Seismic Data Processing of VB02 in ECHOS

By Alec Vila

Outline

(1) Preprocessing Steps

(2) Processing Steps

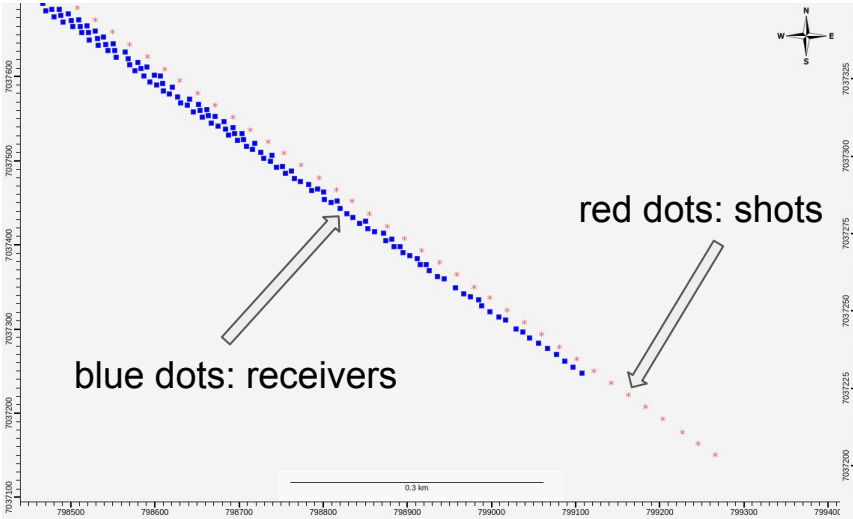
(3) Suggested Future Work

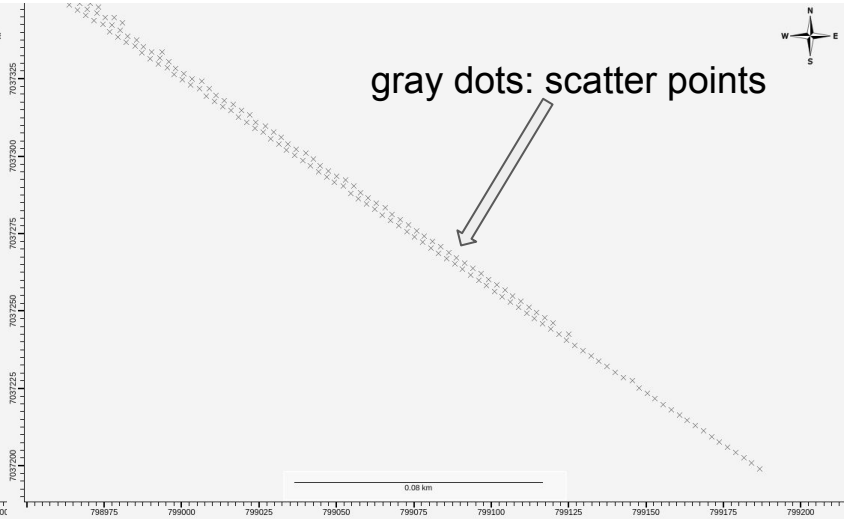
Preprocessing Steps (Geometry)

Need shotx, shoty, recx and recy to know shot and receiver locations

Use these locations to calculate the scatter plot in Basemaps

-equivalent to CMP that aren't binned





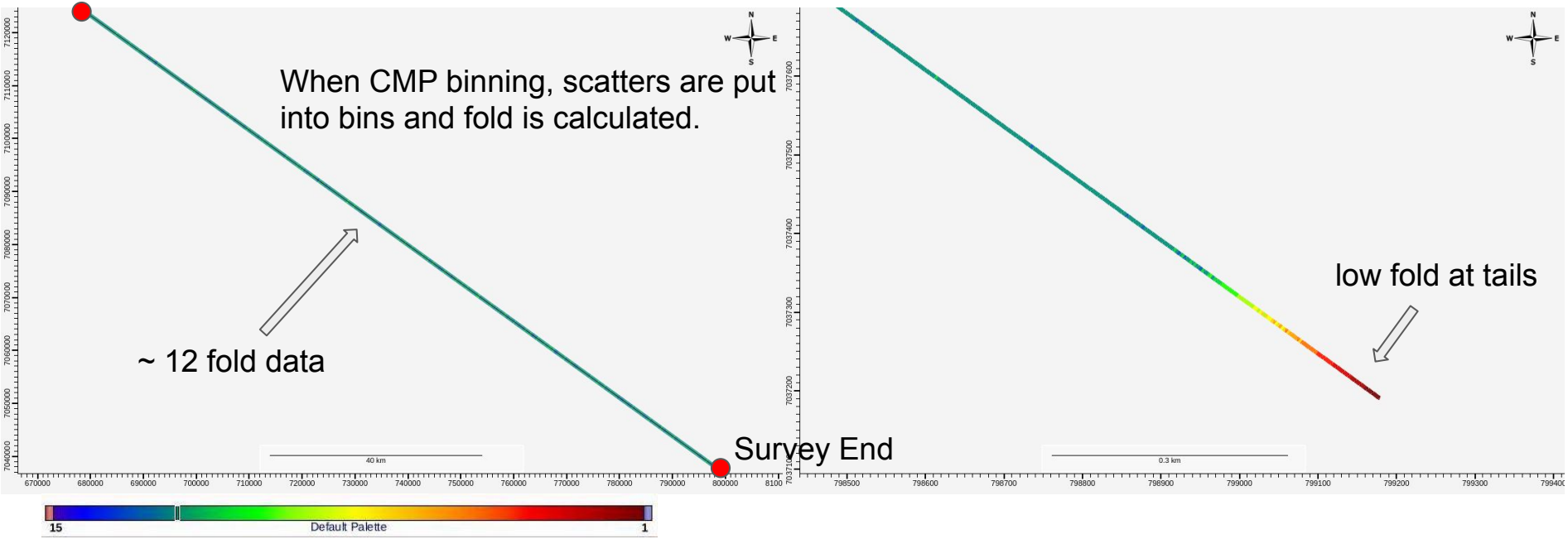
Preprocessing Steps (Geometry)

Survey Start

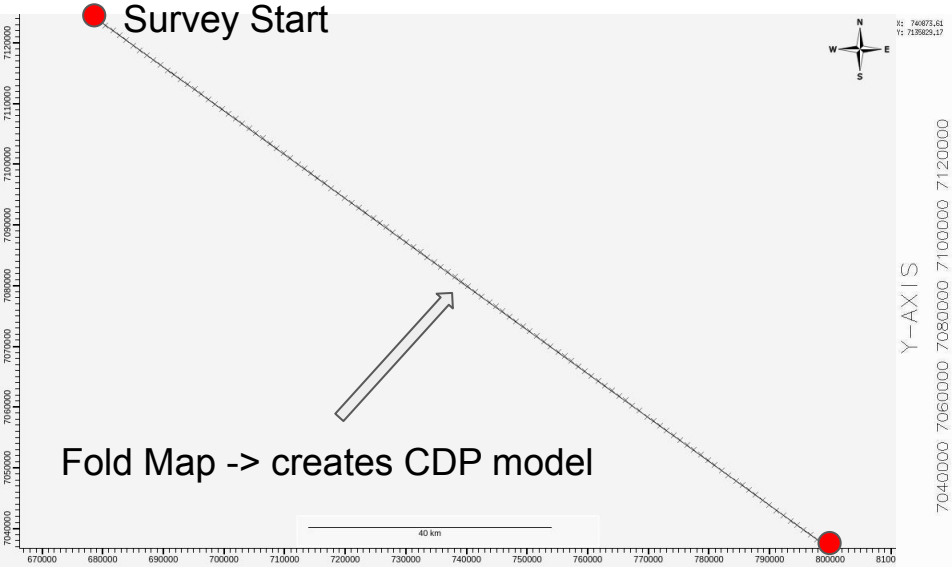
When CMP binning, scatters are put into bins and fold is calculated.

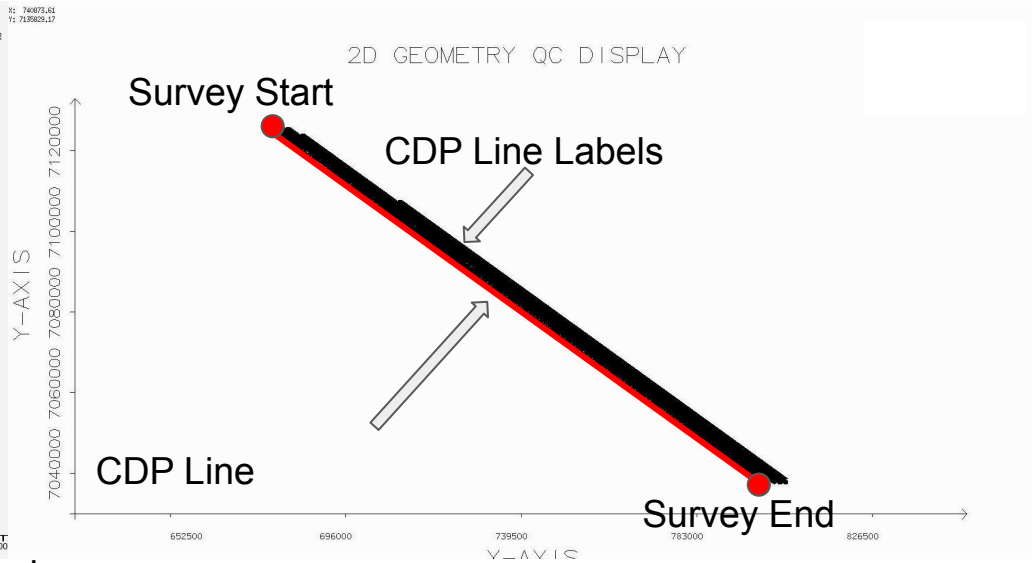
~ 12 fold data

Survey End

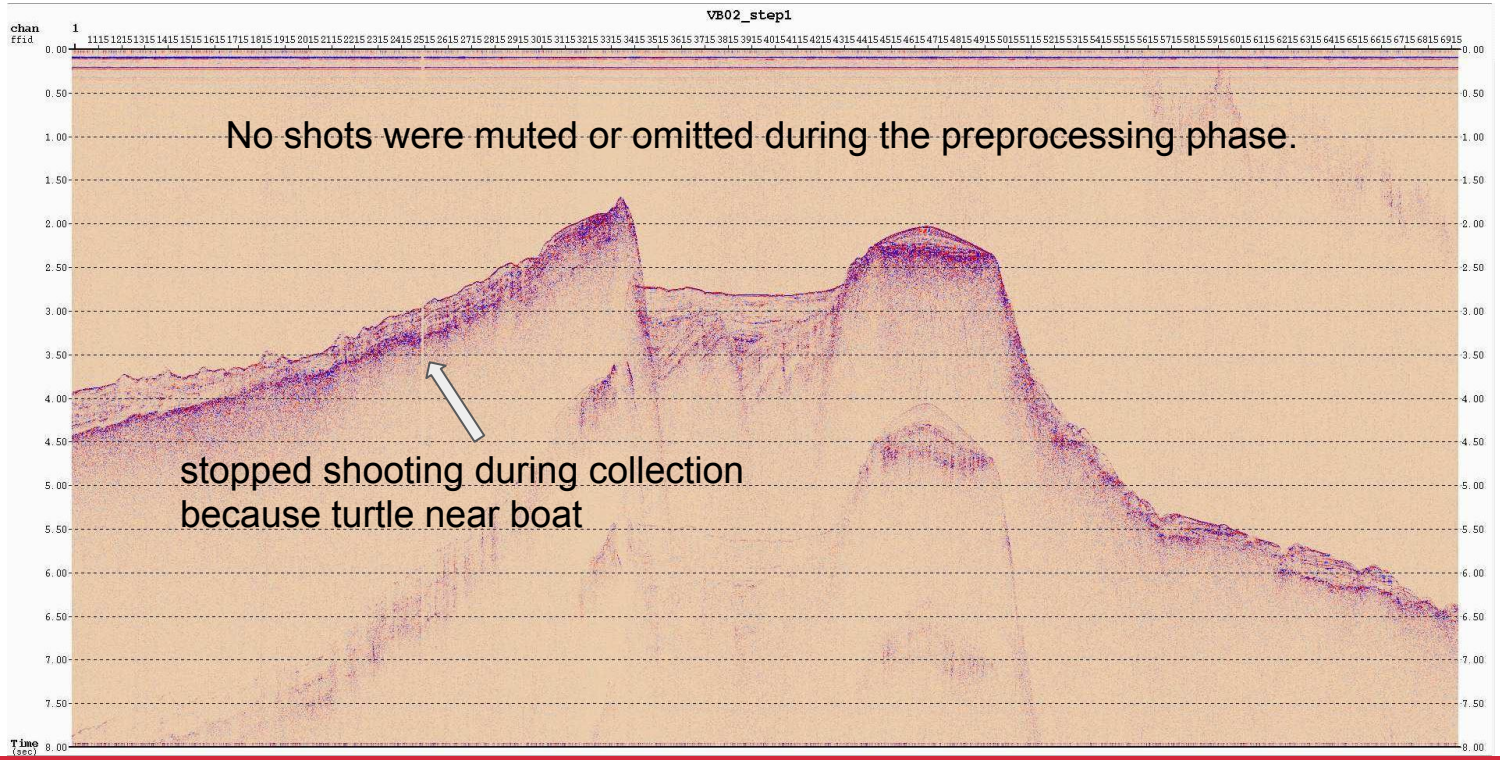


Preprocessing Steps (Geometry)



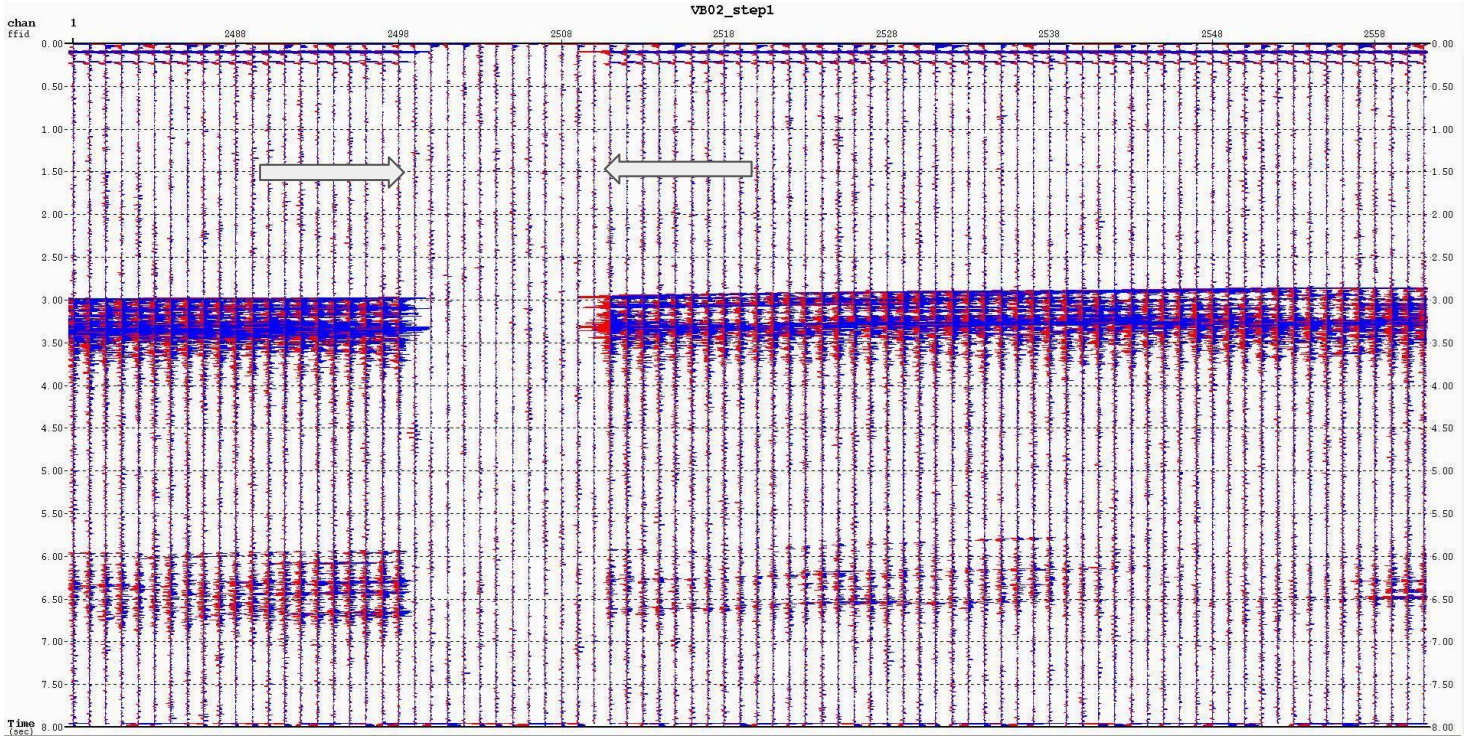


Preprocessing Steps (Editing Shots)



Preprocessing Steps (Editing Shots)

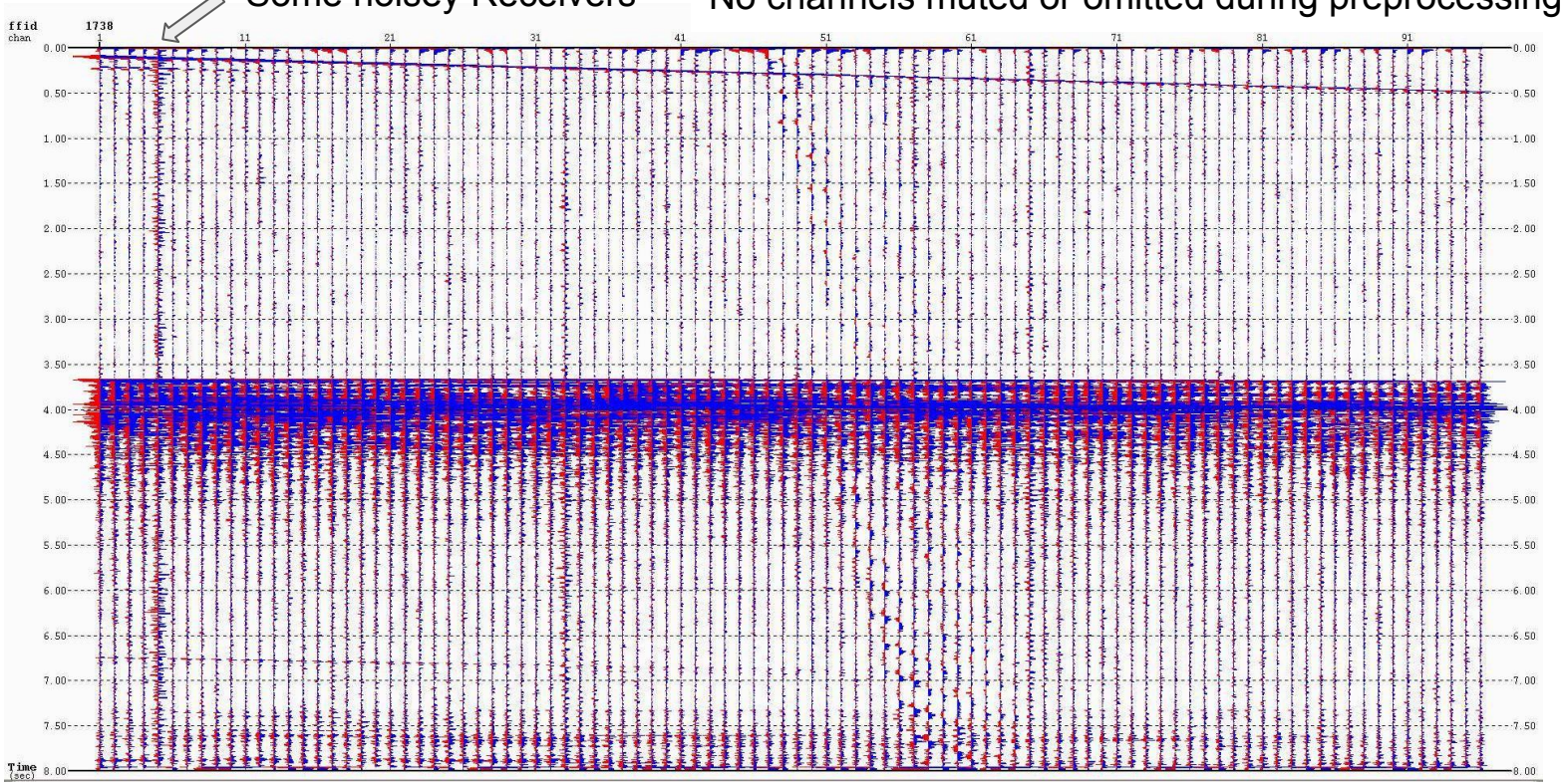
stopped shooting during collection because turtle near boat



Preprocessing Steps (Editing Receivers)

Some noisey Receivers

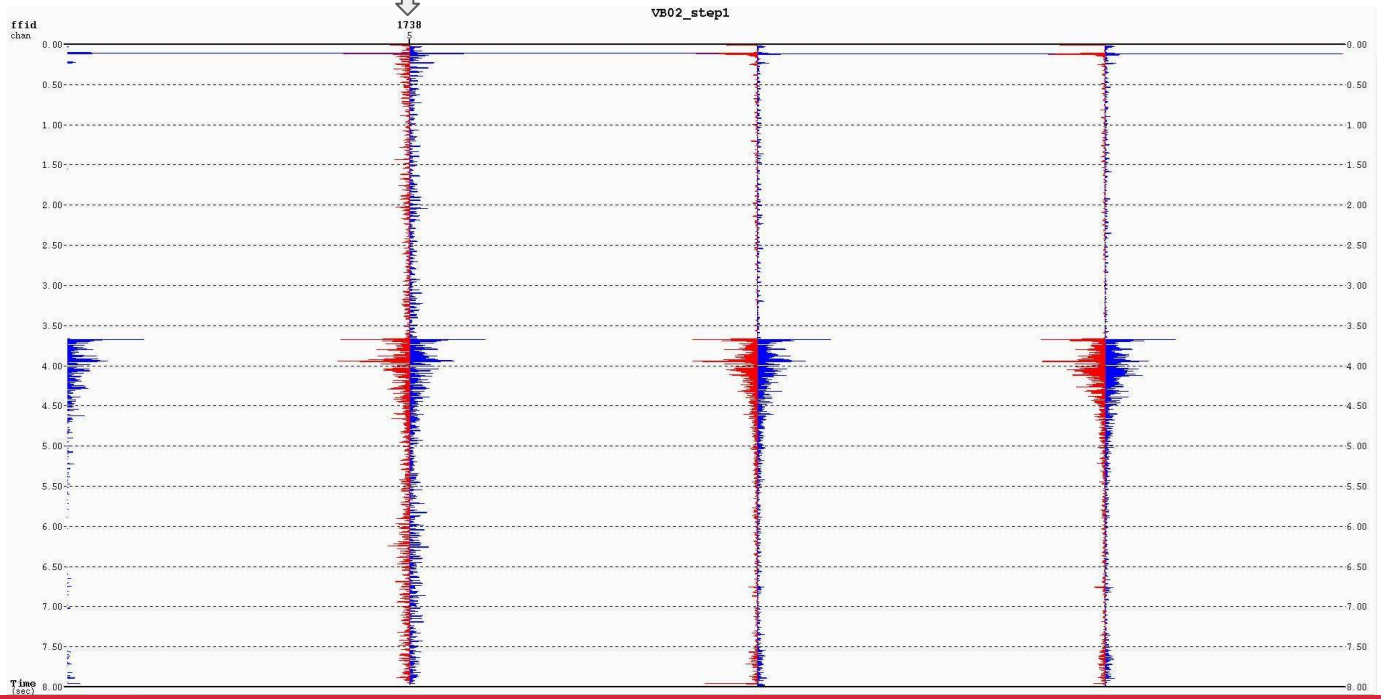
No channels muted or omitted during preprocessing



Preprocessing Steps (Editing Receivers)

Some noisey Receivers

Can be fixed with amplitude balancing and noise attenuation

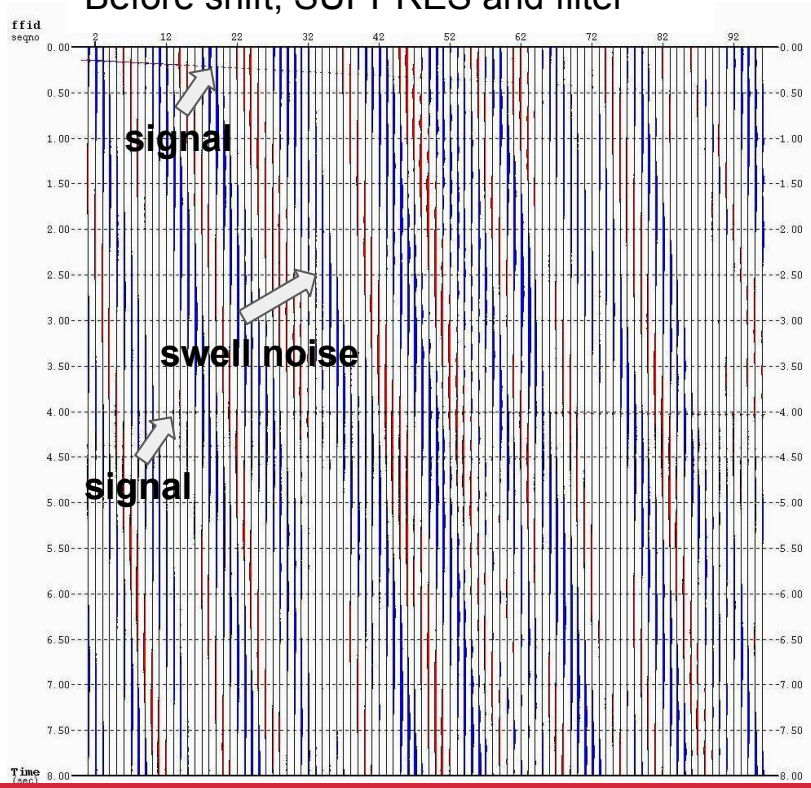


Processing Steps

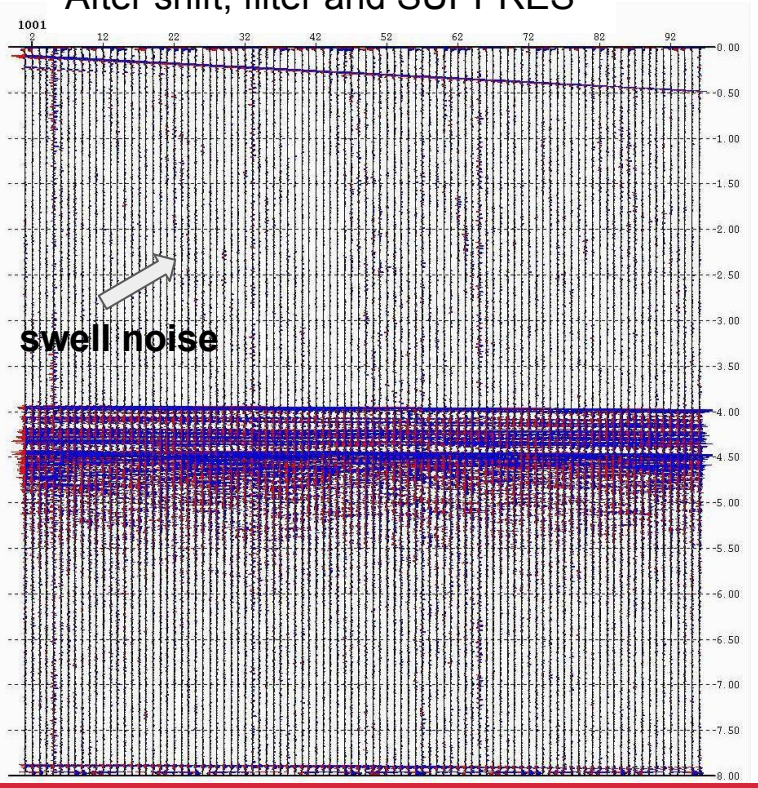
1. Attenuate Swell Noise
2. Correct Ghosting Effect
3. Build Velocity Model and Brute Stack + Migration
4. Debubble
5. Attenuate Linear and Random Noise
6. Amplitude Compensation
7. Remove Multiples
8. Final Stack and Migration

Static shift up 50 ms + Notch filter at .7 hz + SUPPRES (0-20 Hz)

Before shift, SUPPRES and filter

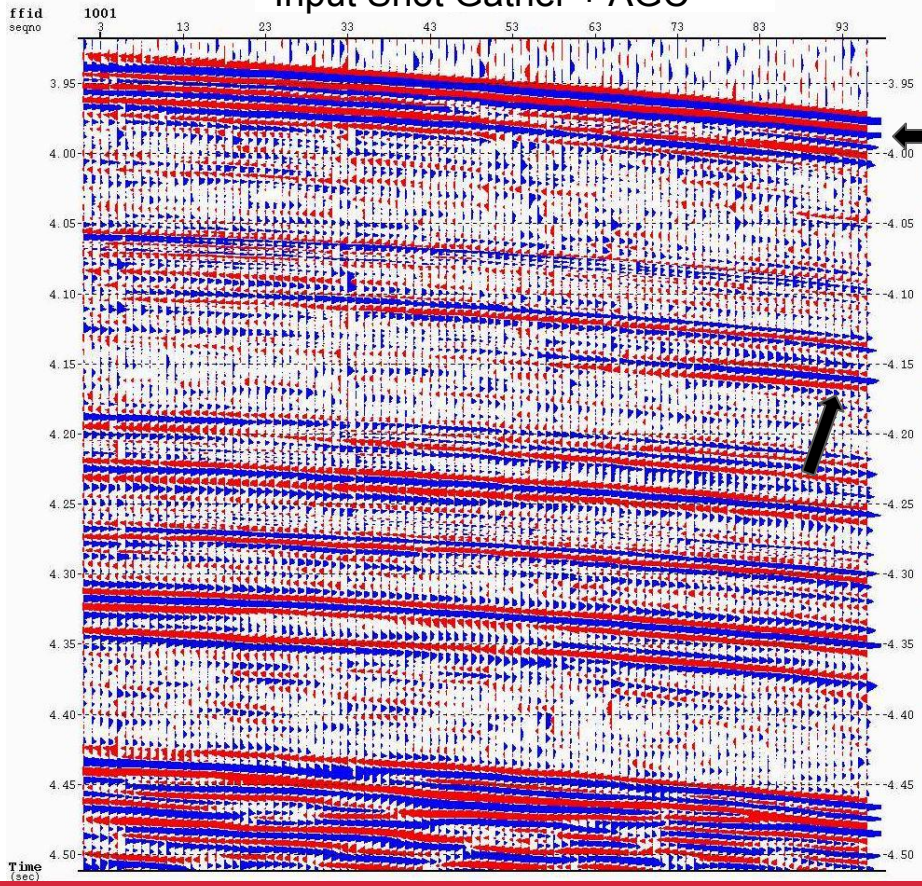


After shift, filter and SUPPRES

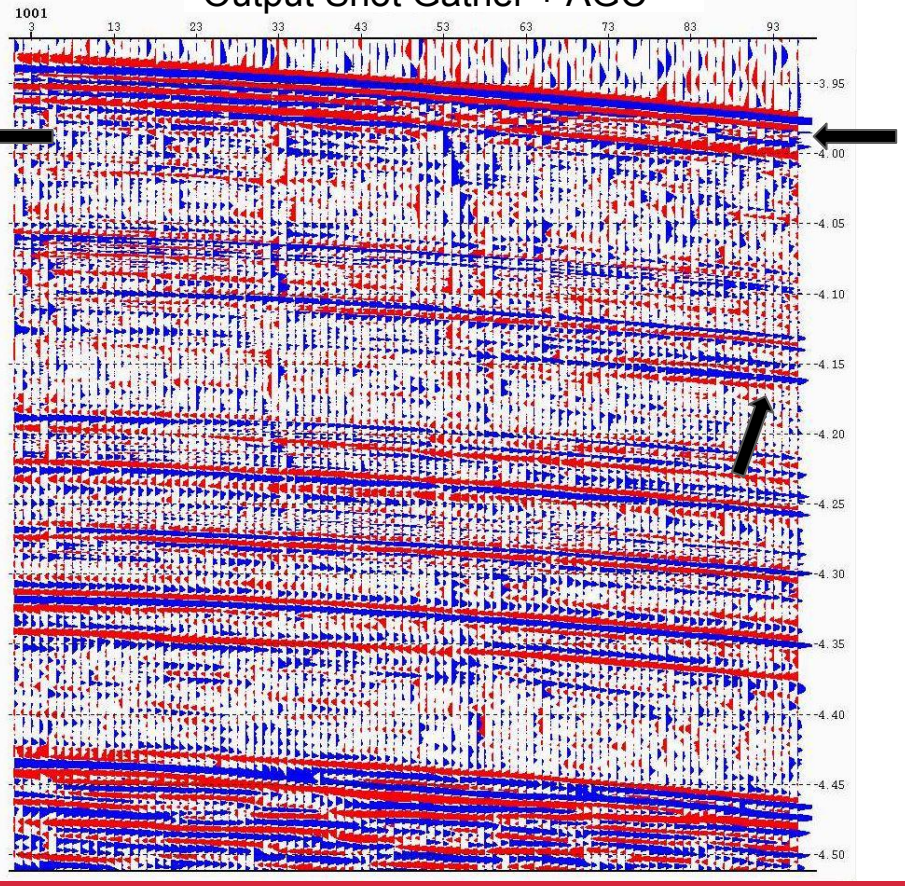


GHOSTX to remove ghost signal with source at 3m depth and receiver at 4m depth

Input Shot Gather + AGC

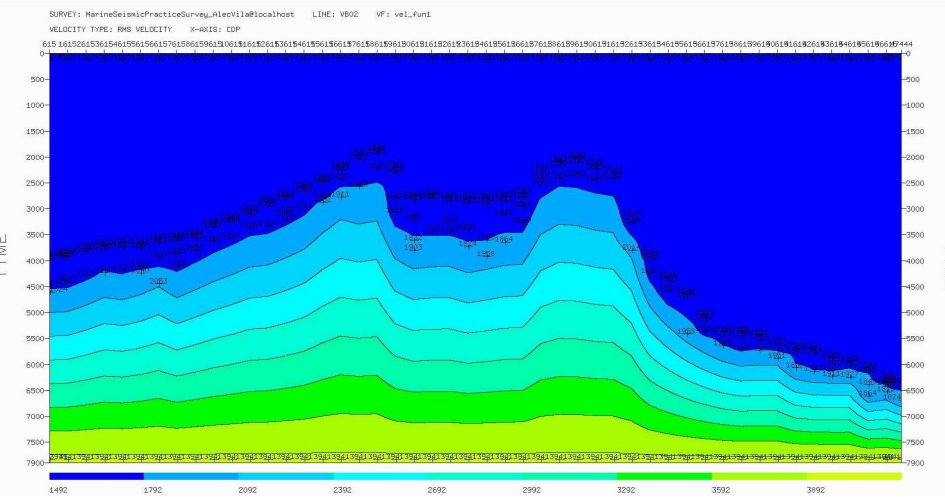


Output Shot Gather + AGC

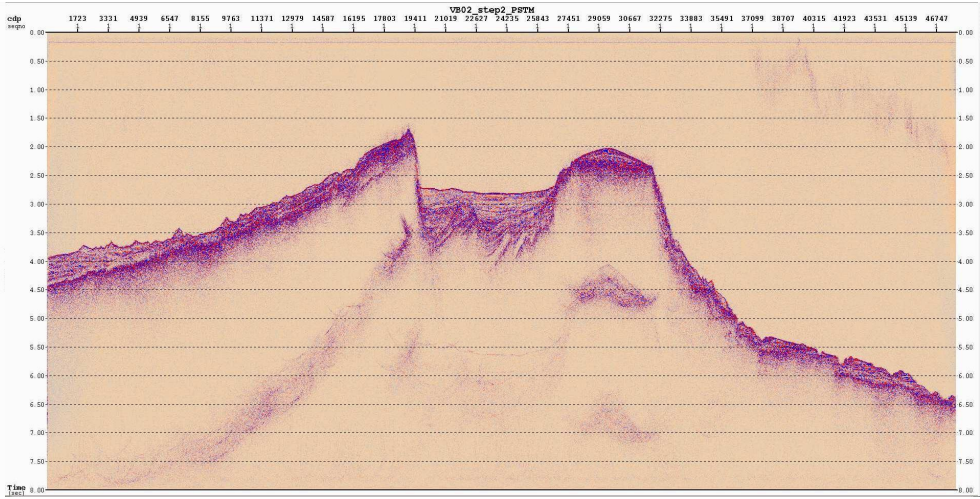


Velocity Analysis and Brute Stack + Migration

First Velocity Model



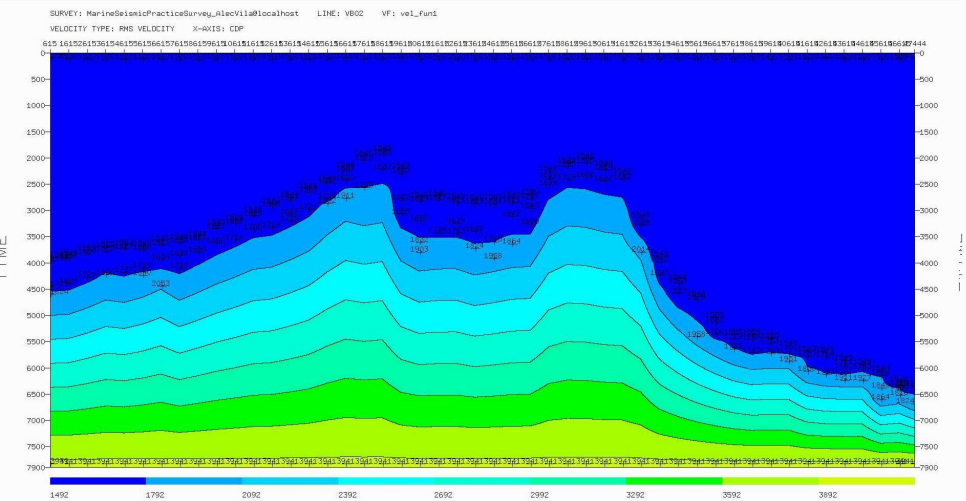
First Post-Stack Time Migrated Section



Picked Time-Velocity pairs for every 1000 CDP -> Time-Velocity Pair per ~3 km

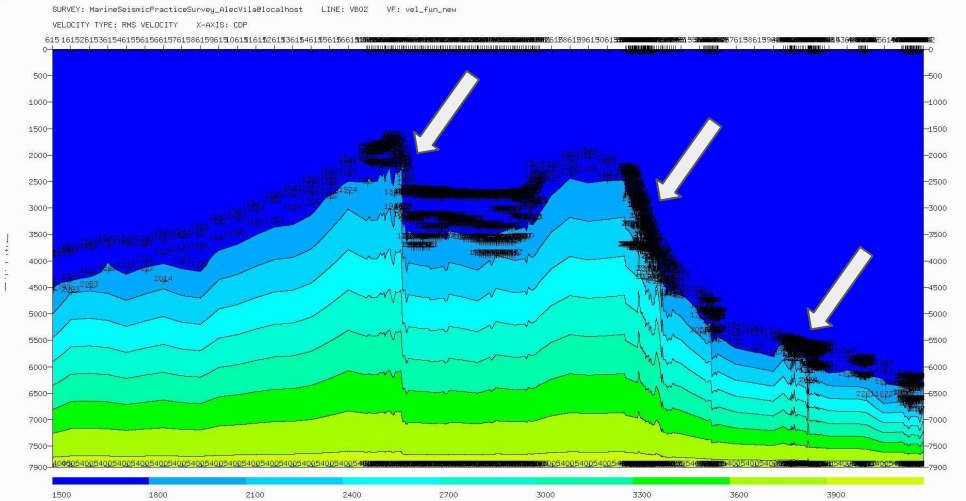
New Velocity Model and Adjustment to Migration

First Velocity Model



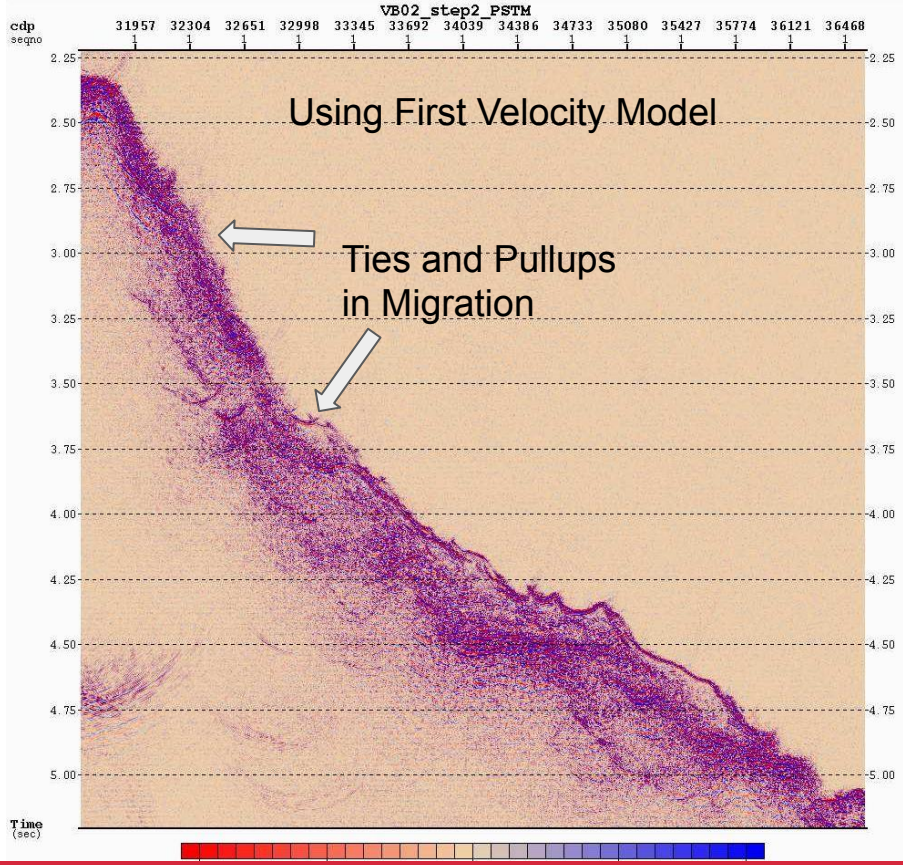
Time-Velocity Pair Every 1000 CDP

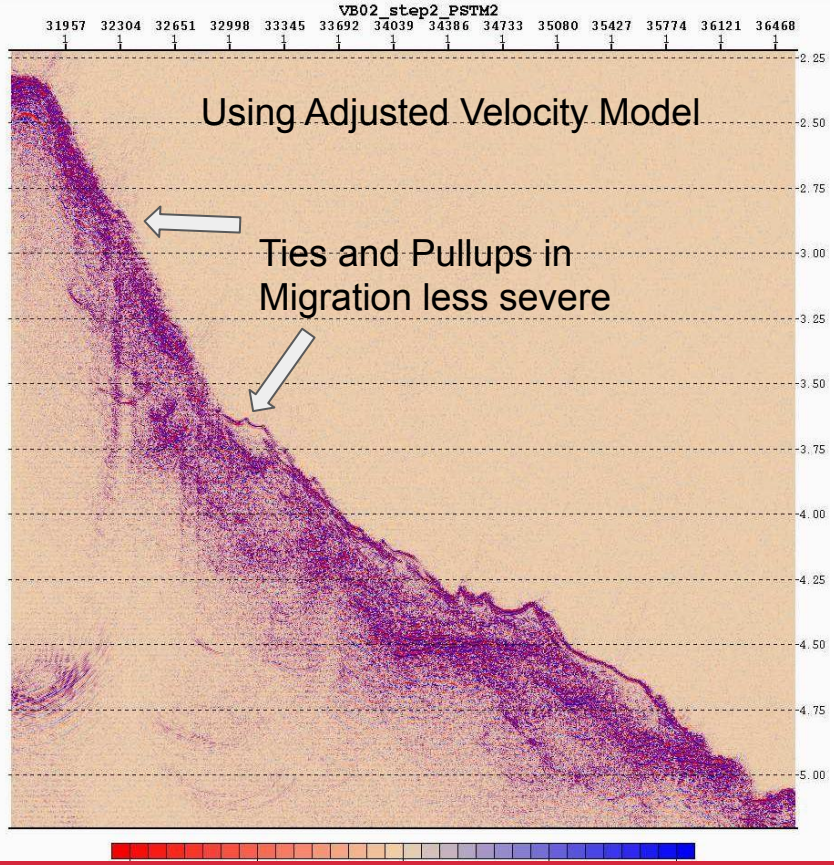
Adjusted Velocity Model



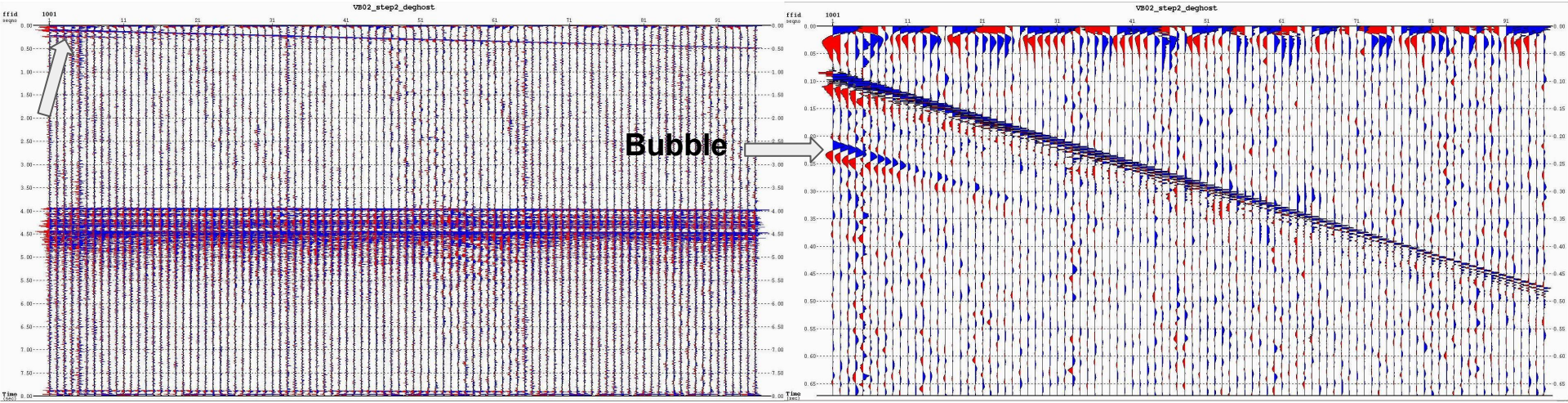
Time-Velocity Pair Every 1000 CDP but
Time-Velocity Pairs Every 50 CDP at weak areas

New Velocity Model and Adjustment to Migration

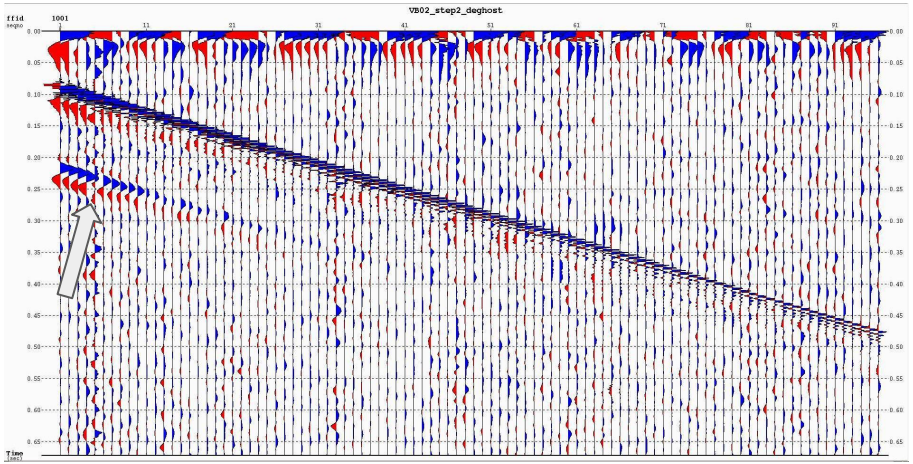


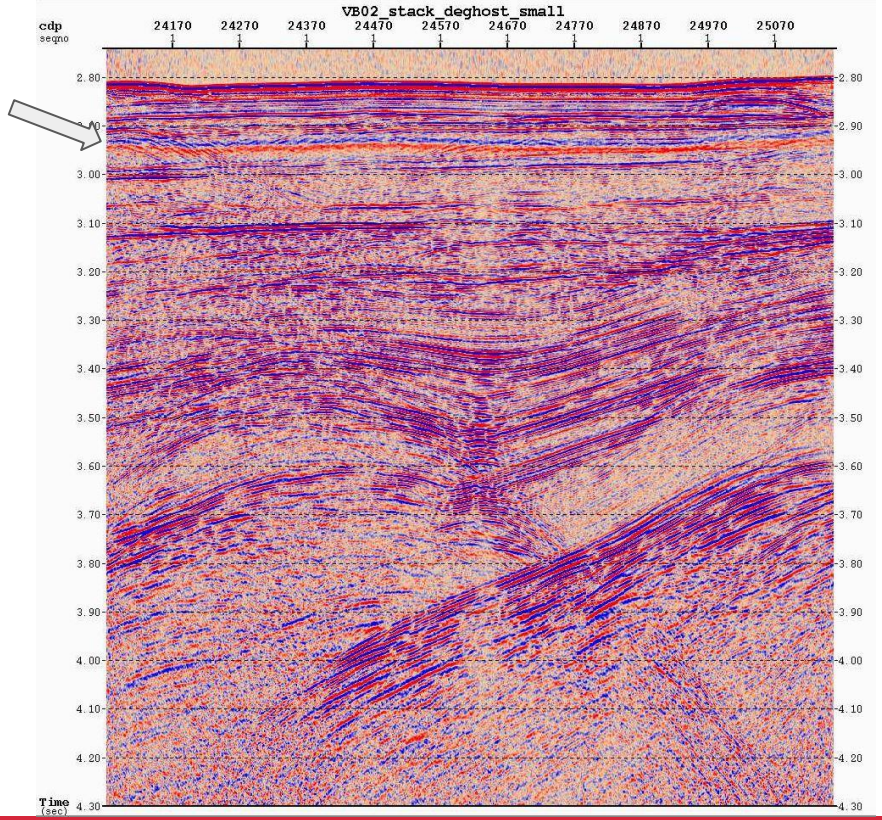


Debubble - Creating Matching Filter



Debubble - Creating Matching Filter

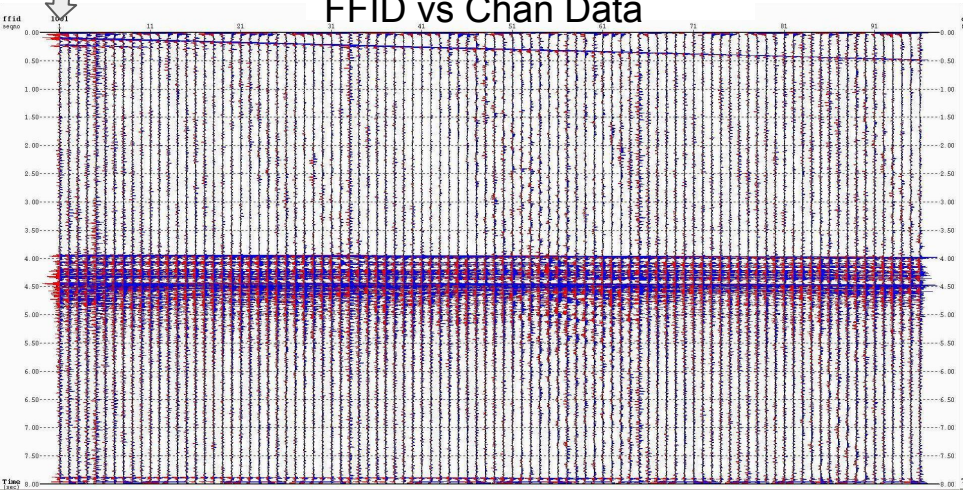




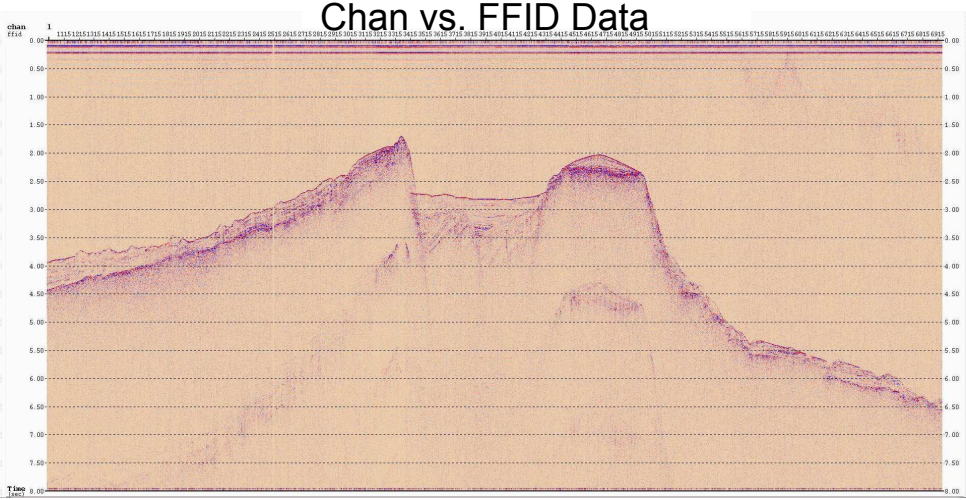
Debubble - Creating Matching Filter

Grab near trace for all shots

FFID vs Chan Data



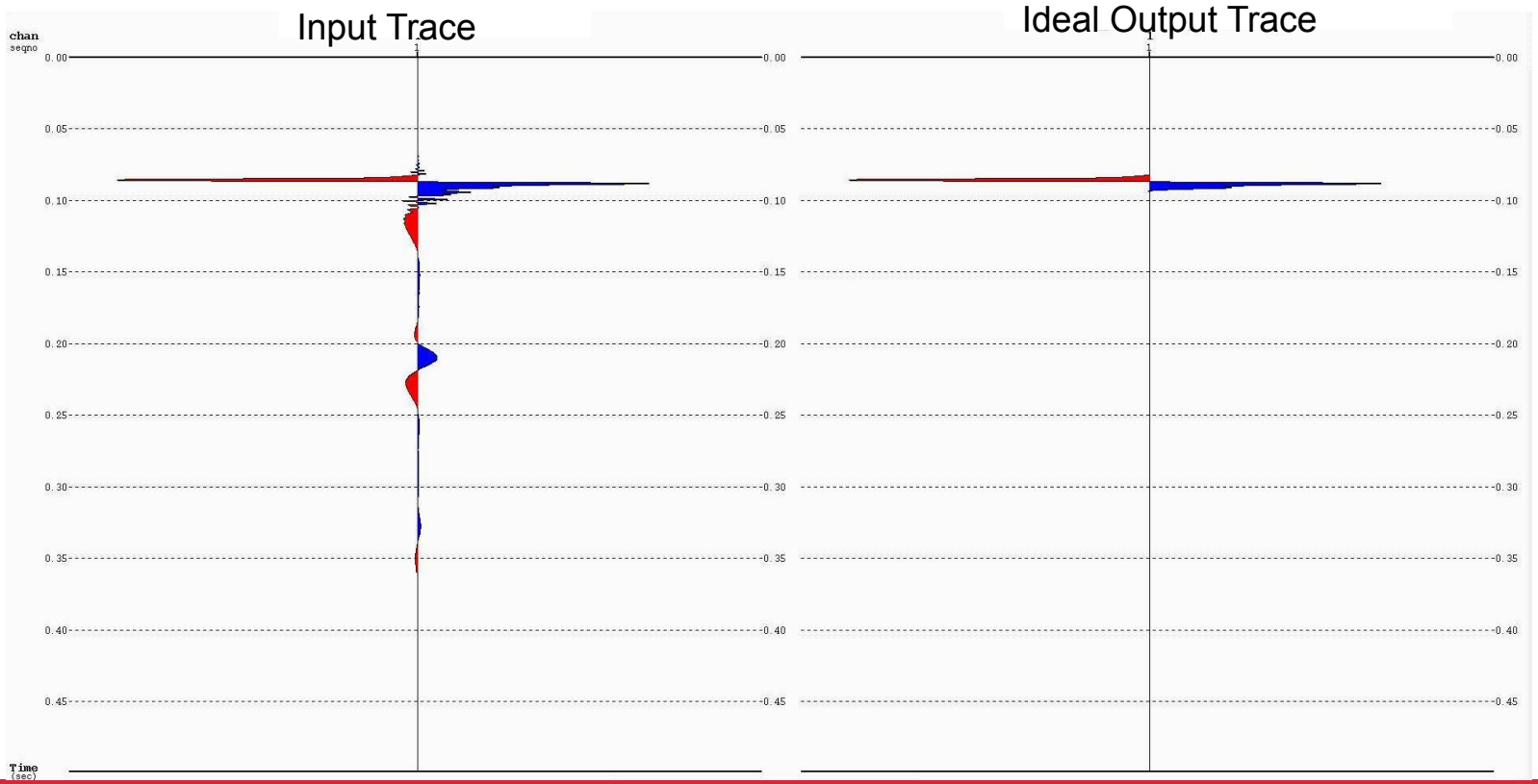
Chan vs. FFID Data



(1) Order to chan vs ffid
(2) Mute after 360 ms using GAIN
(3) Stack traces to form “ideal” input trace

Debubble - Creating Matching Filter

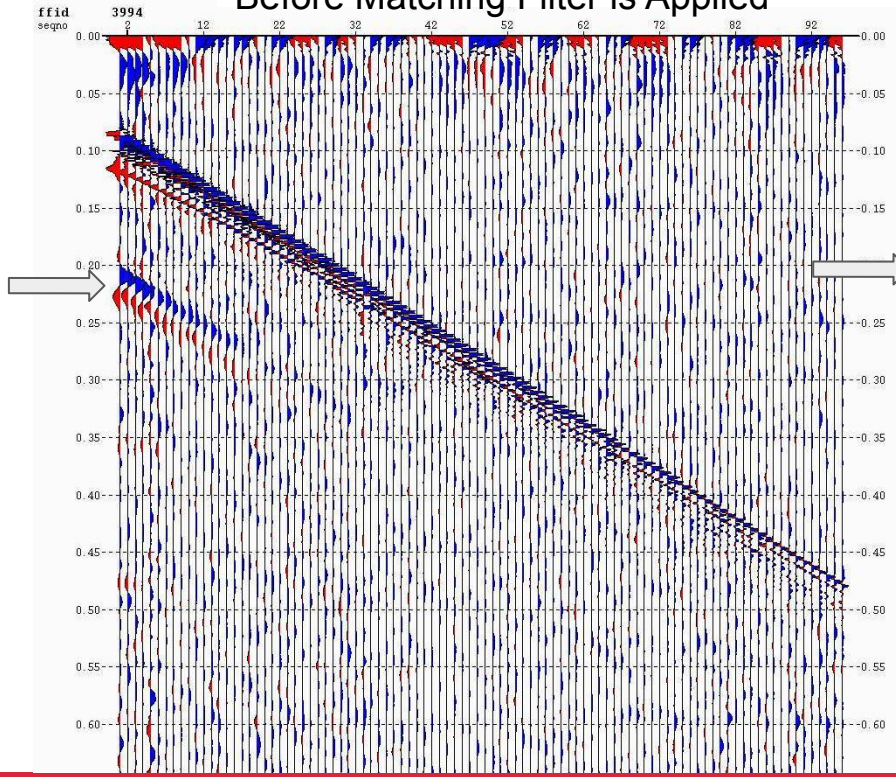
Used Gain to mute portions of trace



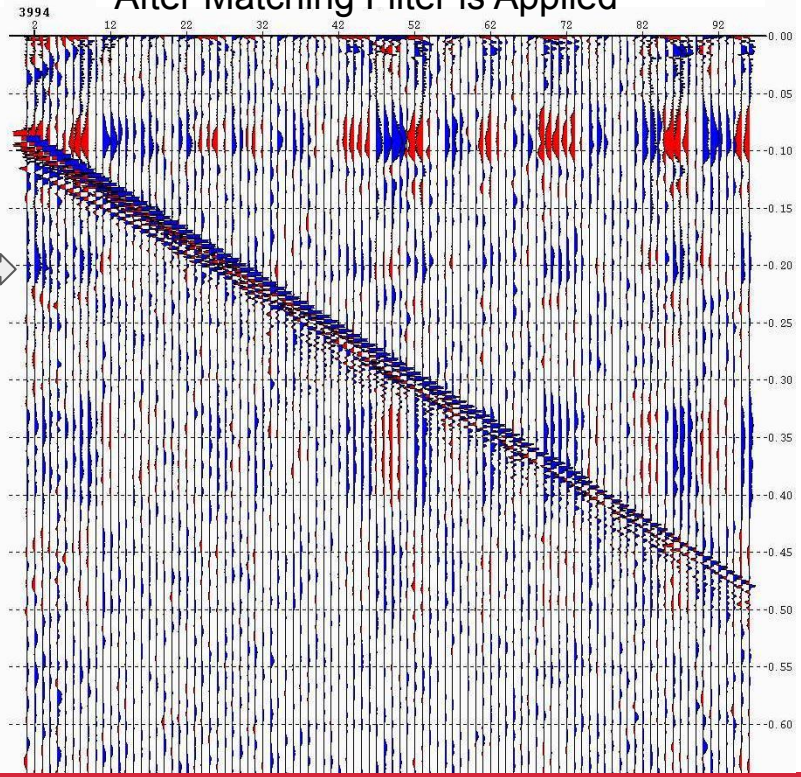
Debubble - Before and After

Matching Filter Length: 512 points

Before Matching Filter is Applied



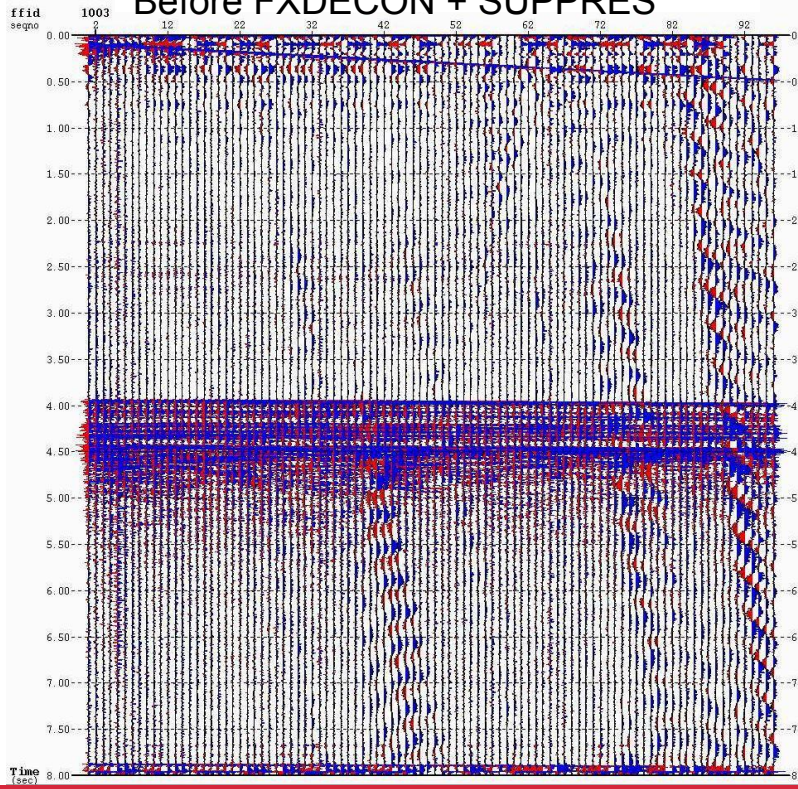
After Matching Filter is Applied



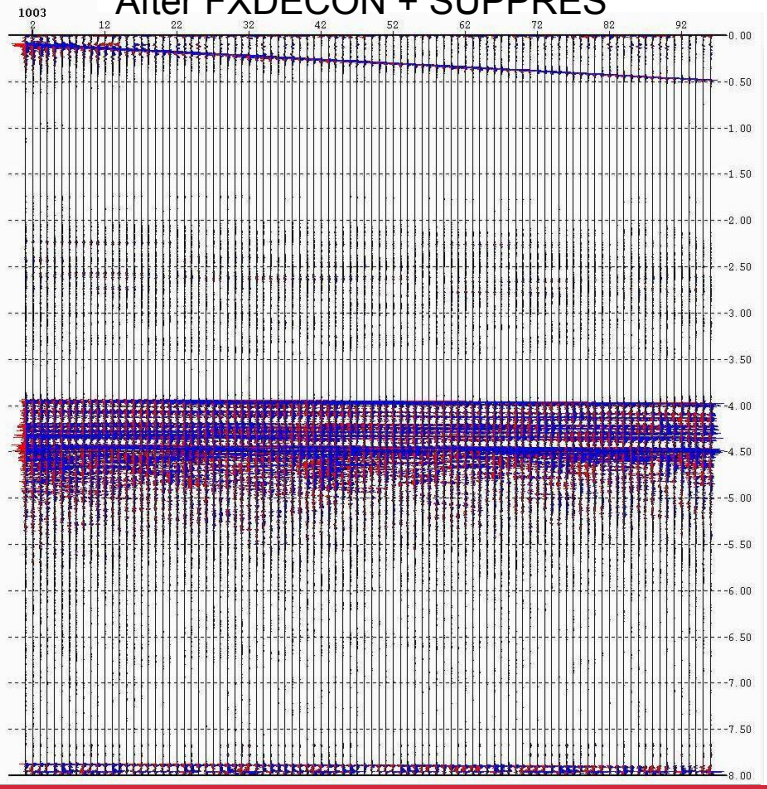
FX-Decon (Random Noise)

FXDECON Time length of window: 100 ms
SUPPRES Frequencies: 0 - 20 Hz

Before FXDECON + SUPPRES

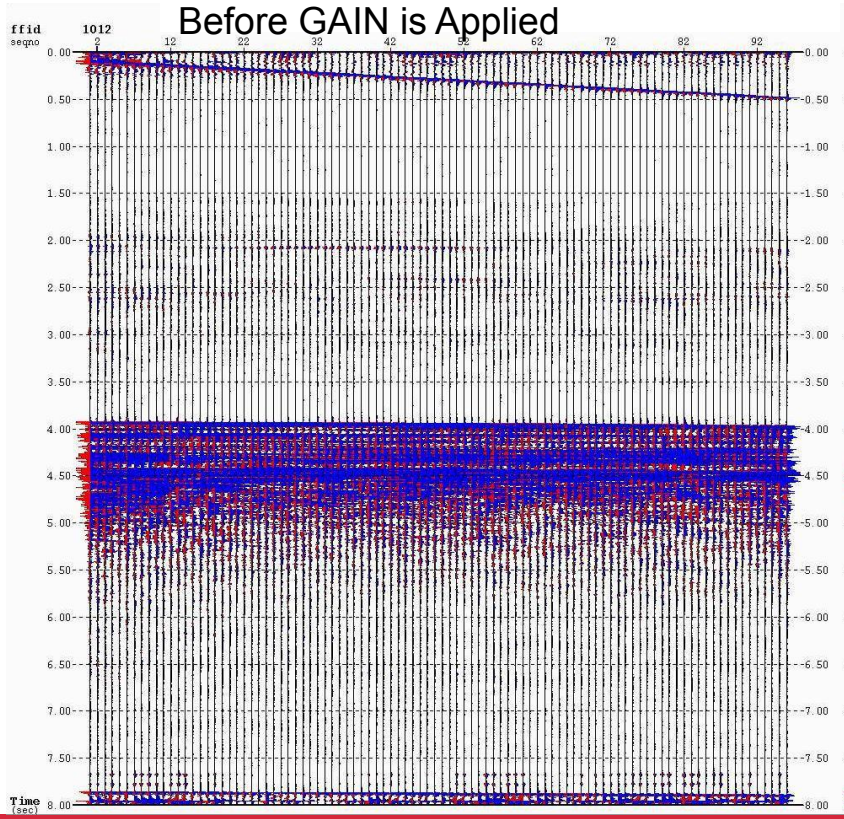


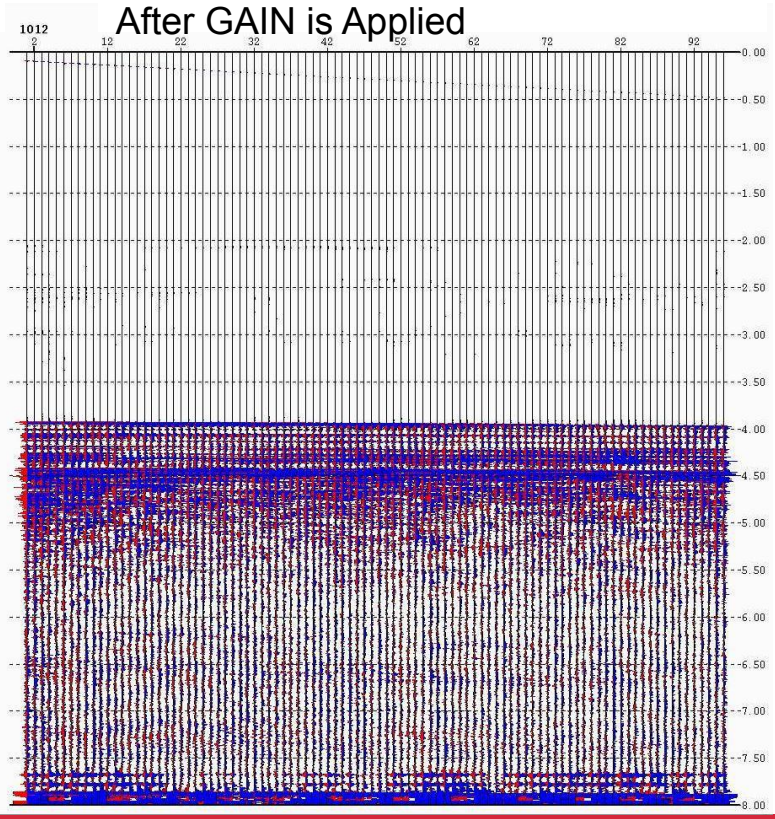
After FXDECON + SUPPRES



Gain (Spherical Divergence)

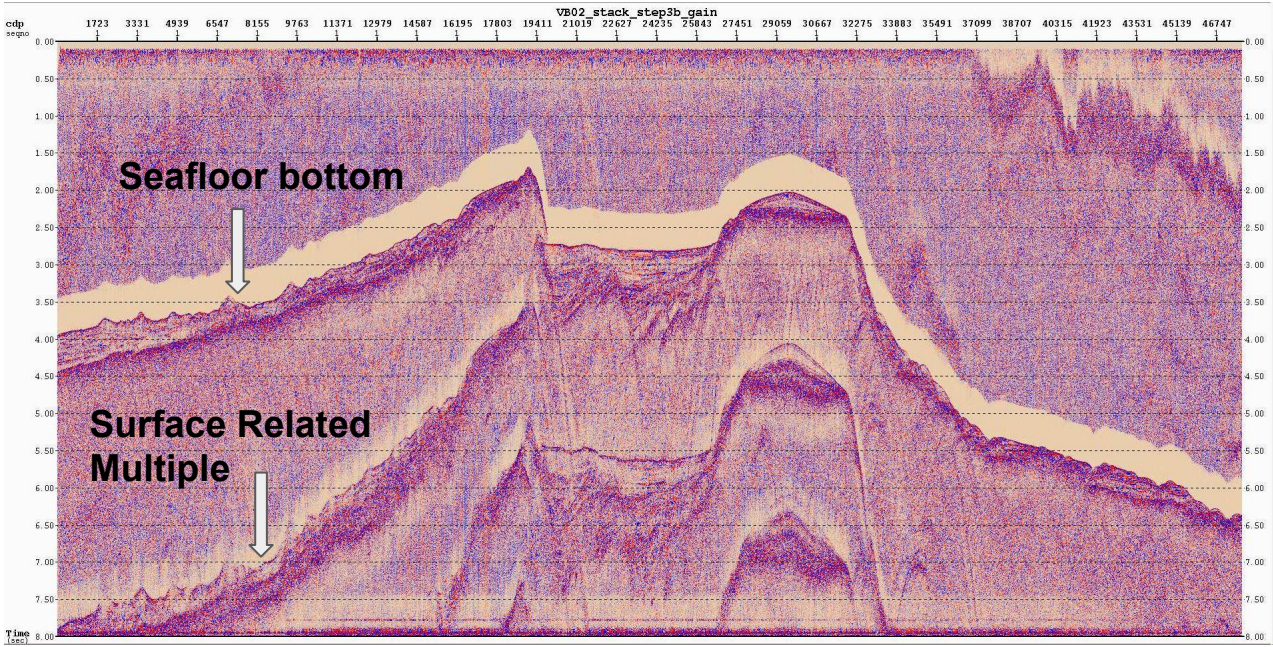
TOPTION = 1
VOPTION = 2





Surface Related Multiples

- Multiples are at large time values
- One way to remove multiple is to perform surface related multiple attenuation (SRMA)
- In order to perform, needs the ghost signal and direct waves removed

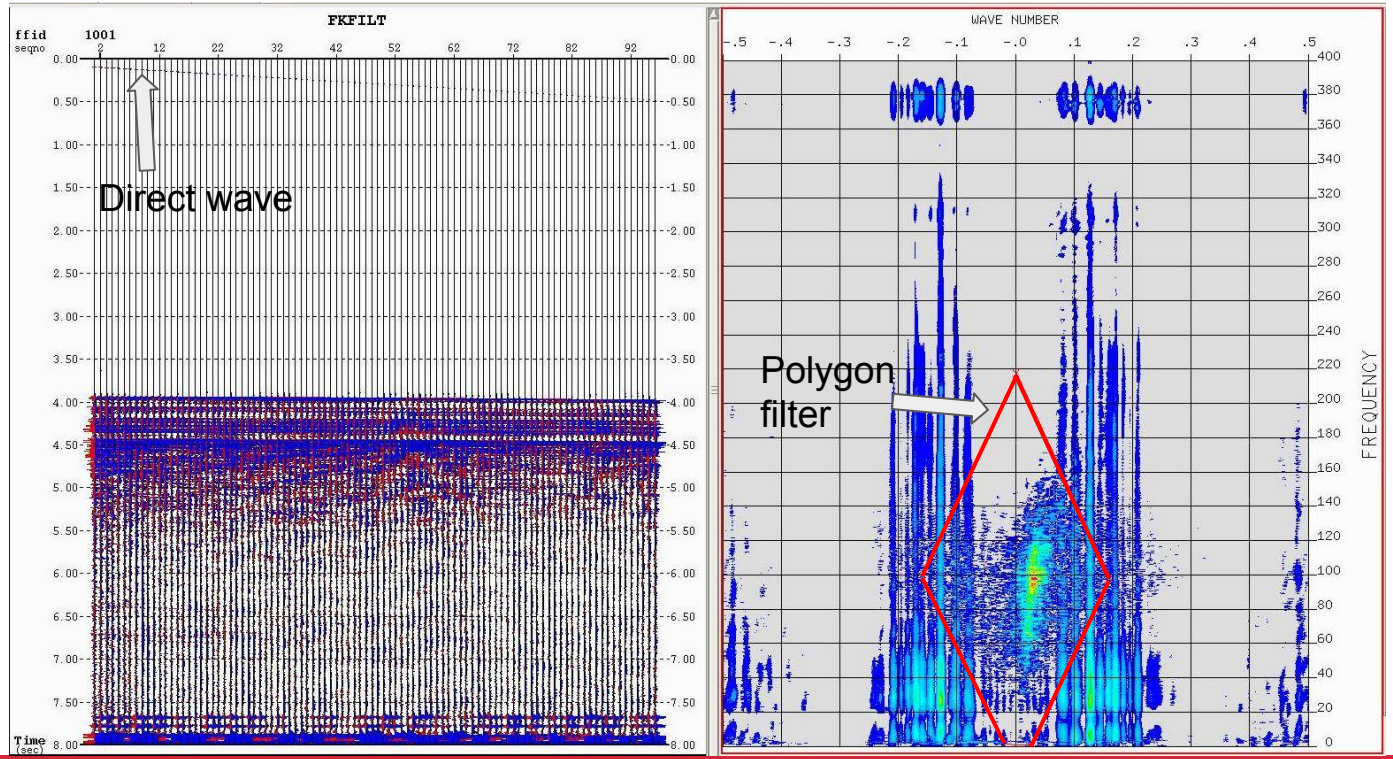


Remove Direct Wave (Linear Noise)

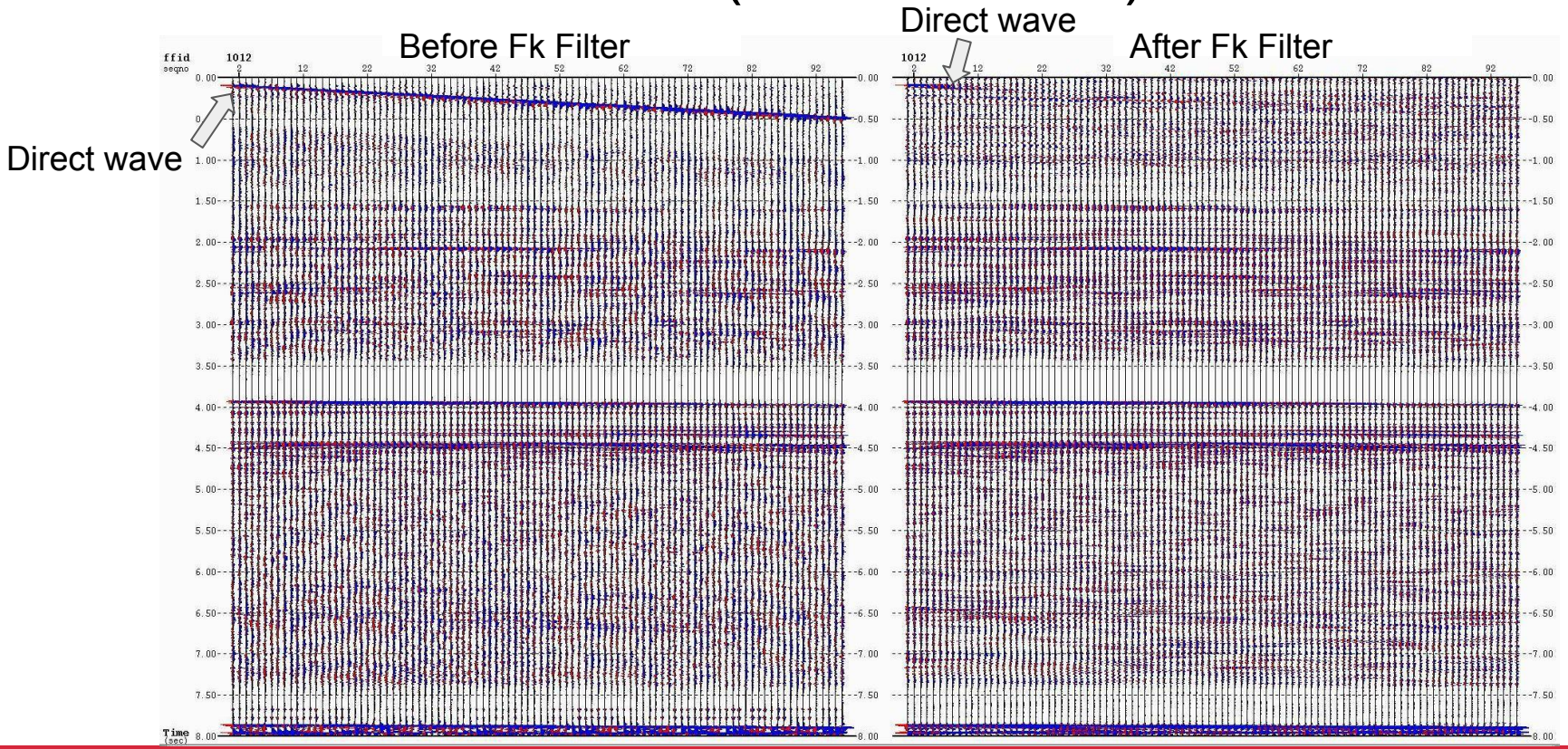
Need to remove linear noise. Ways:

(1) FK Filter
(2) Mute
(3) Radon Filter

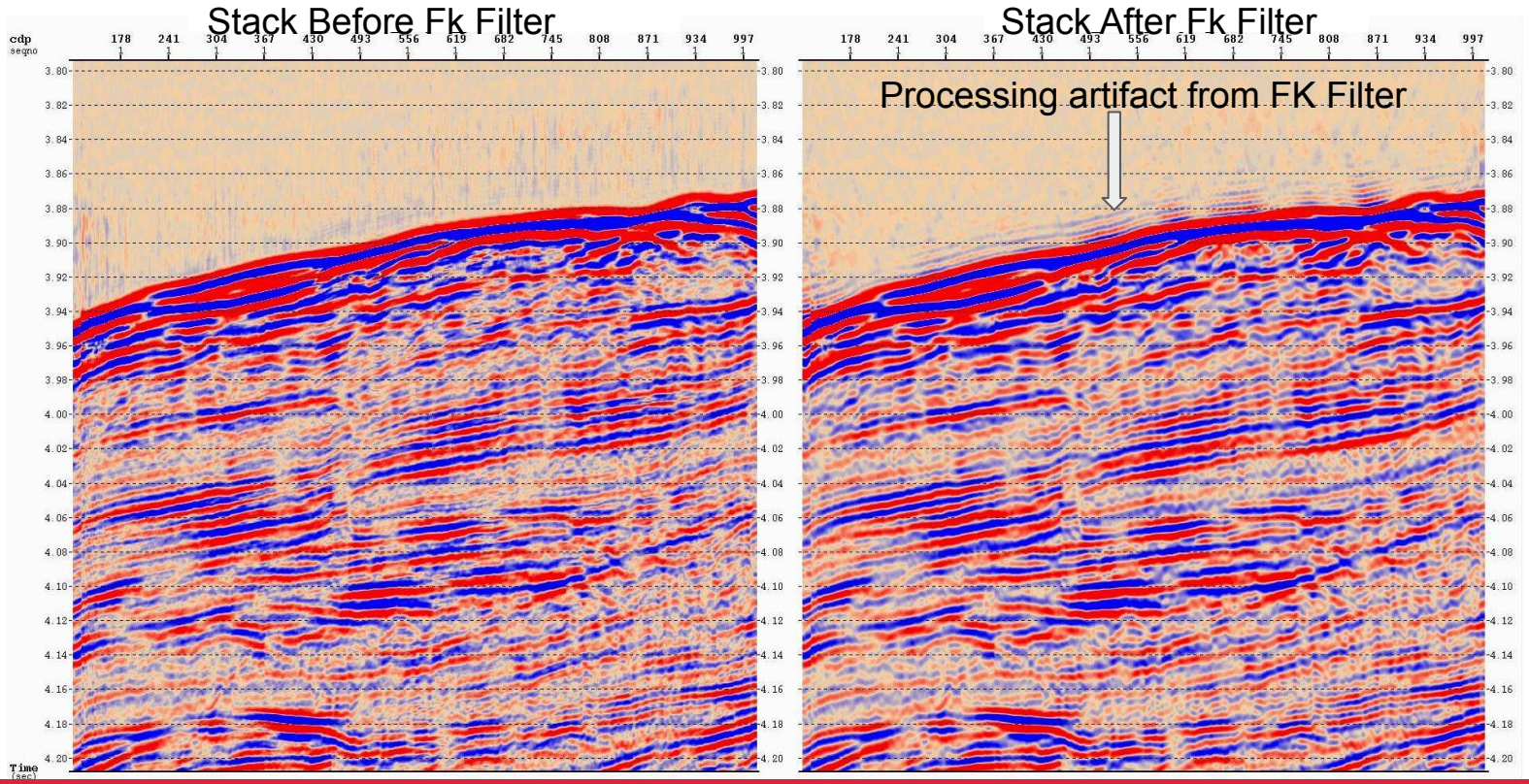
FK Filter tested with polygon filter:



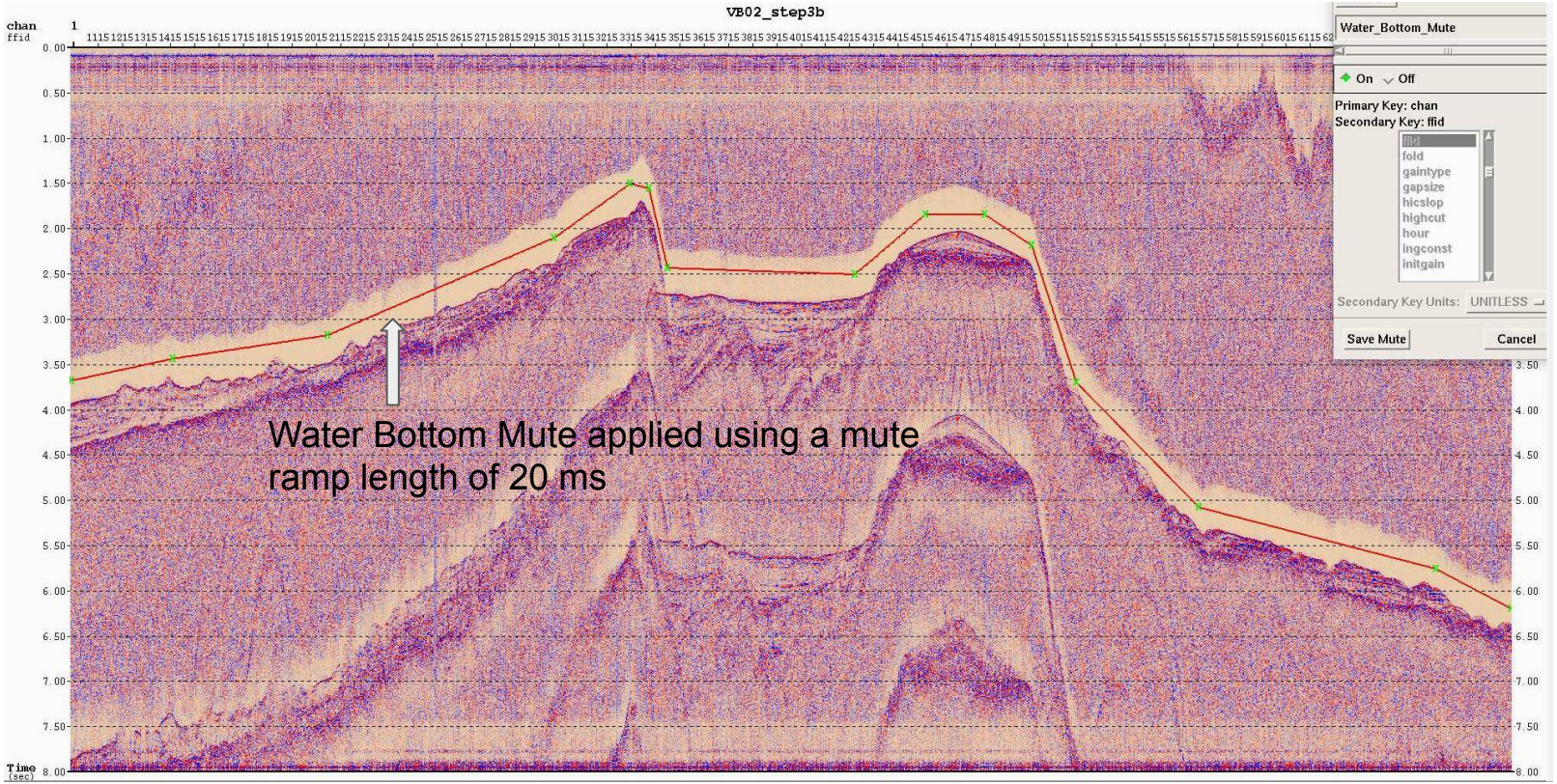
Remove Direct Wave (Linear Noise)



Remove Direct Wave (Linear Noise)

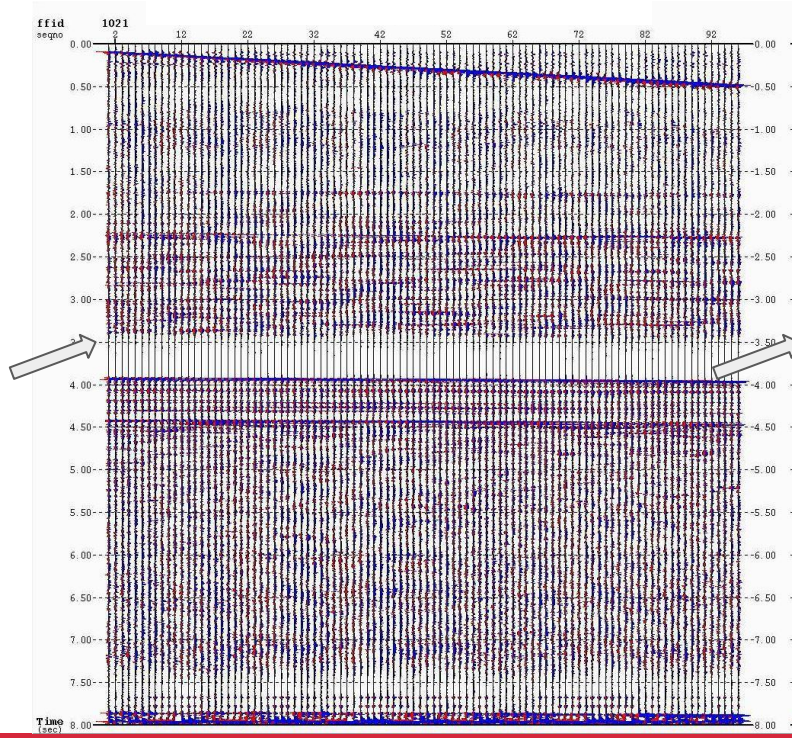


Remove Direct Wave (Linear Noise)

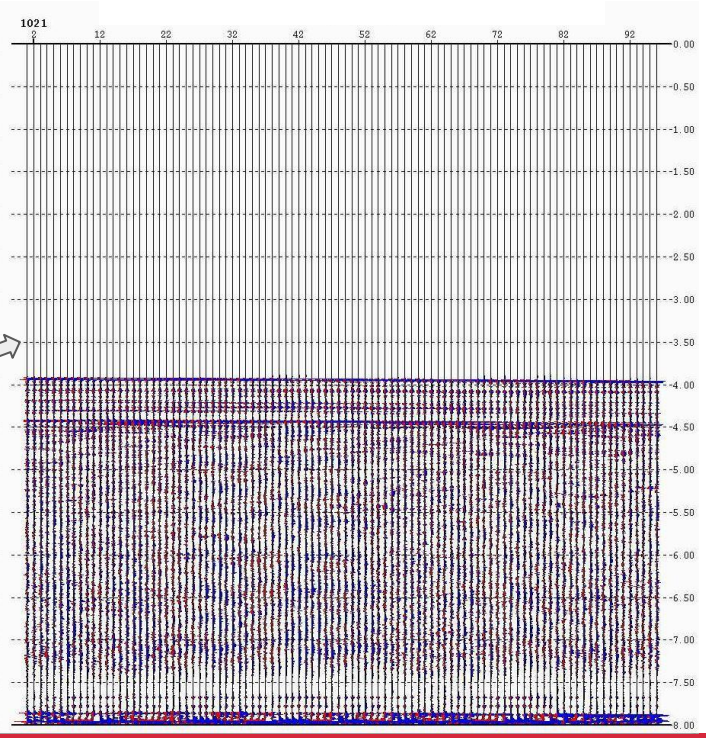


Remove Direct Wave (Linear Noise)

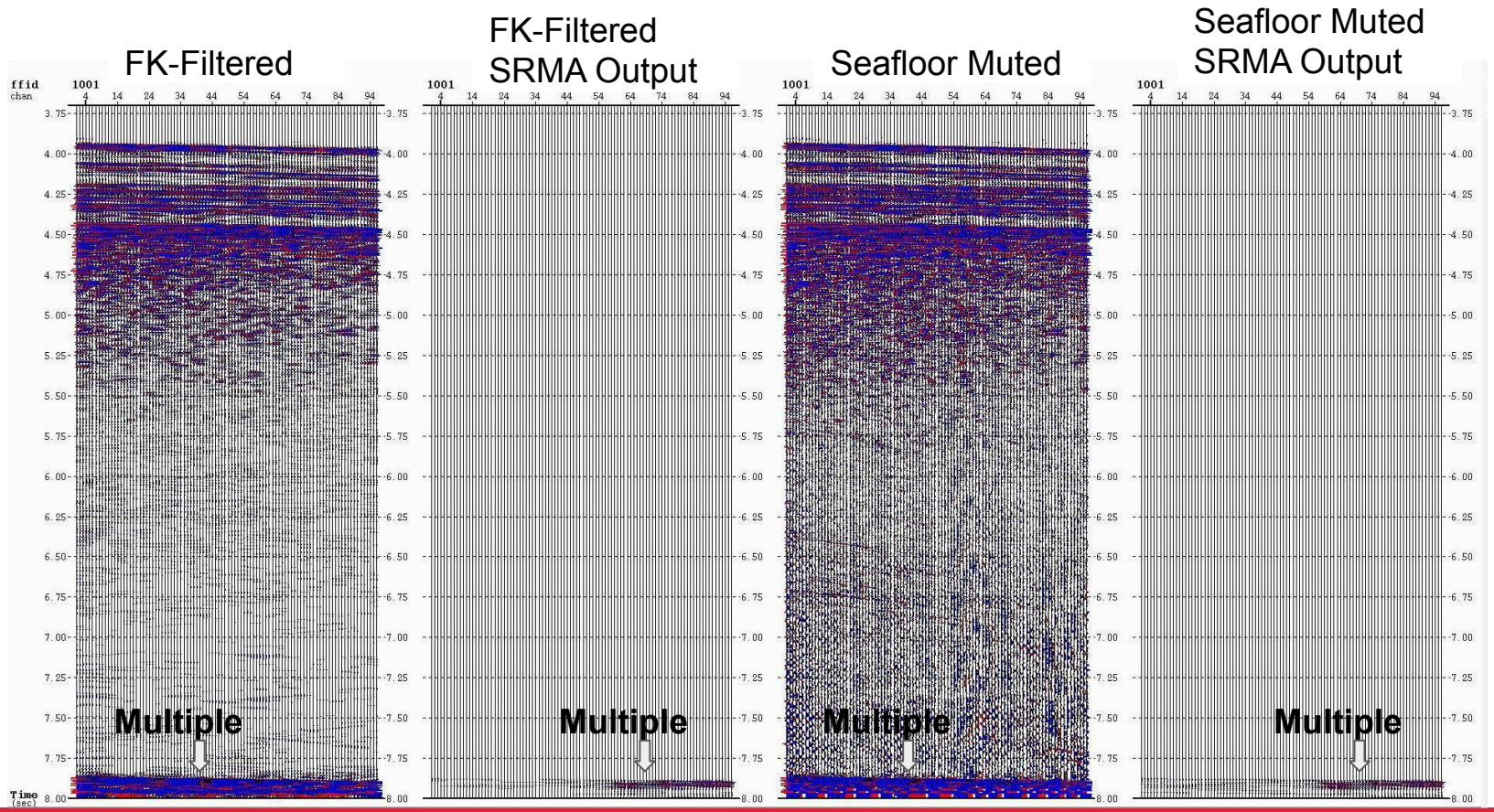
Before Water Bottom Mute



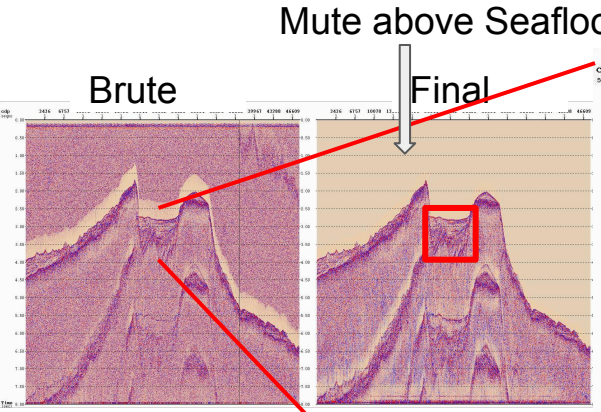
After Water Bottom Mute

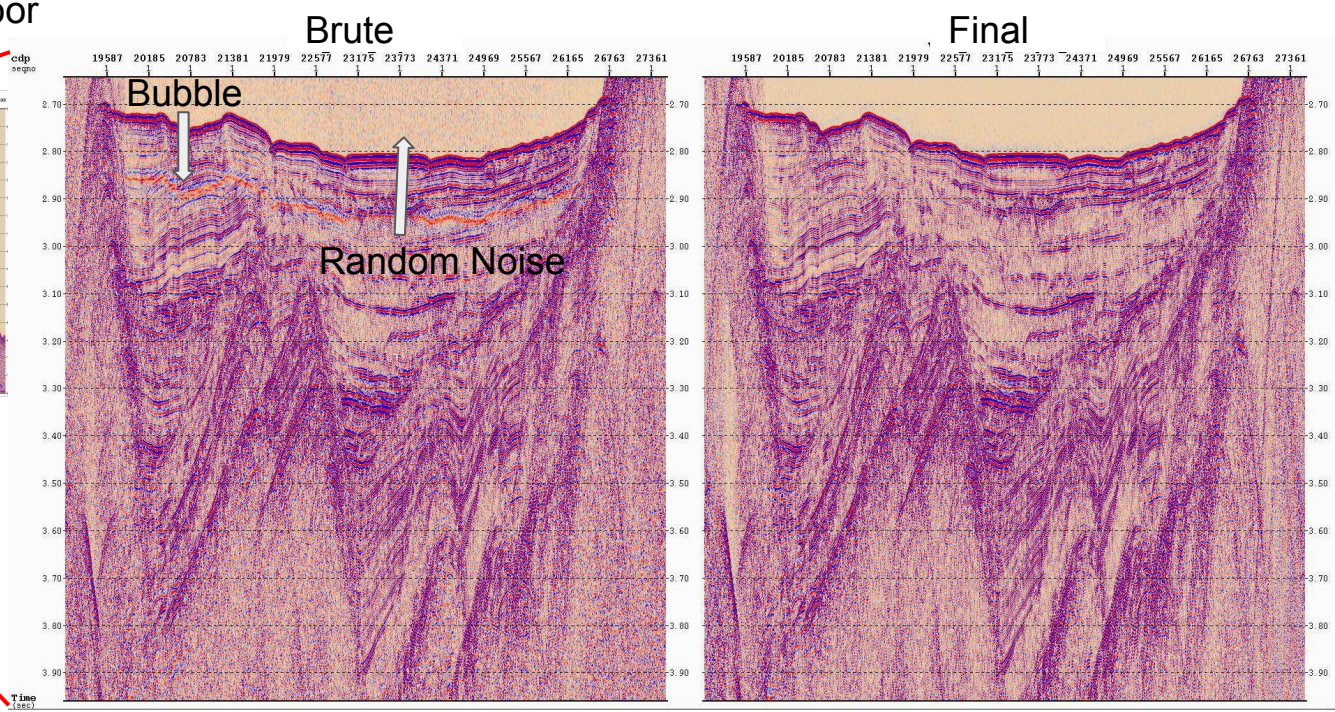


SRMA (FK Filter vs Mute)

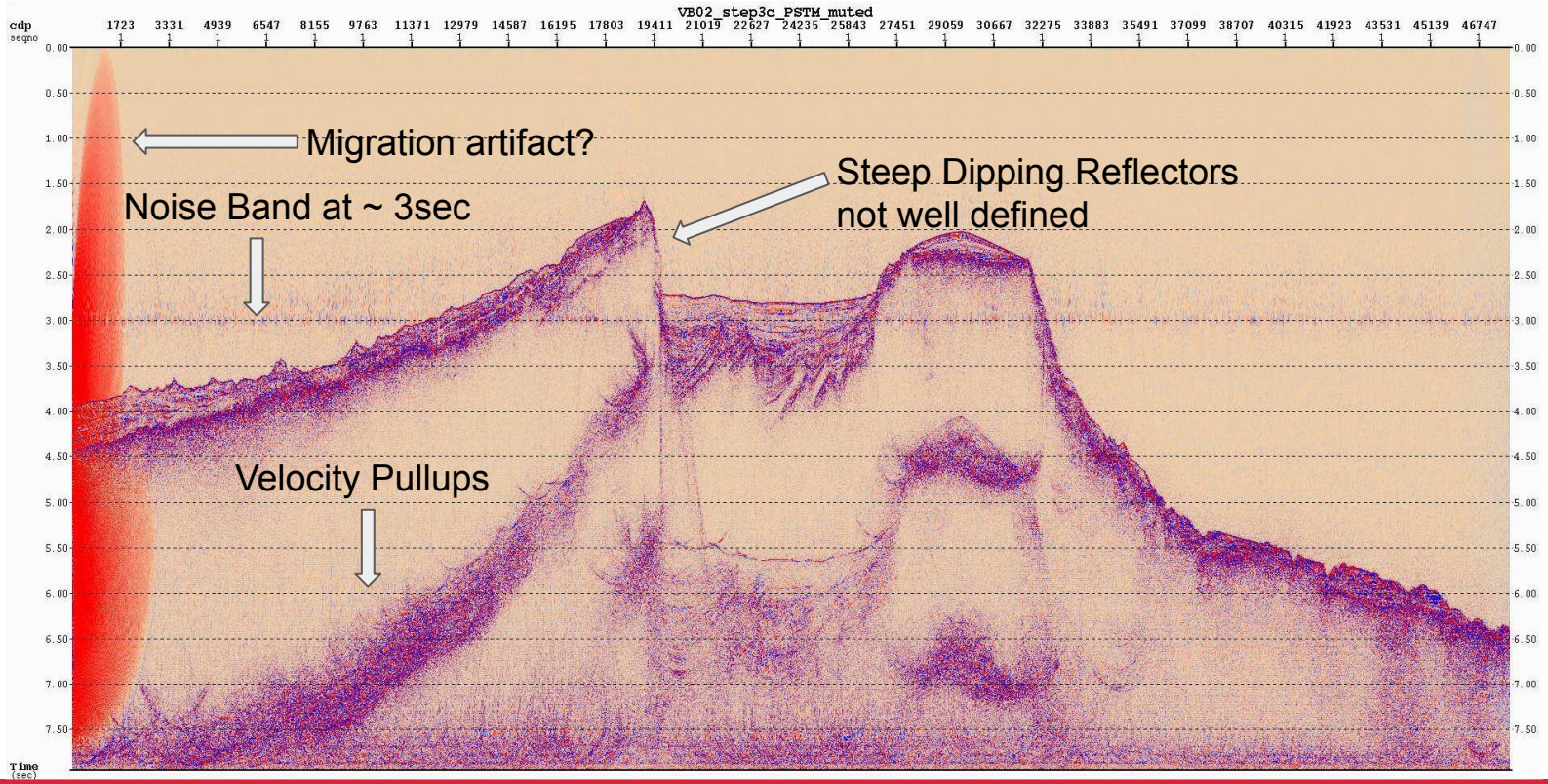


Brute Stack + AGC vs. Final Stack + AGC

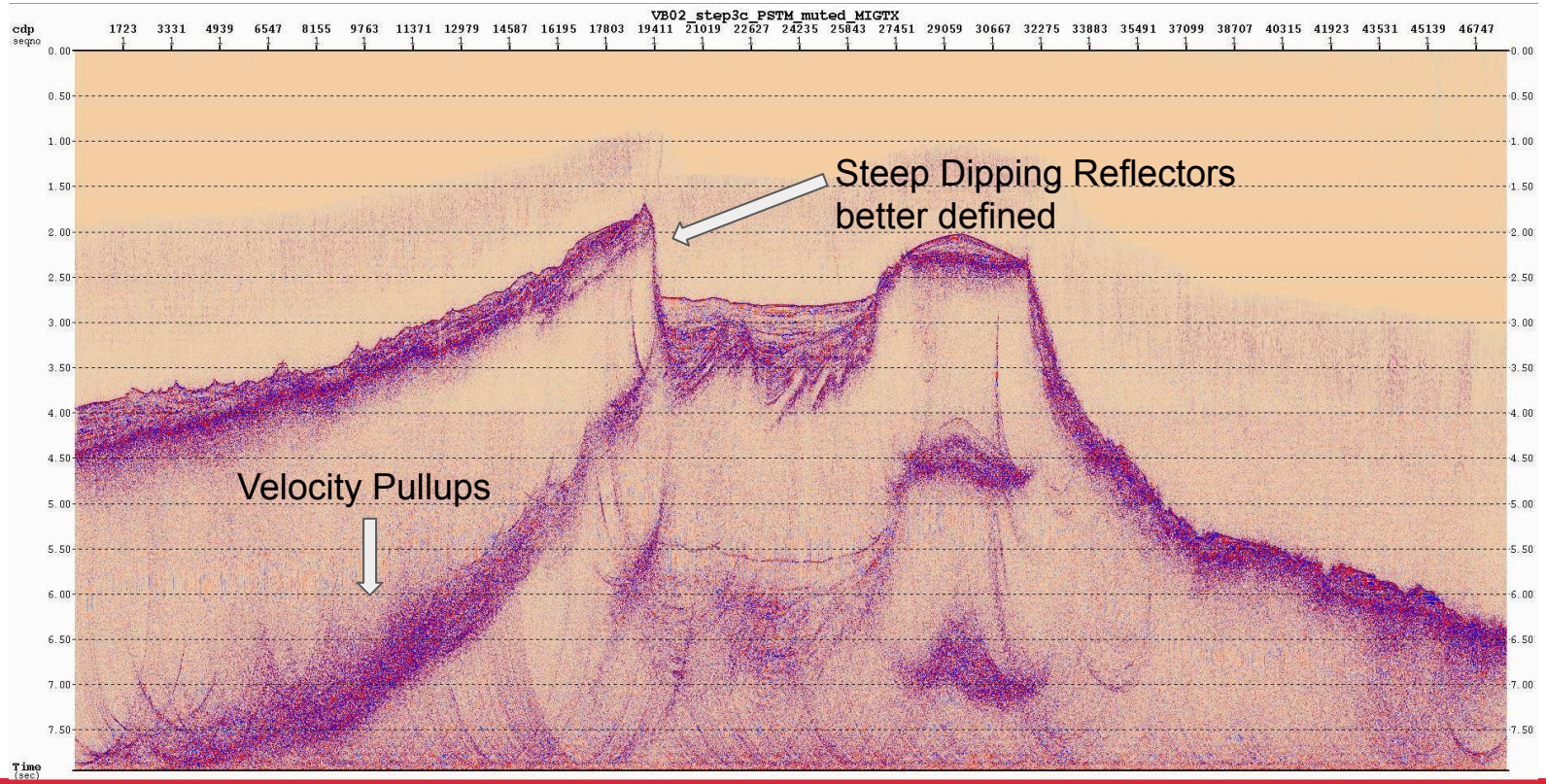




Final Post-Stack Migrated Section (MIGRATX)



Final Post-Stack Migrated Section (MIGTX)



Suggested Future Work

1. Velocity model needs updated again for weak areas in migration
2. Radon Filtering to remove linear noise
3. Finish the SRMA process on the data
4. Mute above the seafloor after migration, not before
5. Test different migration techniques and different migration parameters

Questions?