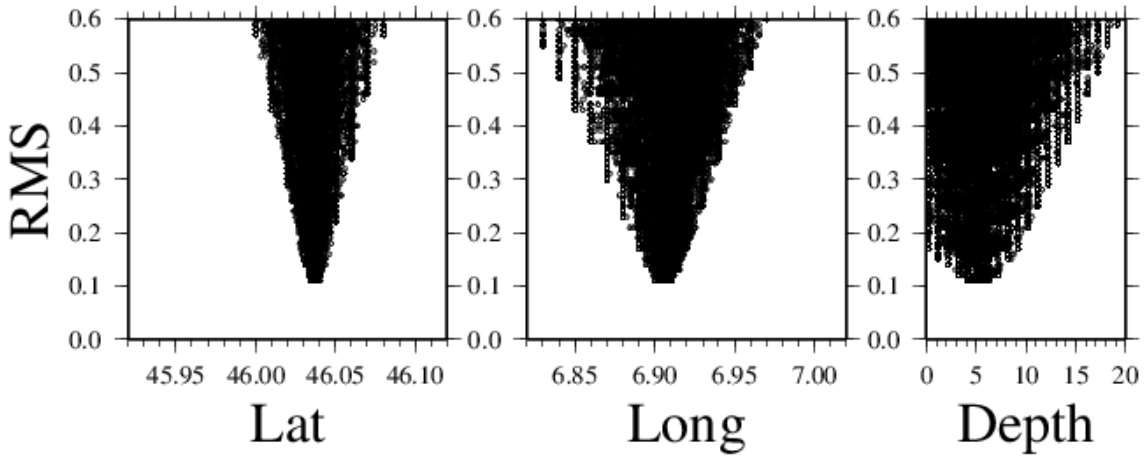


Inversion of P and S arrival times for lat, long, depth, and T0 combining grid searches, simulated annealings, and HYPOINVERSE-2000 (Klein, 2002),
Testing series of velocity models with varying velocity gradient
Vp/Vs ratio ranging from 1.66 to 1.9

Vp en surface testée entre 3.8 et 5.4 km/s
Vp à la base de la croûte testée entre 6.6 et 7.0 km/s Moho depth: 45 km

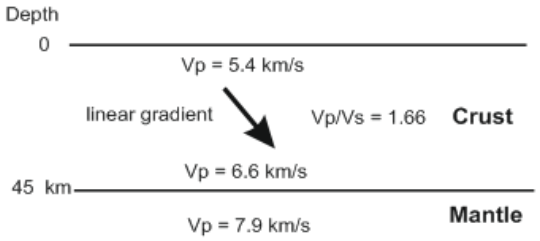
Weighted phases retained:
7 P + 7 S

Graphs combining localisations obtained with more 81 velocity models

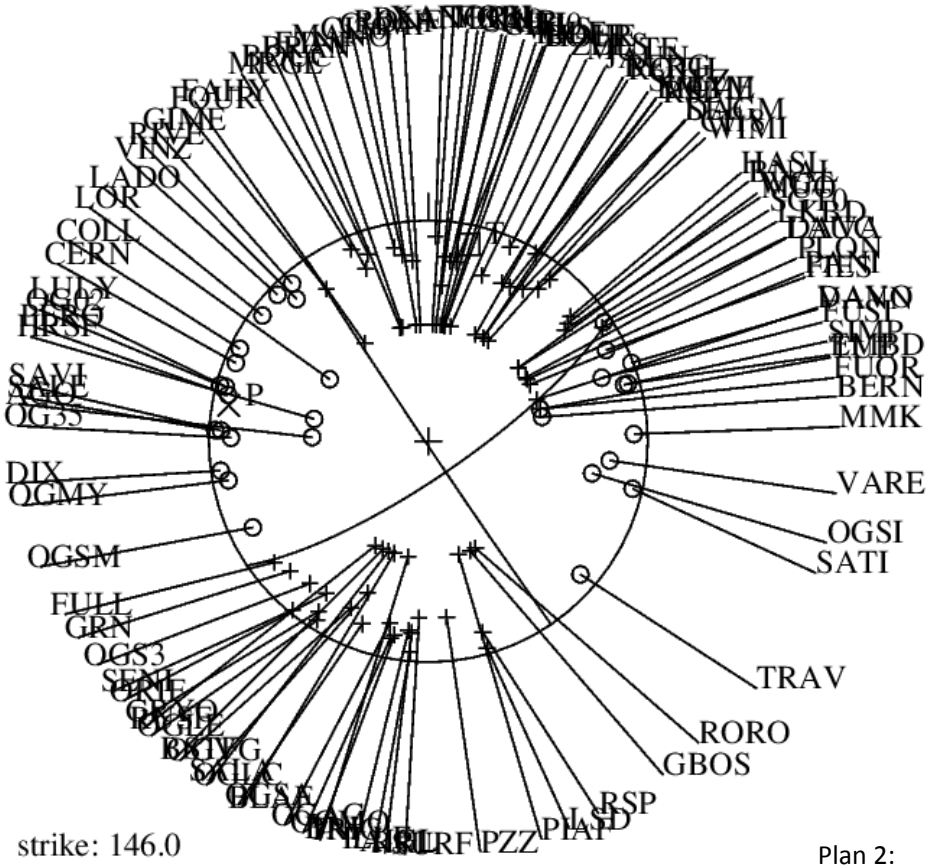


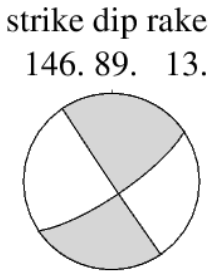
Best solution found:

Lat: 46.036 Lon: 6.910 Depth: 5.4 km
T_0: 06h25 : 41s RMS_{LOC}: 0.11s
Vp_top, Vp_base
5.4 km/s 6.6 km/s
best Vp/Vs= 1.66



Mécanisme au foyer par sens des premiers mouvements de l'onde P pour la meilleure localisation trouvée



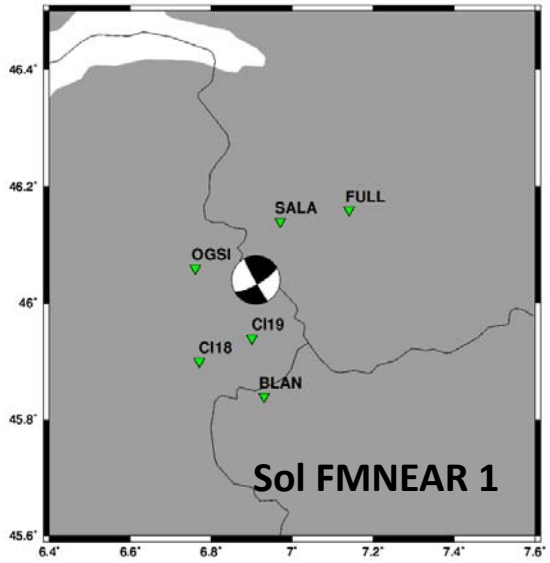


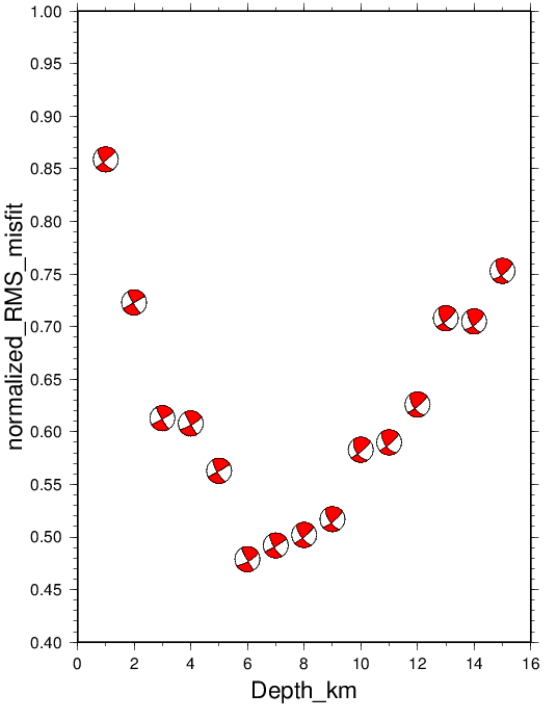
Plan 2:
strike 56
dip 77
rake 179

\+ : first motion in compression (Zup) o : first motion in dilatation (Z down)

Focal mechanism from waveform inversion (FMNEAR)

Standard velocity model
from routine FMNEAR inversions





strike dip rake
60.0 75.0 176.2 : best focal mechanism

RMS = 0.479

Selected depth: 6.0 km

18 = number of components with freqband > 0.015Hz
77 % : index of confidence

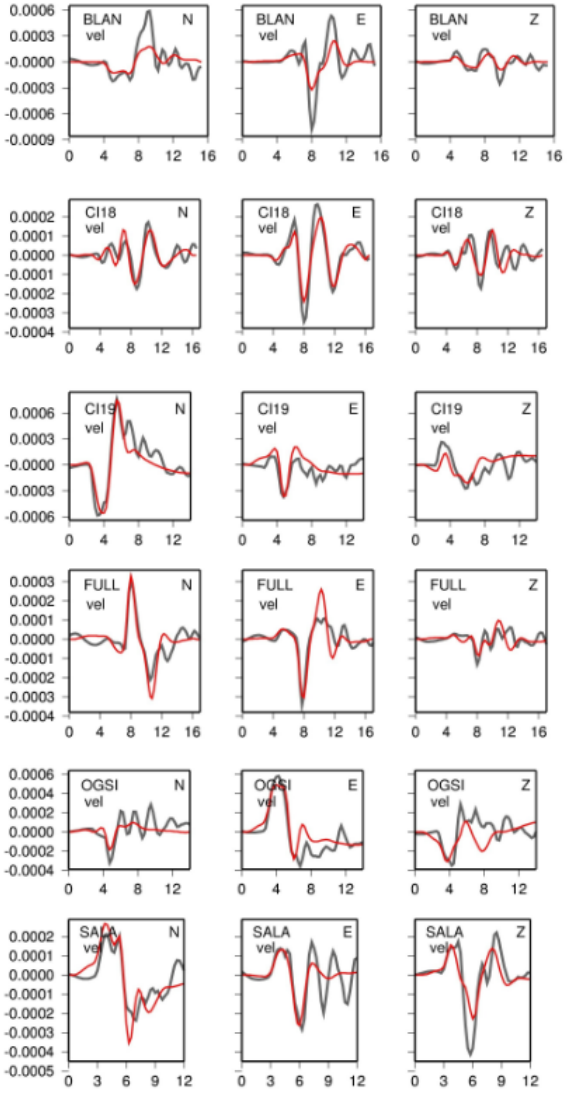
3.19 : Mw from waveform inversion

Epicenter used (lat,long): 46.036 6.910
Starting depth(km): 6.0

strike dip rake of the second nodal plane:
151.0 86.3 15.0

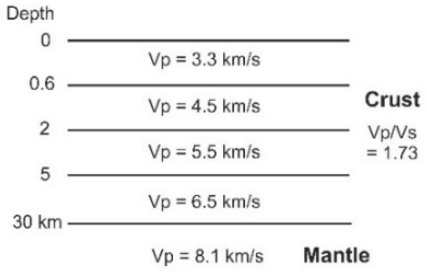
****
****** quality: B ******
****

**** Signification of quality *******
A: focal mechanism STONGLY CONSTRAINED
B: focal mechanism WELL CONSTRAINED
C: focal mechanism MODERATELY CONSTRAINED
D: focal mechanism WEAKLY CONSTRAINED
E: focal mechanism BARELY CONSTRAINED
F: focal mechanism NOT CONSTRAINED
****



X axis: time in seconds Y axis: displacement in cm
Grey line: observed Red line: computed

Velocity model



Best solution
(best waveform fit)

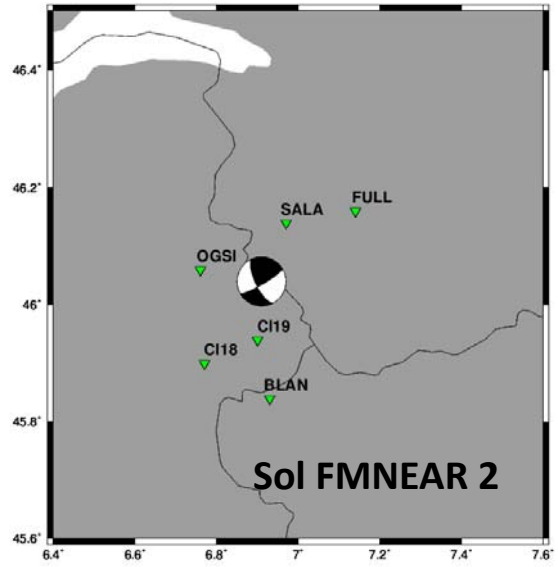
Filtering per component

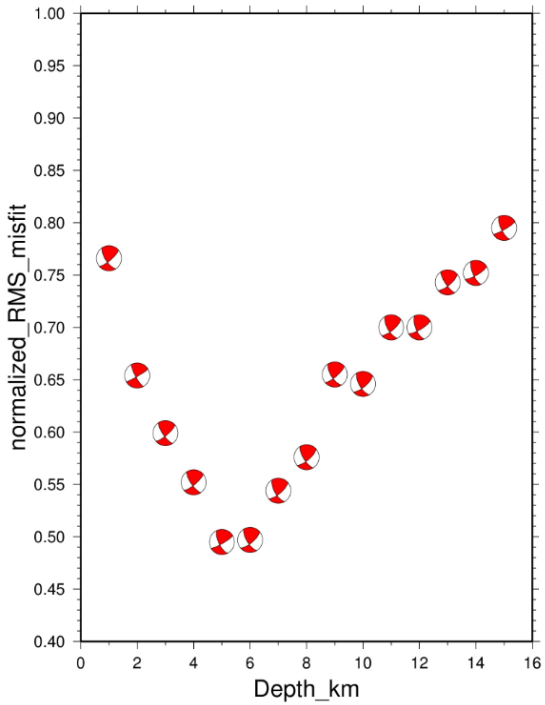
BLAN N vel	0.0300	Hz to	0.5000	Hz
BLAN E vel	0.0300	Hz to	0.5000	Hz
BLAN Z vel	0.0300	Hz to	0.5000	Hz
CI18 N vel	0.2000	Hz to	0.5000	Hz
CI18 E vel	0.2000	Hz to	0.5000	Hz
CI18 Z vel	0.2000	Hz to	0.5000	Hz
CI19 N vel	0.0500	Hz to	0.5000	Hz
CI19 E vel	0.0500	Hz to	0.5000	Hz
CI19 Z vel	0.0500	Hz to	0.5000	Hz
FULL N vel	0.0500	Hz to	0.5000	Hz
FULL E vel	0.0500	Hz to	0.5000	Hz
FULL Z vel	0.0500	Hz to	0.5000	Hz
OGSI N vel	0.0300	Hz to	0.5000	Hz
OGSI E vel	0.0300	Hz to	0.5000	Hz
OGSI Z vel	0.0300	Hz to	0.5000	Hz
SALA N vel	0.0500	Hz to	0.5000	Hz
SALA E vel	0.0500	Hz to	0.5000	Hz
SALA Z vel	0.0500	Hz to	0.5000	Hz

Focal mechanism from waveform inversion (FMNEAR)

Specific velocity model

close to the gradient model found by the inversion of arrival times





strike dip rake
60.0 80.0 158.8 : best focal mechanism

RMS = 0.495

Selected depth: 5.0 km

18 = number of components with freqband > 0.015Hz
79 % : index of confidence

3.19 : Mw from waveform inversion

Epicenter used (lat,long): 46.036 6.910
Starting depth(km): 5.0

strike dip rake of the second nodal plane:
153.8 69.2 10.7

****
****** quality: B ******
****

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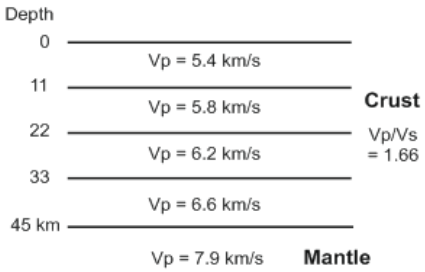
****

Velocity model



Filtering per component

BLAN	N vel	0.0300	Hz to	0.5000 Hz
BLAN	E vel	0.0300	Hz to	0.5000 Hz
BLAN	Z vel	0.0300	Hz to	0.5000 Hz
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CI18	Z vel	0.2000	Hz to	0.5000 Hz
CI19	N vel	0.0500	Hz to	0.5000 Hz
CI19	E vel	0.0500	Hz to	0.5000 Hz
CI19	Z vel	0.0500	Hz to	0.5000 Hz
FULL	N vel	0.0500	Hz to	0.5000 Hz
FULL	E vel	0.0500	Hz to	0.5000 Hz
FULL	Z vel	0.0500	Hz to	0.5000 Hz
OGSI	N vel	0.0300	Hz to	0.5000 Hz
OGSI	E vel	0.0300	Hz to	0.5000 Hz
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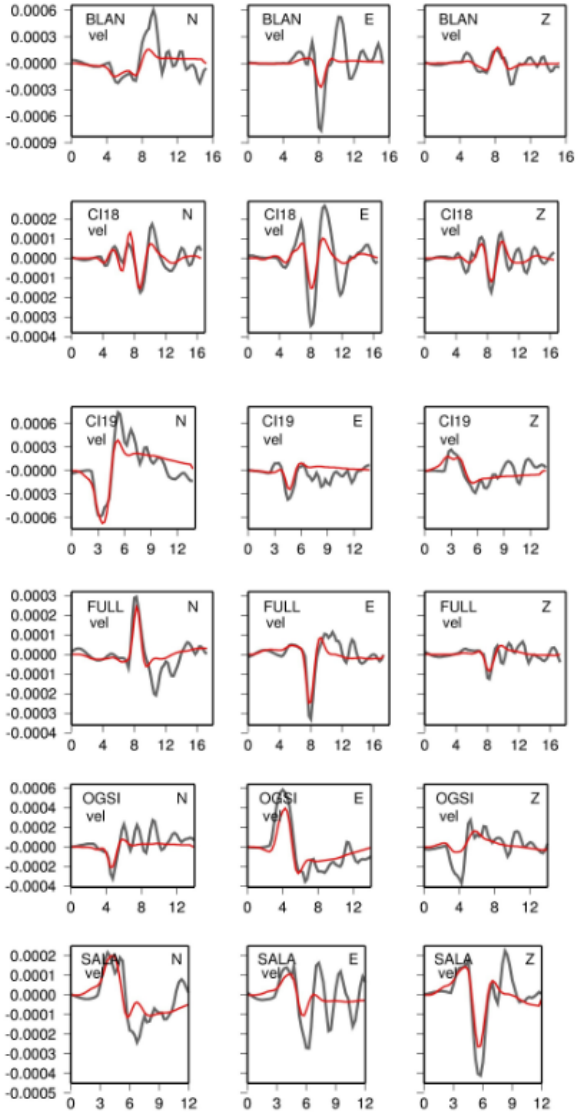
SALA	E vel	0.0500	Hz to	0.5000 Hz
SALA	Z vel	0.0500	Hz to	0.5000 Hz



X axis: time in seconds Y axis: displacement in cm
Grey line: observed Red line: computed

Conclusions

Profondeur hypocentrale :

- 3 à 7 km par inversions des temps d'arrivées Tp et Ts
- 5 à 6 km par inversion de formes d'ondes (FMNEAR)

Profondeur compatible entre les deux approches bien contrainte entre 5 et 6 km

Mécanisme au foyer:

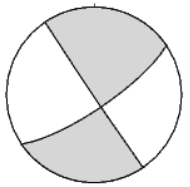
- ❑ Solution bien contrainte avec les polarités
- ❑ Solution stable par l'inversion des formes d'ondes, et très proche de la solution par polarités

Au total, mécanisme au foyer bien contraint avec :

- **un plan NE-SW subvertical décrochant dextre**
- **un plan NW-SE subvertical décrochant senestre**

Solution retenue :

strike dip rake
146. 89. 13.



Plan 2:
strike 56
dip 77
rake 179

Magnitude de moment par inversion des formes d'ondes :
Mw = 3.2