in the Wilkes Basin from Receiver Function Analysis.

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Abstract

Wilkes Basin lies to the east of the Transantartic Mountains. The origin of this subglacial basin is still controversial. Flexural uplift of the Transantartic Mountains has been suggested as the geophysical process which generated the basin (Stern & ten Brink, 1989). Other studies proposed a continental rift structure for this region (Ferraccioli et al., 2001). The two models differ mainly in the crustal structure predicted beneath the basin. In the former, crustal thickening is expected to be originated from the high rigidity of the East Antartic Craton lithosphere. Otherwise, the rift structure hypothesis is consistent with a broad crustal thinning. During the WIBEM 2003 campaign, we deployed five broadband seismic stations across the basin. We selected high signal/noise teleseismic recording to compute a data-set of receiver functions. We applied a classical inversion scheme, the Neighbourdhood Algorithm, to our data-set. Here, two different and complementary studies are presented. We constrain the Moho geometry beneath the Wilkes Basin from the analysis of low-frequency P-to-s conversion at the base of the crust. Also, we investigate the nature of the basin mapping the presence of subglacial sediments using the P-to-s conversion at the ice-bedrock interface.

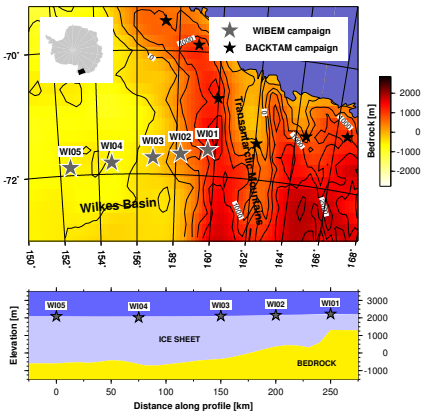
Introduction

Between December 2003 and January 2004 five broadband seismic stations (WI01, WI02, WI03, Wi04, WI05) recorded about 200 teleseisms in the 25-100° epicentral distance range and with $M_w > 5$. We selected the best 40 waveforms based on high signal/noise for every station. Receiver Function (RF) technique is based on the removal of source and path effects through frequency deconvolution of vertic al from radial and transverse components. The RF is a composite of P-to-S converted waves that reverberate in the structure beneath the seismometer (Ammon, 1990). The amplitudes and the arrival times of the converted phase depend on the depth of the velocity contrast. We computed the RFs through the frequency-domain deconvolution technique developed by Di Bona (1998). Our data-set was "inverted" using a Neighbourood algorithm (NA) scheme (Sambridge, 1999) which belongs to the Monte Carlo sampling family. Ice-sheet data has been interpolated from the data-set of the BEDMAP poject (Lythe, M.B., & D. G. Vaughan, 2000). We estimate the sedimentary layer thickness following the approch developed by Anandakrishnan & Winberry (2004).

Ice Thickness Data

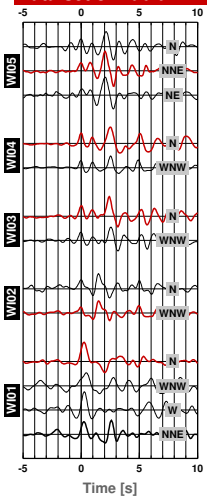
Stat	WI01	WI02	WI03	WI04	WI05
Ice (m)	604	1829	2442	2663	2675

WIBEM seismic stations

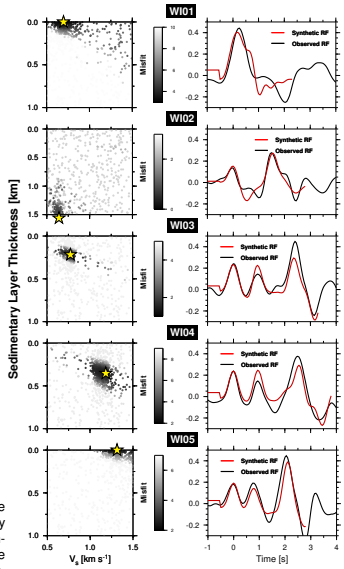


Sedimentary Layer Thickness

Data-set of Radial RF



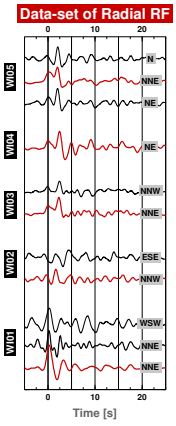
Inversion results



Upper panel: Receiver Function data-set. RF were filtered using a low-pass filter with corner frequency at 2 Hz. Red traces indicate RF used in the inversion. Black lines indicate RF which sample the structure below the station from other BAZ direction. **Left panel:** NA inversion results. On the right, 2D distribution of the sampled models, for two parameter: thickness and V_S of the sedimentary layer. Stars indicate best-fit model found. On the left, fit between observed and synthetic RF. Synthetic are computed using best-fit model.

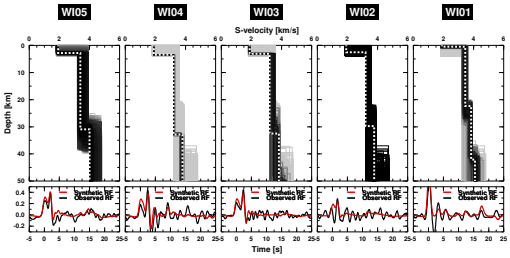
Moho Geometry

Data-set of Radial RF



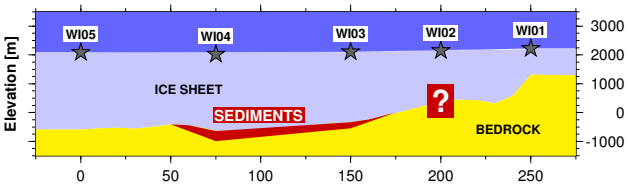
Left panel: radial RFs obtained. Red lines indicate the RFs chosen for the inversion in every station and the labels are the back-azimuthal direction of the waves. **Bottom panel:** S waves velocity models for each station. Gray shaded areas show all the sampled models. Gray shading varies following the fit to the data, from white (worst) to black (best). Best-fit model is indicated using a white dashed line. Synthetic RF computed using the best-fit model is shown in the bottom panel together with the observed RF.

Inversion results



Conclusion

Sedimentary layer in the WIlkes Basin



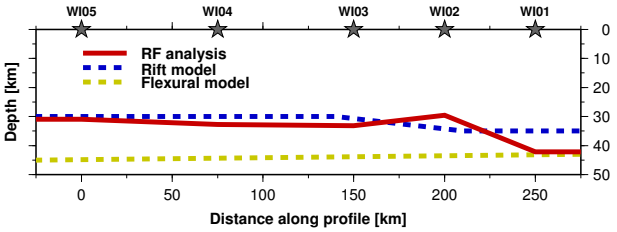
♡ **We map the subglacial sedimentary layer across Wilkes Basin.**

♣ **Subglacial sediments are present only under WI03 and WI04 seismic stations.**

♢ **Thickness of this layer is comparable with previous results from other sites in Antarctica (Anandakrishna & Winberry, 2004).**

♠ **Results from the analysis of WI02 data-set are controversial. We cannot rule out the presence of sediments under this station.**

Moho Depth across Wilkes Basin



♡ **Our results show a thickening of the crust under the Transantarctic Mountains.**

♣ **The Moho depth obtained from RF analysis is between 29 and 42 Km.**

♢ **Structure under WI02 seismic station is more complex due to the transition between the Transantarctic Mountains and the Wilkes basin.**

♠ **Our Moho geometry resembles the profile predicted from the rift model even if we cannot rule out the flexural model for the formation of the Wilkes basin.**

REFERENCES

Ammon C., *BSSA*, 81, 6, 2504–2510, 1991; **Anandakrishna S. & J. P. Winberry**, *Global and Planetary Change*, 42, 167–176, 2004; **Di Bona**, *Geophys.J.Int.*,, 134, 634–646, 1998; **Ferracioli F. *et al.***, *EPSL*, 192,407–421, 2001; **Lythe, M.B., & D. G. Vaughan**, *BEDMAP - bed topography of the Antarctic*, BAS, 2000; **Sambridge M.**, *Geophys.J.Int.*, 138, 479–494, 1999; **Stern T. A. & U. S. ten Brink**, *JGR*, 94, B4, 10315–10330, 1989;