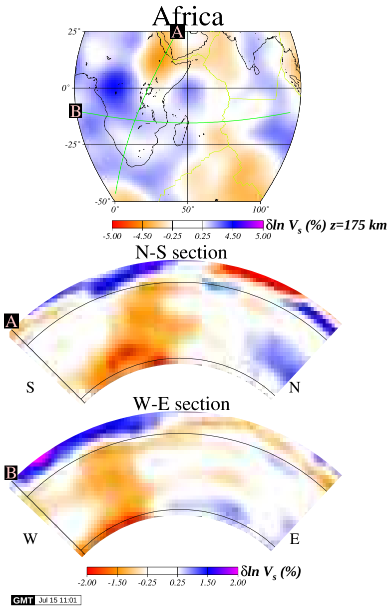


Figure 11.7: West Pacific cross-sections

### 4.2.2 Slow anomalies

The model presents three large scale slow anomalies that extend continuously from the bottom of the mantle into the uppermost mantle, one under Africa and two in the Pacific. In figure 11.8, we show an image of the upwelling beneath the African continent.

Figure 11.8 (top) shows a lateral section of the upper mantle at 175 km depth under Africa and the Indian Ocean, displaying fast anomalies beneath the African and Indian plates and slow anomalies near the East African rift zone, the Red Sea and along the mid-Indian ridge. The East African, West African and Congo cratons are isolated by the presence of slow regions surrounding them.

Figure 11.8 (A), shows a SW-NE cross-section across the continent. The slow domain under Africa extends vertically from the base of the mantle into the upper mantle and is subsequently shifted to the northeast. The upper mantle image is consistent with the closure of the Tethys by the African continent throughout the Cretaceous: in our tomographic model, the upper part of the low velocity anomaly is offset in the direction of motion of the African plate. Figure 11.8 (B) shows an East-West cross-section. The low velocity zone is deflected to the east by the Nubian plate where it connects with the mid-Indian ridge. In the lower mantle, the shape of the anomaly in *SAW24B16* is in general agreement with the model *M2* of *Ritsema et al*, 1998, suggesting an upwelling shifting in the northeast direction with increasing radius. However, in contrast with their study, we find continuity of the slow domain into the upper mantle.

## 4.3 Conclusion

This study shows that, with a relatively restrained data set consisting of waveforms of all the phases present on a seismogram, it is possible to derive global images of the mantle on scale lengths of 7.5°, consistent with results of regional studies. This is related to the adoption of a waveform methodology to image deep Earth structure. We use a theoretical formalism valid both for body and surface waves that allows 1) the modeling of finite frequency effects on the seismogram and 2) the use of all the information on the seismic trace. In particular we make use of the S phase diffracted on the core-mantle boundary which cannot be modeled with a ray-theoretic approach and which provides the bulk of lower mantle information; we also use simultaneous phase arrivals which are precluded by travel time studies as they rely on the the determination of an onset time for each datum. This methodology is well suited to the imaging of both fast and slow domains in the earth. The present model suggests the existence of three large scale plume-like slow anomalies in the mantle, one under Africa, and two in the Pacific.

## 4.4 References

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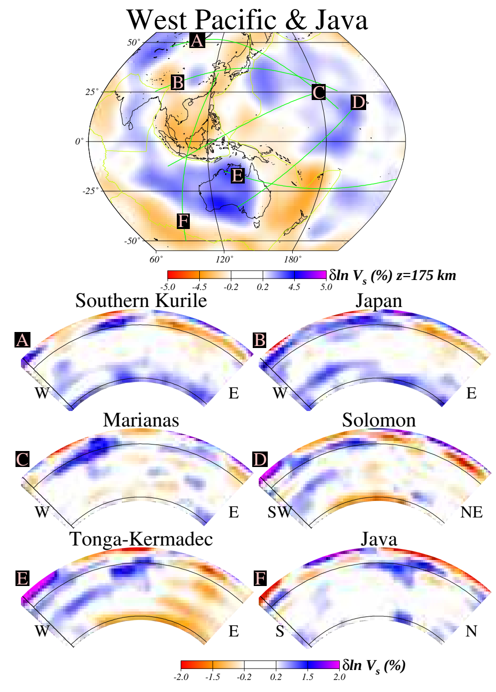


Figure 11.8: Cross-sections through Africa

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