Dear authors,

Your paper is almost ready for publication provided that you apply the few minor corrections listed below. Once again, the line numbers refer to the authors's tracked change manuscript, and not to the last version of the manuscript.

Dear Anne Paul,

Again, thank you very much for reviewing our manuscript. Please find our detailed replies in blue below.

- L. 18 (abstract): "a short western Alpine slab whose surface trace ends about 100 km from the Penninic front"? According to the corresponding part of the discussion l. 521), you rather mean "a short western Alpine slab whose easternmost end is located at about 100 km depth beneath the Penninic front". Please correct.

Yes thank you

- L. 47-55: you cite a number of papers on seismic refraction and reflection surveys, local earthquake tomography studies, etc. but none of these lists is complete. You should then either cite all relevant papers, which are numerous, or as a stop back, start all lists with "e.g.".

Okay, done

- L. 50: you cite Fry et al. (2010) and Molinari et al. (2015), and not the first paper published on ambient-noise tomography of the Alps, which is Stehly et al. (2009, doi: 10.1111/j.1365-246X.2009.04132.x). You should at least add this one.

Okay, done

- L. 242: you probably mean "data base" rather than "data basis"

No, we mean data basis here

- Caption of Fig. 5: "will get visible WHEN (?) analysing resolution capabilities"

Yes, thanks

- L. 454, 456: rather than "Ivrea zone" (which is a surface outcrop of low-velocity rocks), you probably mean "Ivrea body" (which is the high-velocity, high-density anomalous body at 10 km depth beneath the Ivrea gravity high of the western Alps).

Yes that is right thank you

- L. 506-508: I still disagree with your argument on the influence of seismic anisotropy measured from SKS splitting analyses on the low-velocity anomalies. The SKS wave is split in a fast and a slow quasi-S waves when propagating through a transversely isotropic medium with a horizontal symmetry axis. As a consequence, both the fast-velocity and the slow-velocity directions measured from SKS splitting are horizontal. Therefore, the steeply incident teleseismic P-waves may be slower if their propagation plane is perpendicular to the fast directions, but they can be faster if it is parallel to the fast direction. As the orientation of the propagation plane depends on the source-receiver backazimuth and is highly variable, there is no single effect of reduction or increase in P-wave velocity. As analyzed by Bezada et al. (2016), the time delays of teleseismic P-waves are affected by anisotropy with dipping symmetry axes in subduction regions. You should read this paper and be more precise on its outcomes on teleseismic tomography around subductions, and the possible implications on your results.

From seismic wave theory we know that for an anisotropic medium the velocity of the quasi P-wave depends on propagation direction, i.e. incidence angle and azimuth, while the S-wave velocity depends on polarisation and propagation direction. For a transversely isotropic medium with fast symmetry axis the P-wave velocity is highest for a propagation direction parallel to this axis and hence slower for any propagation direction oblique and in particular perpendicular to this axis. For the case of a horizontal fast symmetry axis, subvertically propagating P-waves are slower than in the isotropic case regardless of the propagation plane which is determined by the azimuth only.

Bezada et al. (2016) analyse in their paper the effect of anisotropy on isotropic teleseismic P-wave tomography. They consider three different azimuthal distributions of seismic events and find for a subhorizontal fast symmetry axis that (Sect. 4 of their paper):

“All three cases present similar artifacts indicating that, regarding anisotropy, azimuthal coverage is of secondary importance when dealing exclusively with teleseismic arrivals. The primary factor is the subvertical orientation of the teleseismic ray-paths and their consequential sampling of the slower directions of regions with subhorizontal fast axes.”

This exactly confirms our view that for subhorizontal mantle flow behind the subducting Alpine slabs the subvertically propagating P-waves are slower than the isotropic average and thus could produce the low velocity regions behind the slabs in our tomographic model. We added another paragraph to the manuscript explaining the above results of Bezada et al. (2016) and their relevance for our tomography.

Kind regards,

Wolfgang Friederich and Marcel Paffrath