

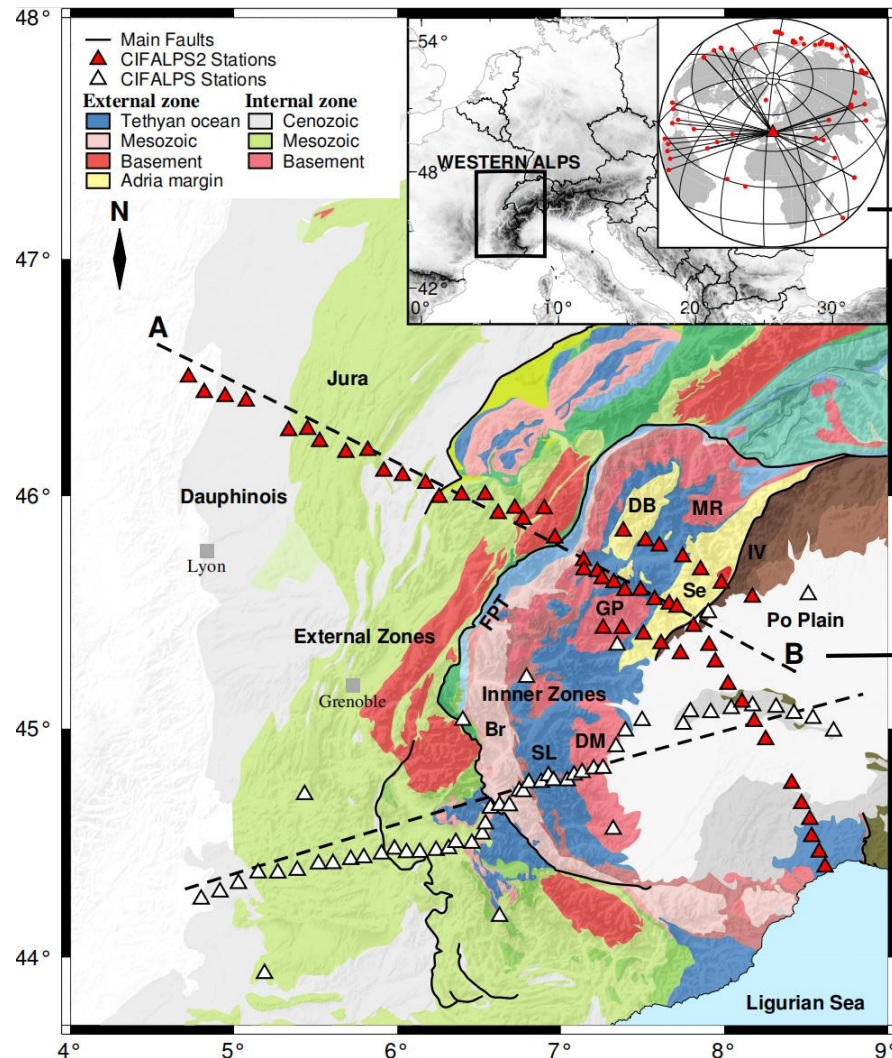
Configuration of continental subduction beneath the Western Alps: results using forward modeling of receiver functions and gravity data

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1. Introduction

Station distribution and Event distribution on a Geology Map



Geology Map from Schmid et al., 2004

Events distribution of Receiver functions.

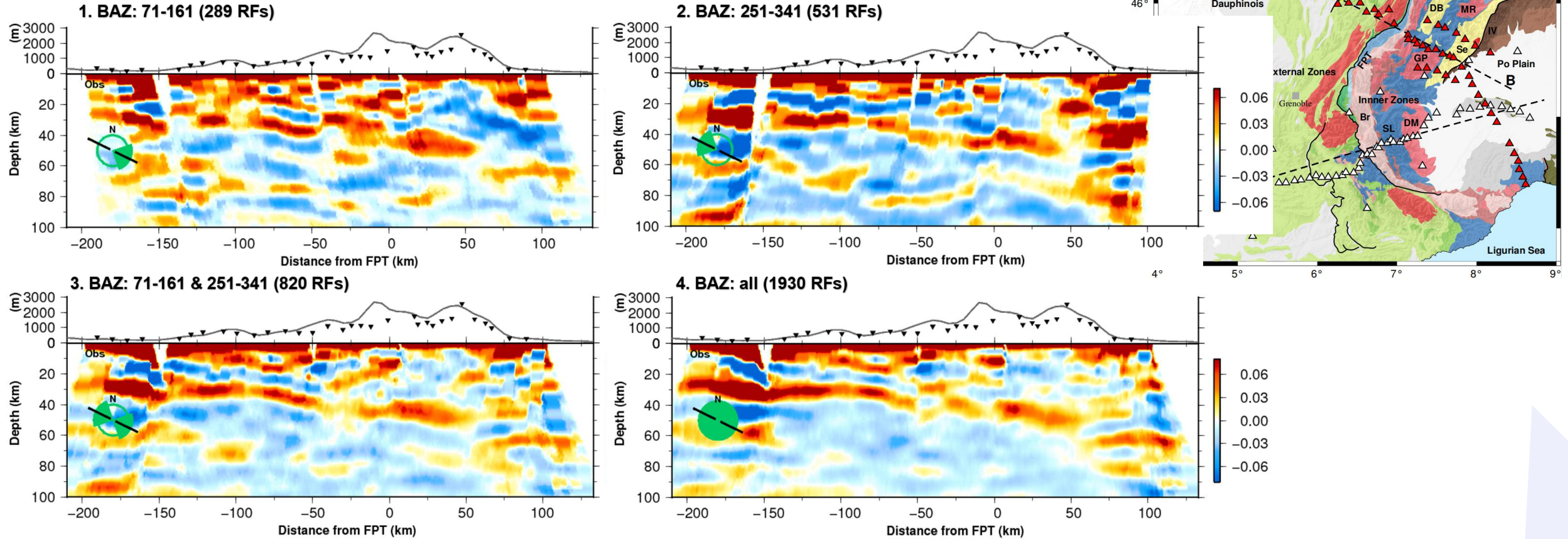
We only use events with back-azimuths from both side of profile azimuth (71-161 and 251-341), and with magnitude $M_w < 5.5$ and epicentral distance range between 20° and 95° .

Dash line AB: CIFALPS-2 reference profile (trending 116°)

Station arrays operated from 2018-2020, only stations with projection distances to profile less than 35km were used

2. Method and result

Receiver Functions with different range of back-azimuth



Different BAZs (indicated by green pie) yield to different CCP images. The 3rd image is selected to display, for its better RFs coverage and less 3D structure effect, which is appropriate for comparison with 2D sythetic CCP image.

2. Method and result

RF Modelling

observe data

obs RF

obs CCP section

Velocity model

synthetic data

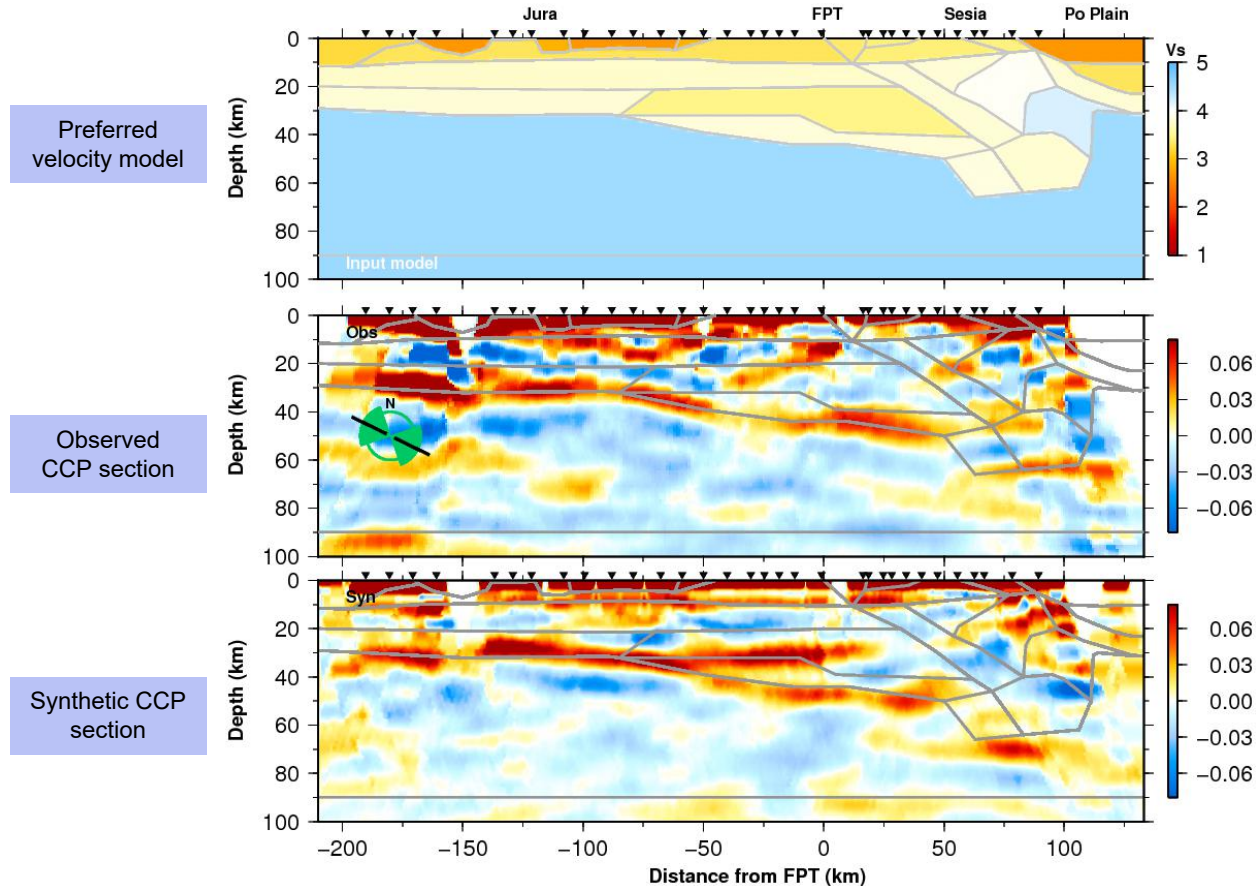
syn RF

syn CCP section

1. Waveform modelling (Zhao et al., 2008, 2014)

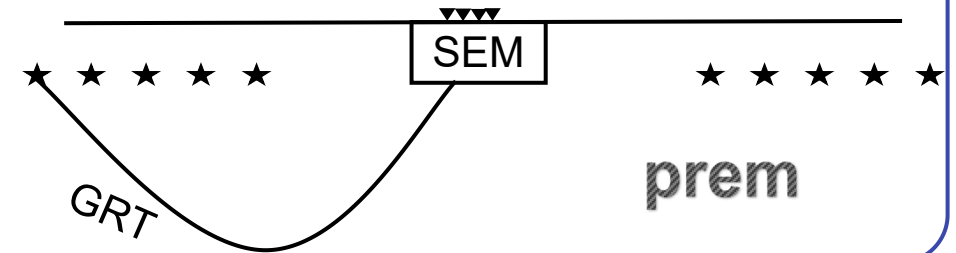
2. Calculate RFs

3. Migrated and Stacked

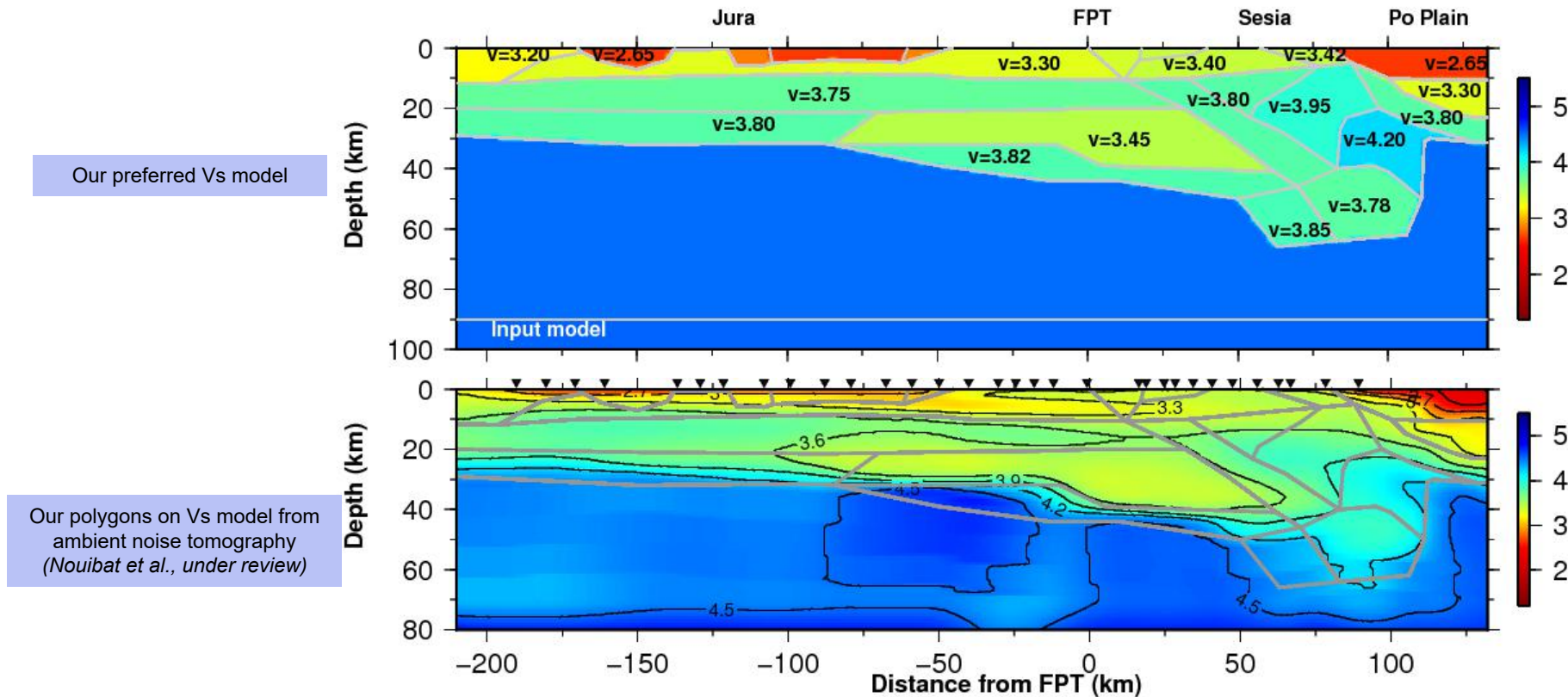


Waveform Modelling: Hybrid forward method

- Generalized RayTheory (GRT): For global simulation
- Spectral Element Method (SEM): For local simulation



2. Method and result



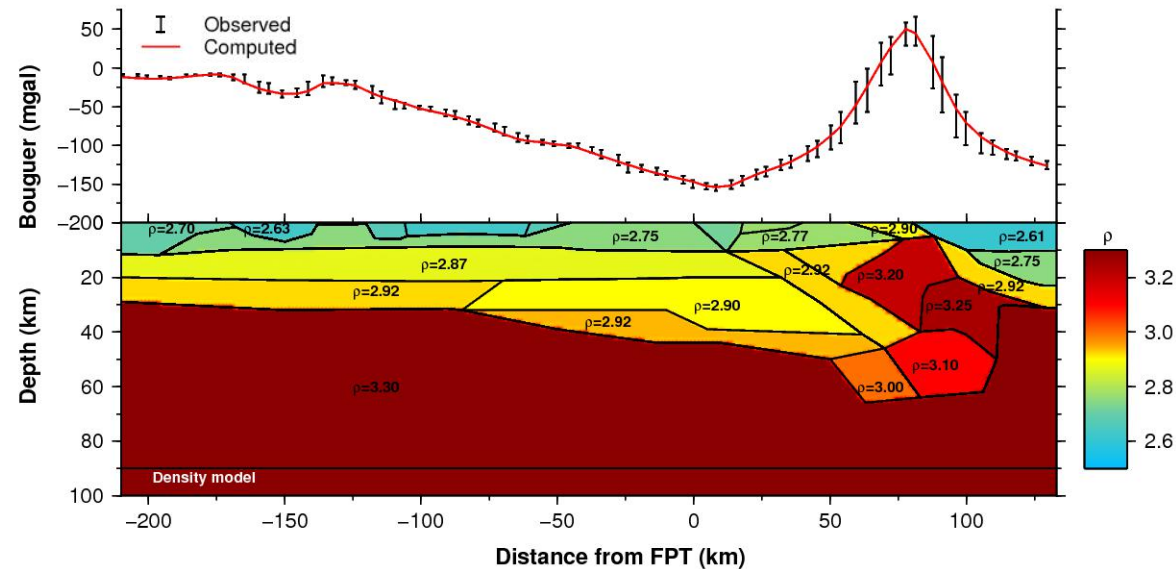
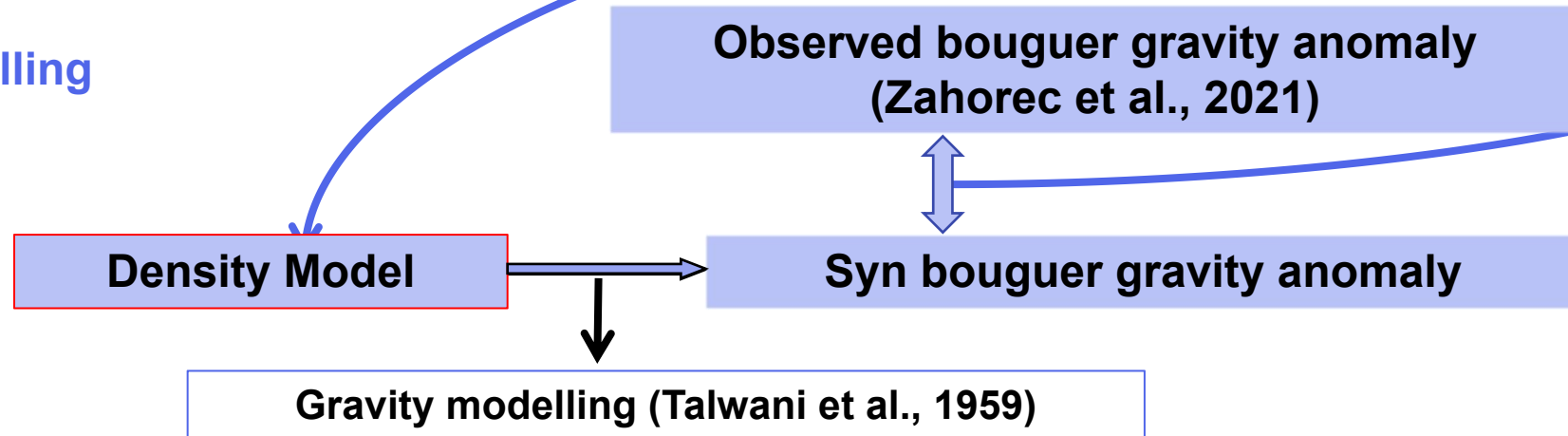
During this work, the initial input velocity model is built based on the geology map (Schmid, 2004) and V_s model (Nouibat et al., under review).

According to our acknowledge and the gradient of V_s contour, the V_s between 3.0 to 3.4 is considered as upper crust (V_s uniformly set as 3.30), the V_s between 3.4-4.2 as middle-lower crust ($V_s = 3.8$). Besides, the European low-velocity lower crust ($V_s = 3.45$) has been divided separately, and the high velocity mantle wedge has divided into upper and lower Ivrea body, and serpentinized mantle.

Then, we continuously modify the polygons as well as V_s , density values, and do a series of modelling to make sythetic CCP image fit observed CCP image better.

2. Method and result

Gravity Modelling



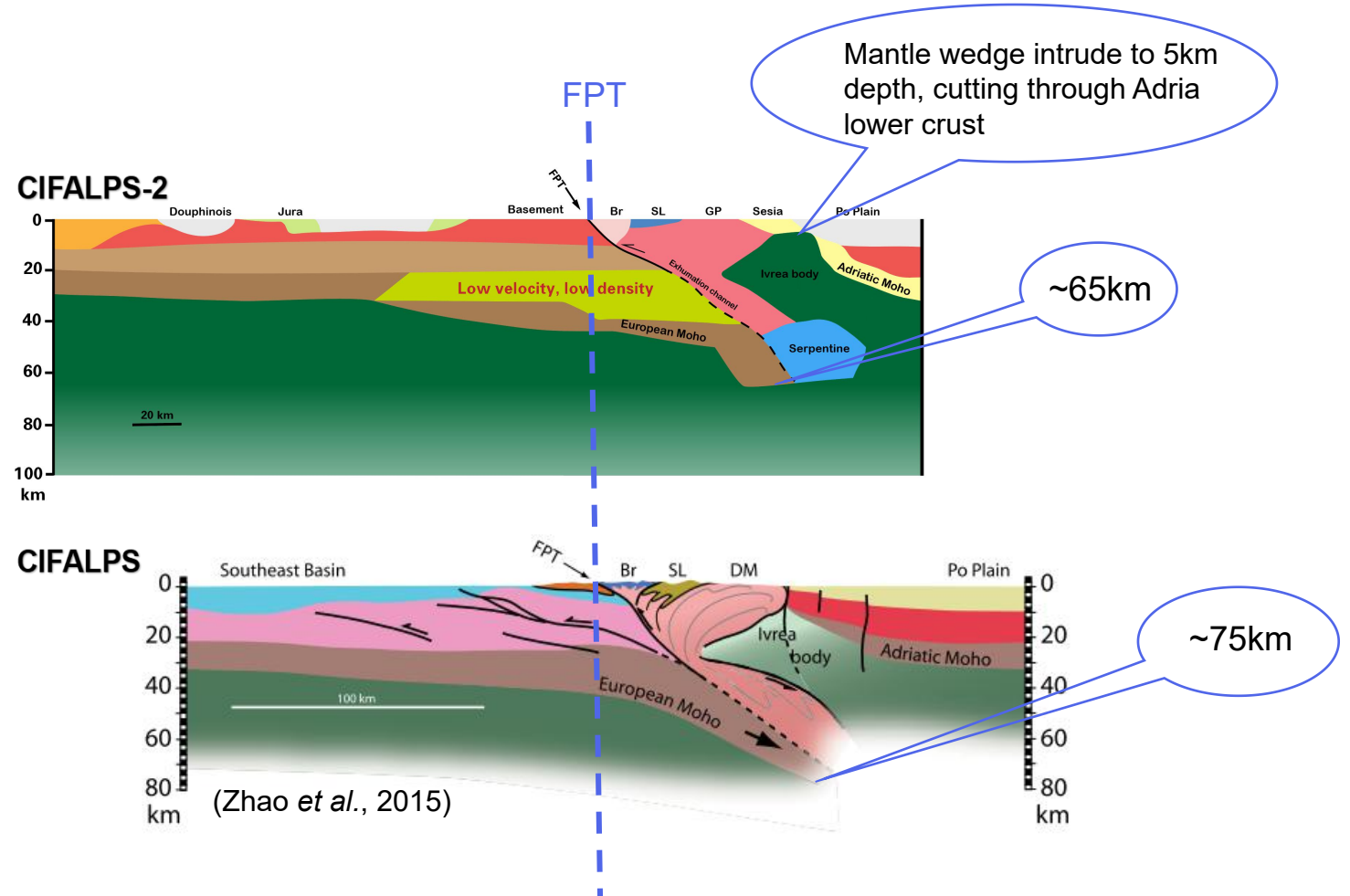
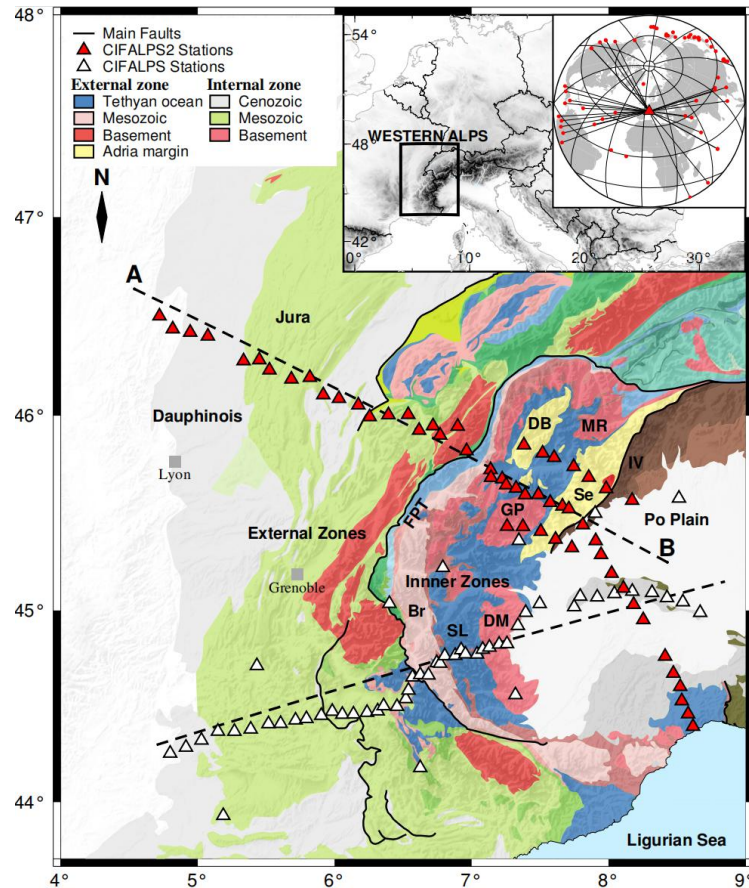
Empirical relationship between density (ρ) and P wave velocity (α):

$\rho = 1.6612\alpha - 0.4721\alpha^2 + 0.0671\alpha^3 - 0.0043\alpha^4 + 0.000106\alpha^5$ (Nafe and Drake, 1957, Ludwig et al. 1970, Brocher 2005) for Crust

$\rho = 0.26\alpha + 1.25$ (Perrier and Ruegg, 1973) for Sediment

$\rho = 0.275\alpha + 1.13$ / $\alpha = 0.3.636\rho - 4.109$ (Christensen, 2004 ; Reynard, 2013) for Ivrea body and Mantle wedge

3. Results and discussion



Many characters are different from CIFALPS profile, which will be discussed later in my future work.

Thanks!

Any comments are welcome