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Lithospheric structure in the vicinity of the SC1 and YU reflection profiles

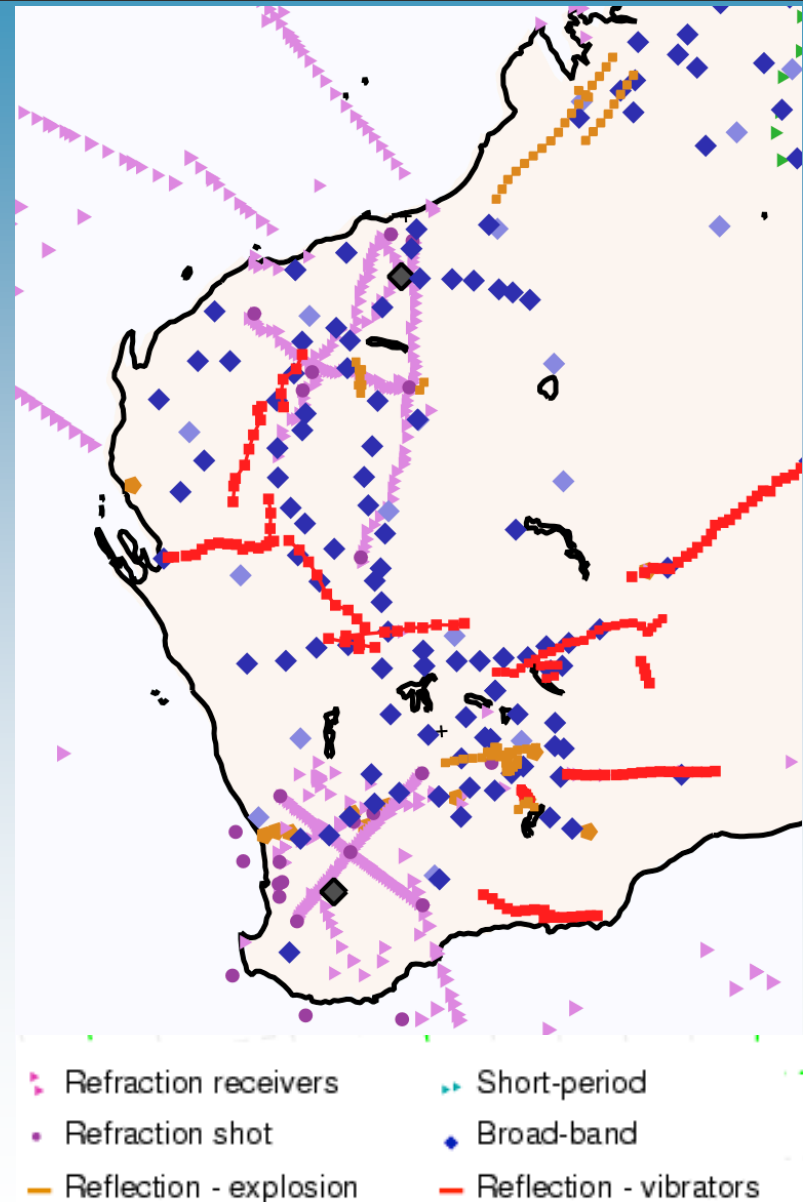
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Seismic coverage for Western Australia

- The South Carnarvon and Younami projects form part of an extensive network of seismic information
- Prior refraction work and extensive broad-band deployments (Receiver Functions) provide control additional to the reflection work

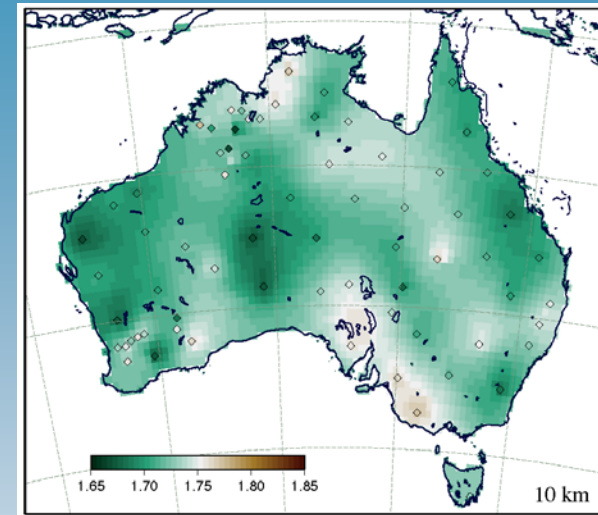


- The Australian Seismological Reference Model (AuSREM) is an effort to bring together existing information on the 3-D structure beneath the Australian area to create a **representative** model
- Depends on collaborative support from a wide range of researchers, whose work bears on the structure of Australia
- Published Products :
 - Revised Moho Map of Australia – Kennett, Salmon et al. 2011,
 - Updated 2012 Salmon et al, 2013, Tectonophysics – in press
 - Summary Paper – Kennett & Salmon, 2012 AJES
 - Crustal & Mantle Papers 2013, GJI, vol 192.

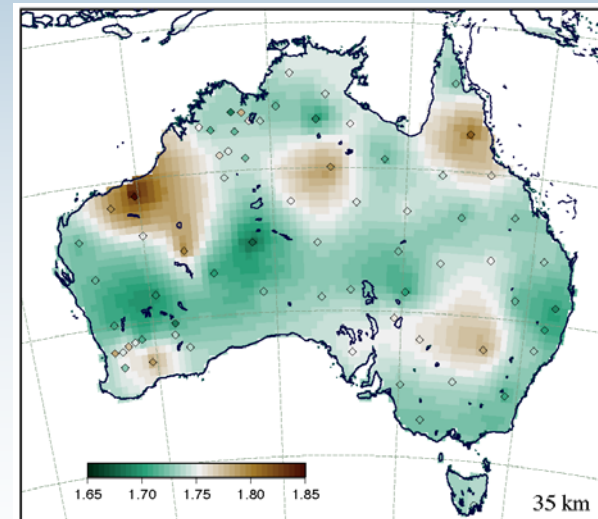
- Prior compilations of sediment thicknesses
- P and S wavespeed distributions through the crust.
- The primary information for P wavespeed comes from refraction profiles, for S wavespeed from receiver function studies.
- Ambient noise tomography for S wavespeed links the point observations into national coverage.
- Density values are derived using results from gravity interpretations.
- Updated map of depth to Moho, using latest full crustal reflection profiling

Construction of Crustal component

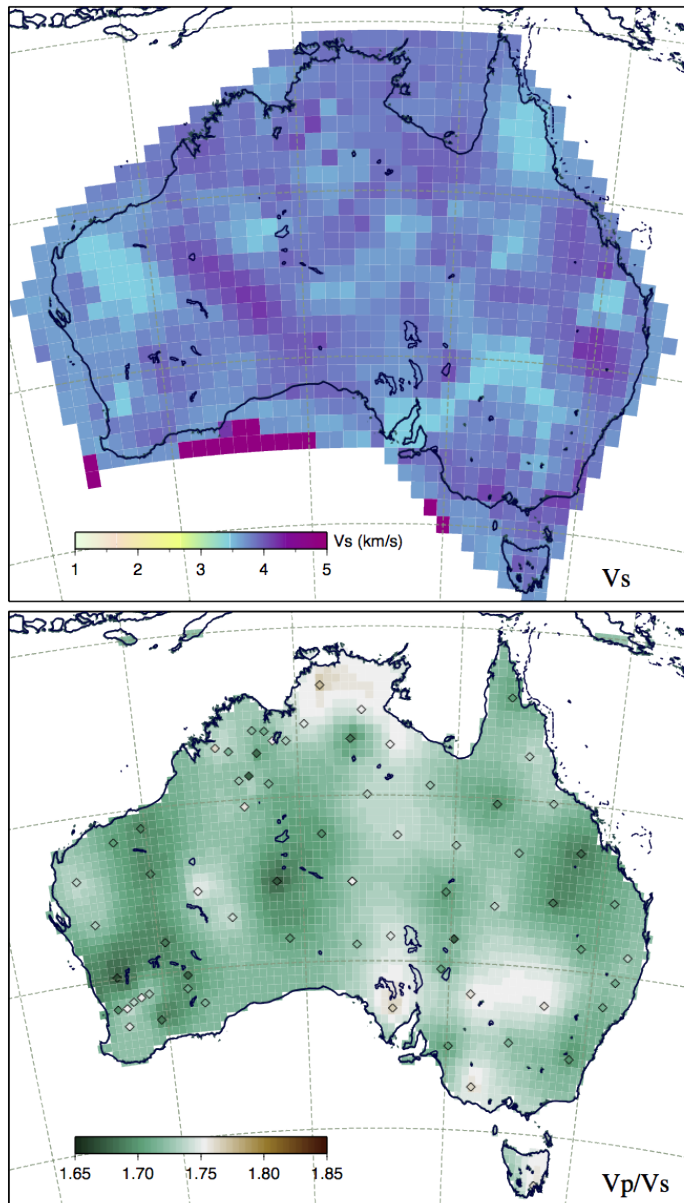
1. Refraction + receiver function V_p field (onshore & offshore)
2. V_p/V_s field from smoothed receiver functions
3. V_p for continent from ambient noise by conversion of V_s
4. Construct composite P wavespeed field from all P results
5. Create S wavespeed from P using V_p/V_s field
6. Construct density from P wavespeed



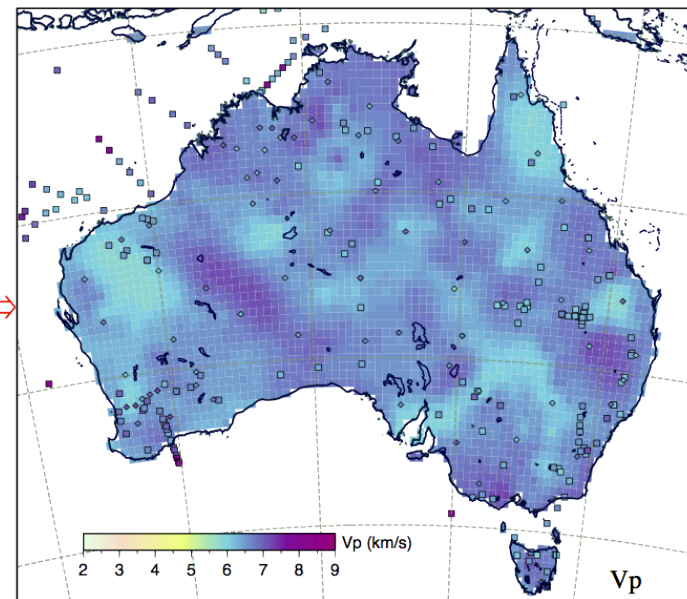
V_p/V_s
10 km

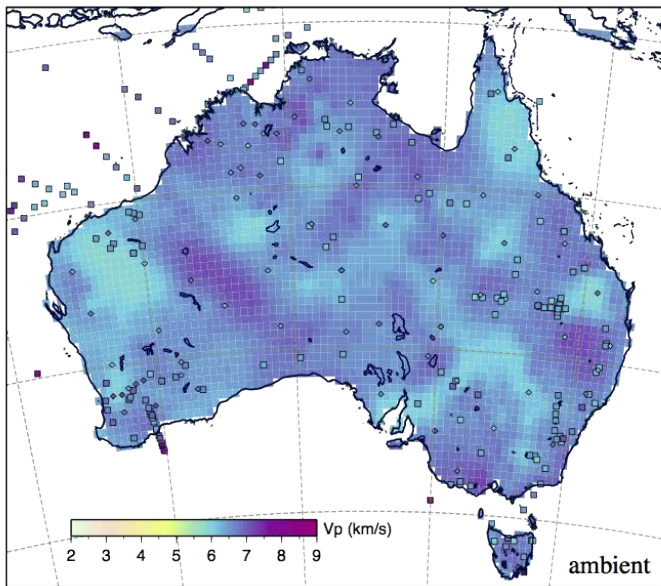
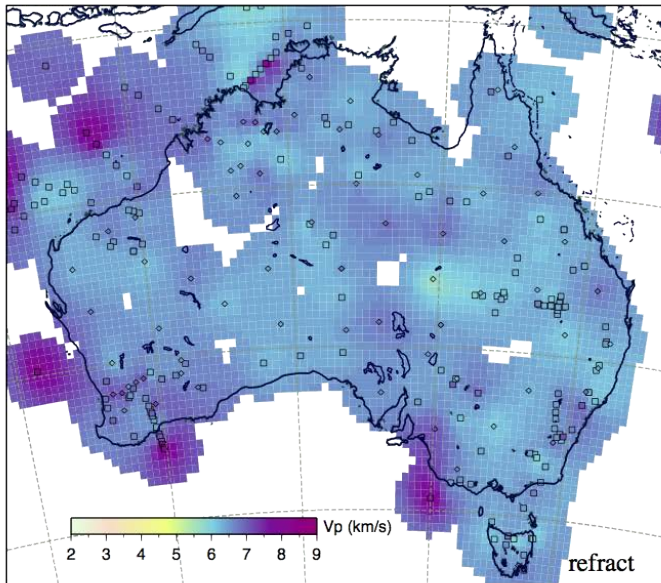


V_p/V_s
35 km

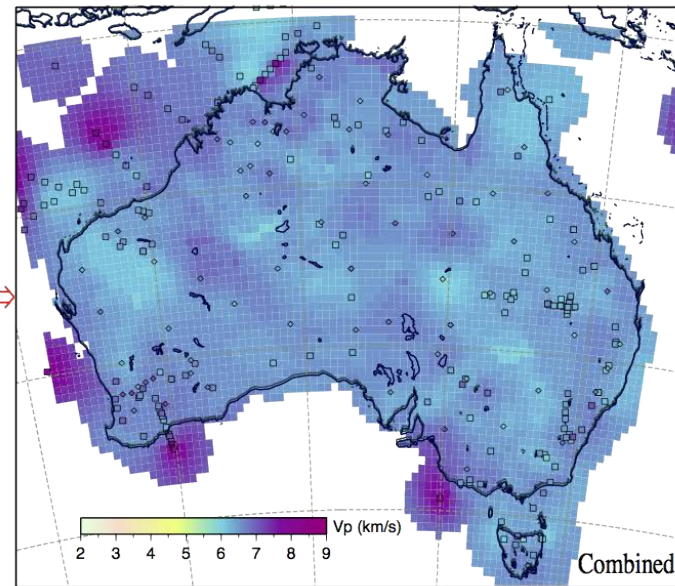


Construction of Vp field from ambient noise results

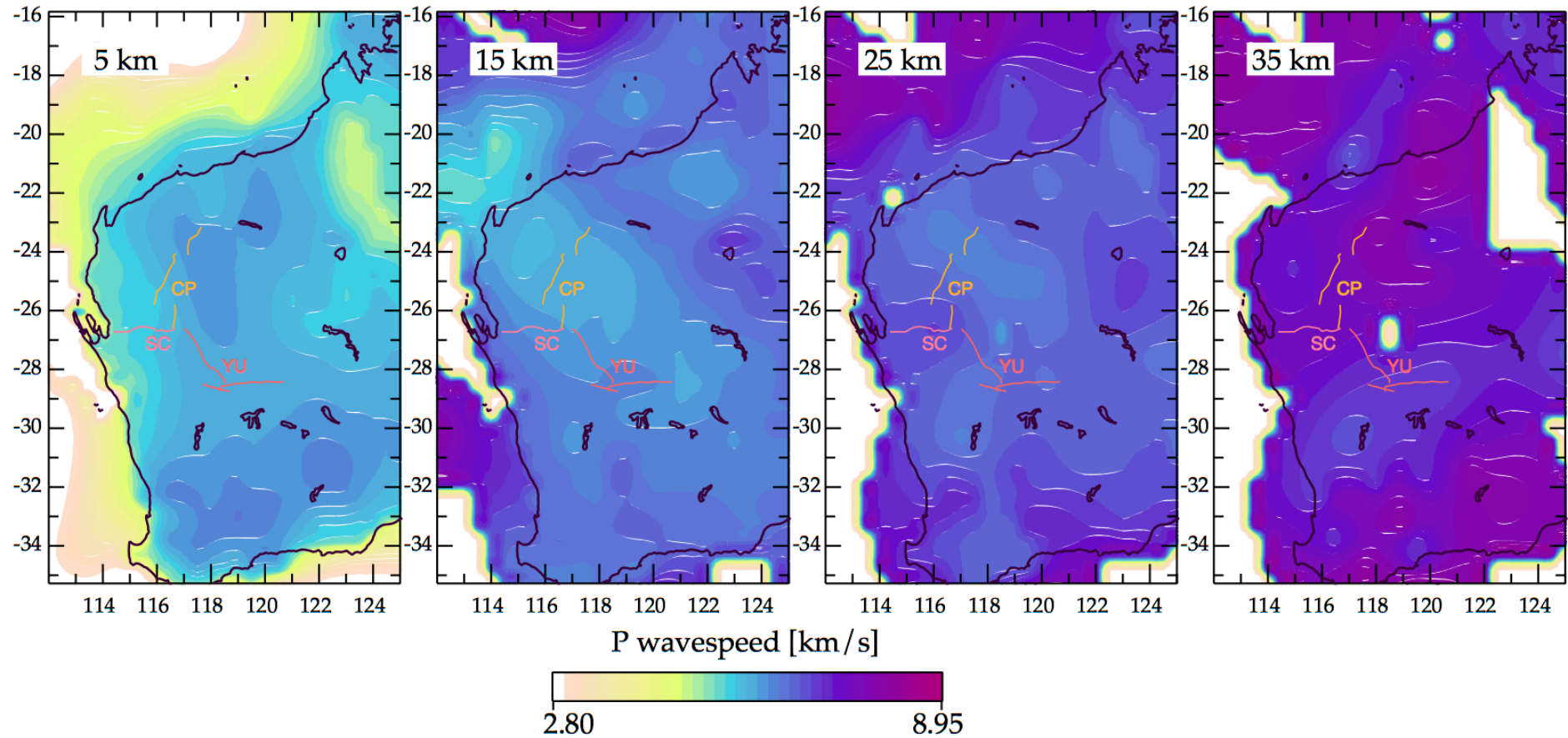




Construction of Vp field



Crustal Structure near SC and YU



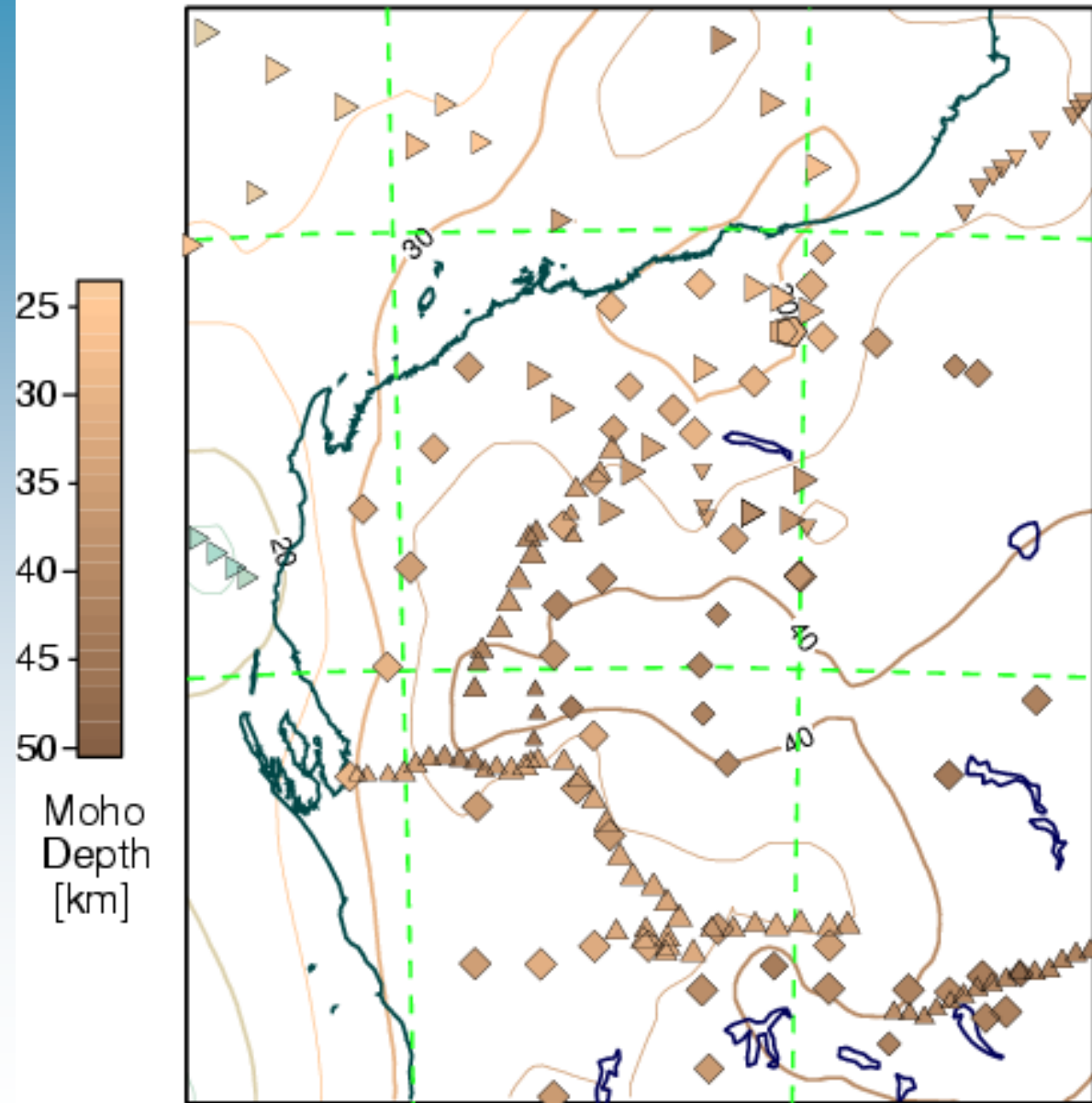
Comparison of Moho Depth estimates

The map summarises all the estimates for Moho depth in the neighbourhood of the SC and YU lines.

Triangles denote depth estimates from reflection work and refraction.

Diamonds, pentagons and squares represent results from Receiver Functions.

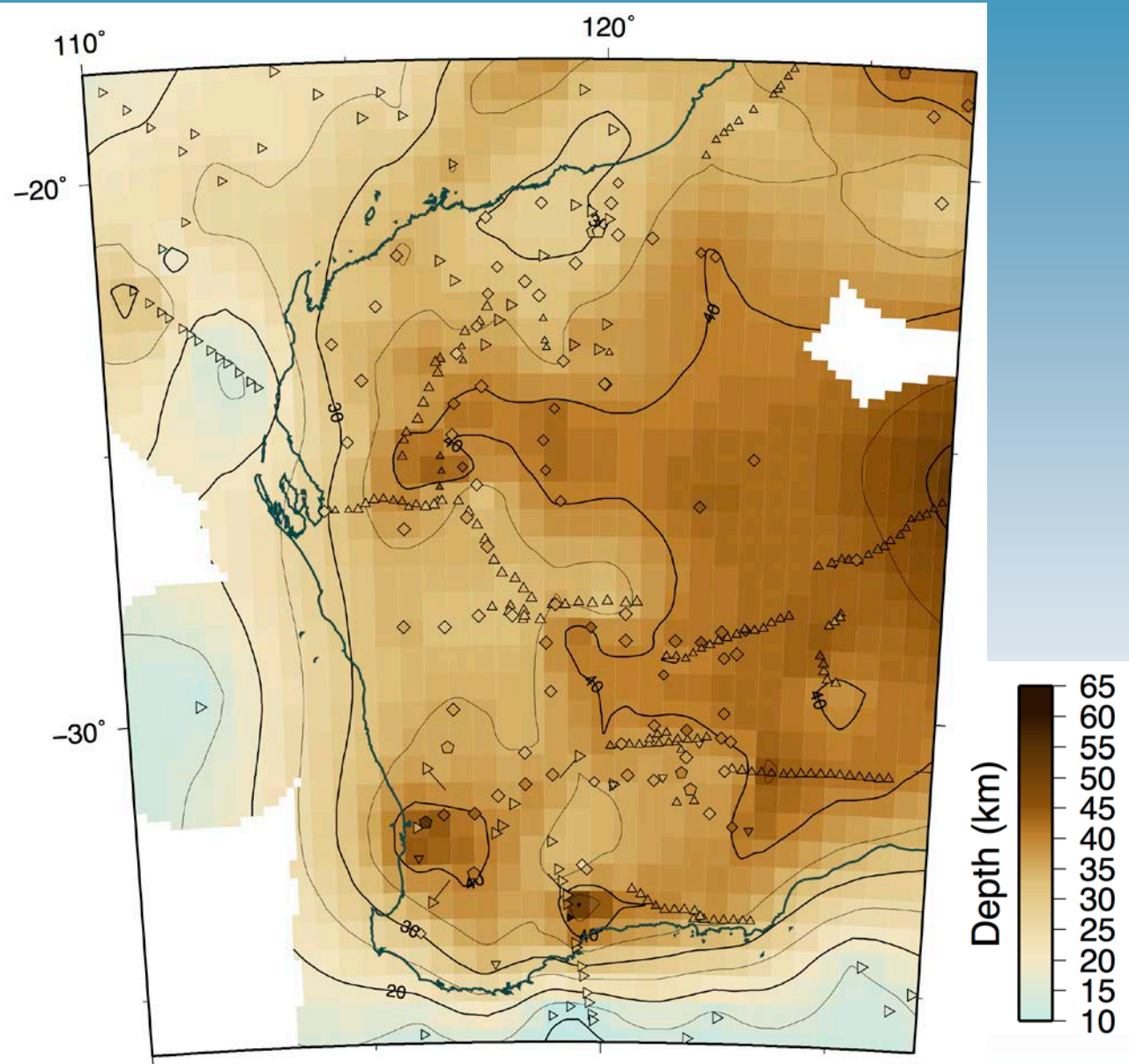
There is very good correspondence between the different approaches



Moho variation across Western Australia

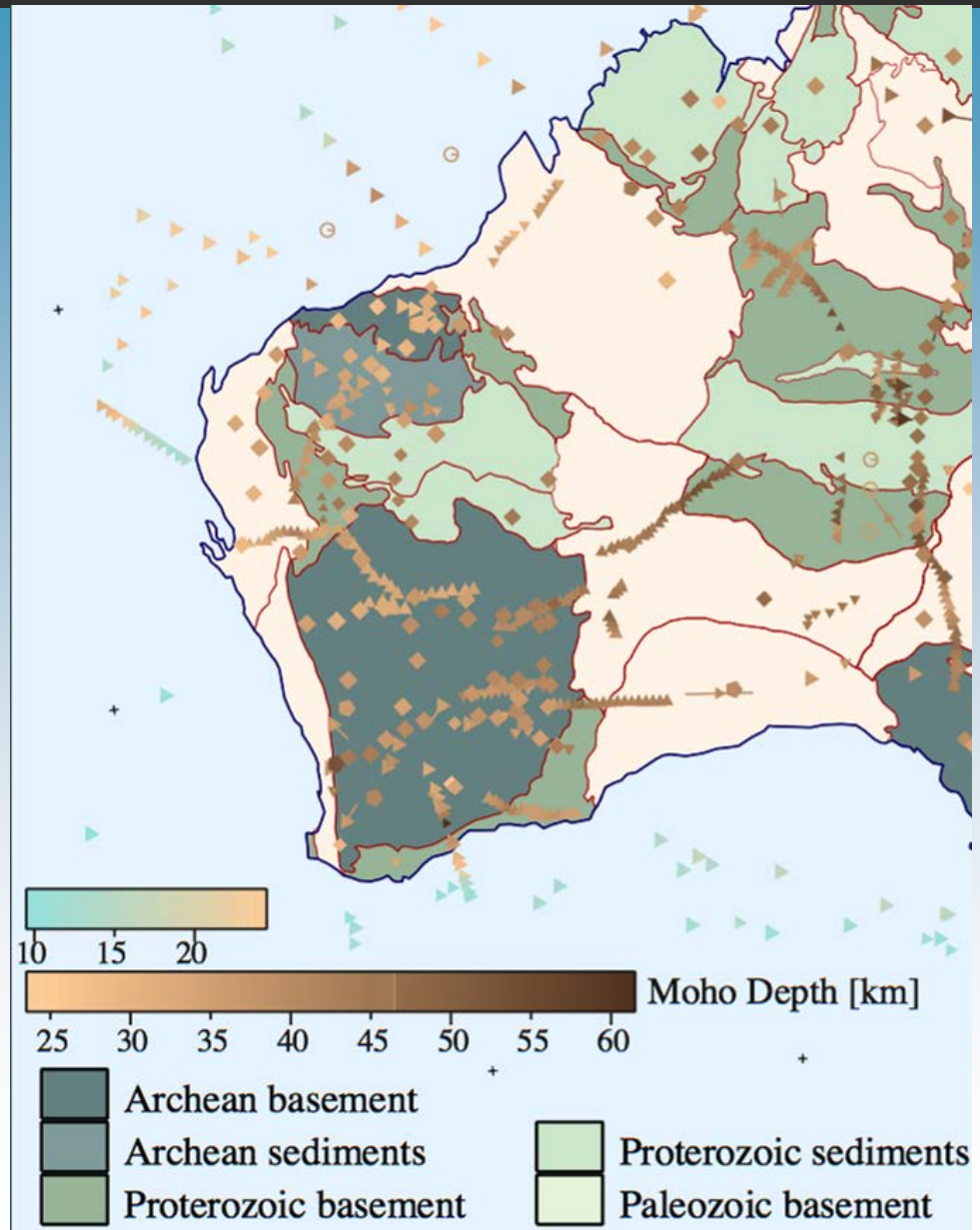
Portion of the 2012
Moho map for Australia
(Kennett et al. 2011.,
GJI, updated)

The map is rendered
using 0.5x0.5 deg
pixels

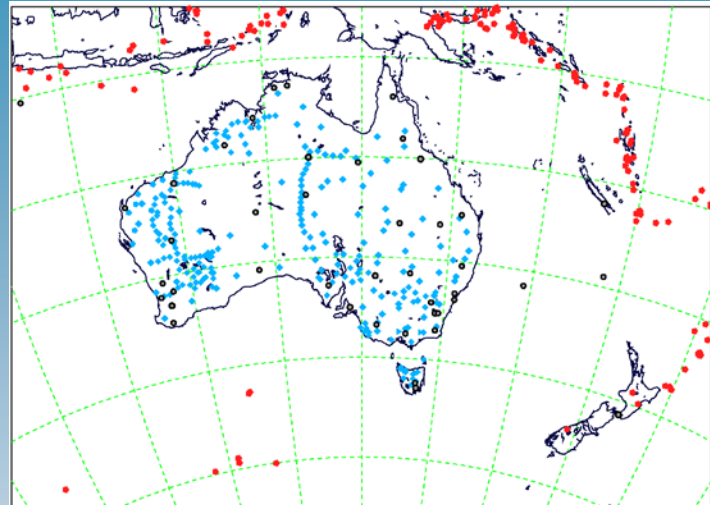


Moho depth superimposed on tectonic framework

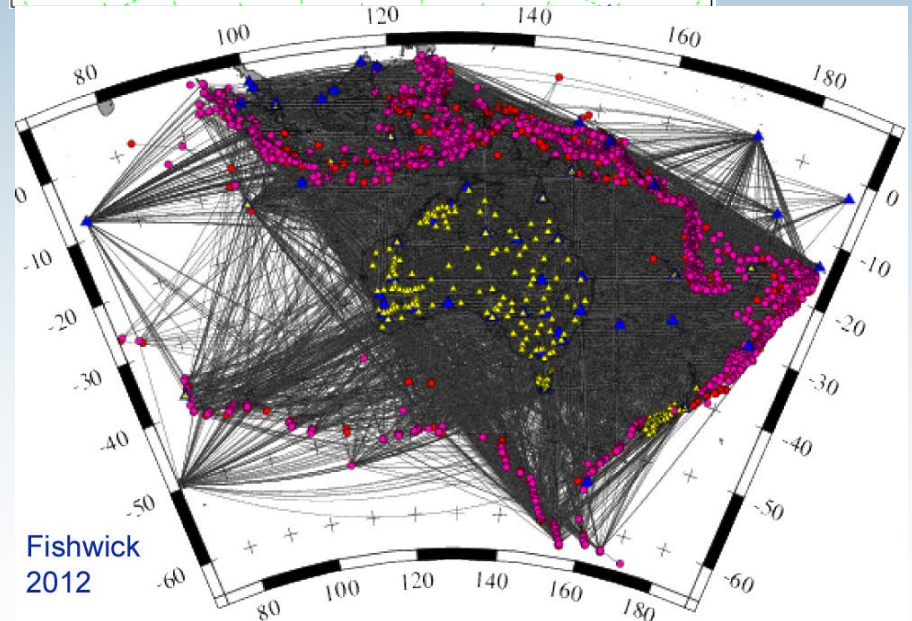
The correlation of
thinner crust with
the ancient
Archean blocks is
very clear



- A major tool for studying the mantle lithosphere is the use of surface wave tomography exploiting the large amplitude surface waves generated by shallow earthquakes
- Waveforms are matched with calculations to extract information on structure and build 3-D models
- Can also use higher frequency body wave arrivals

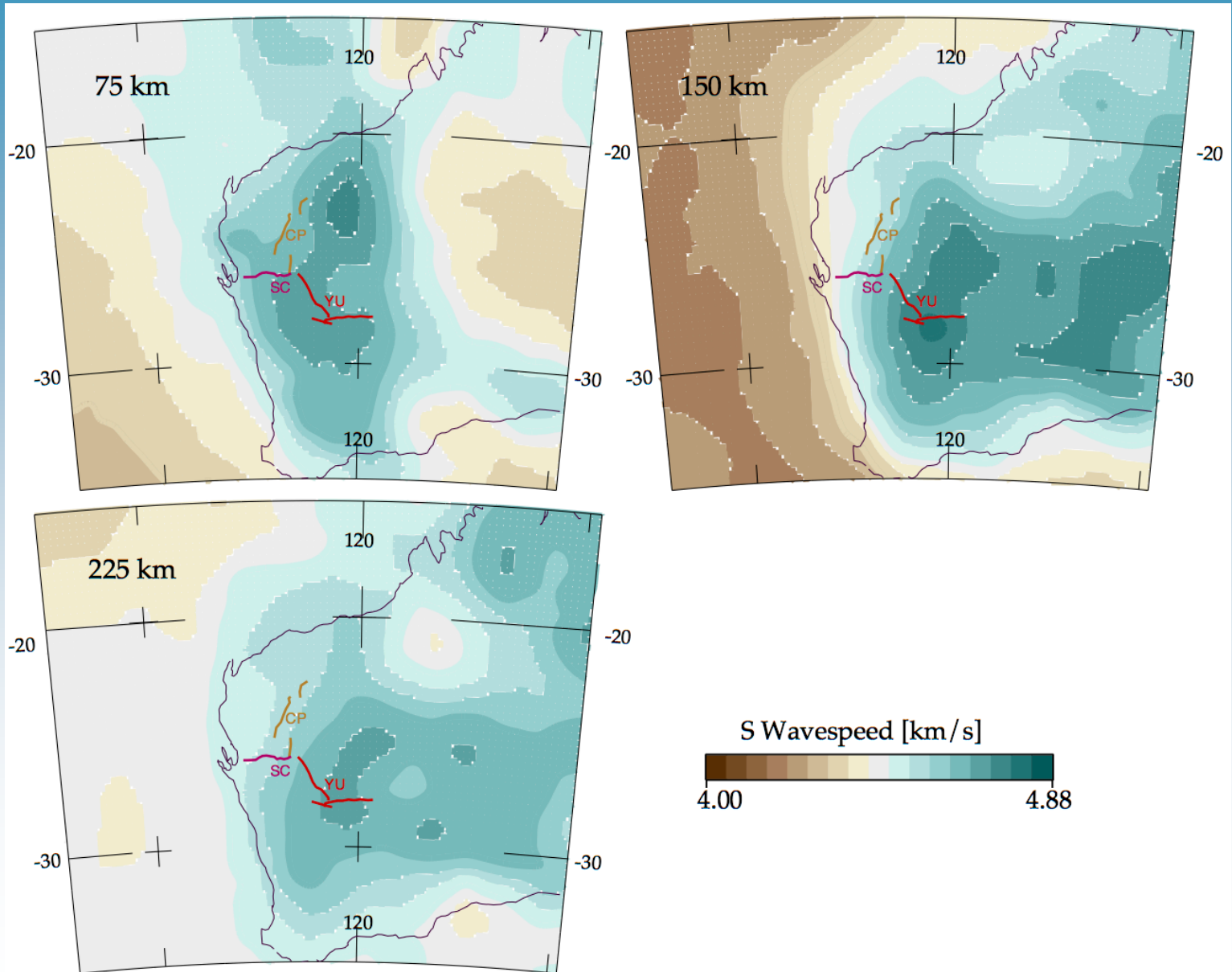


Broad-band stations and regional events (one year)

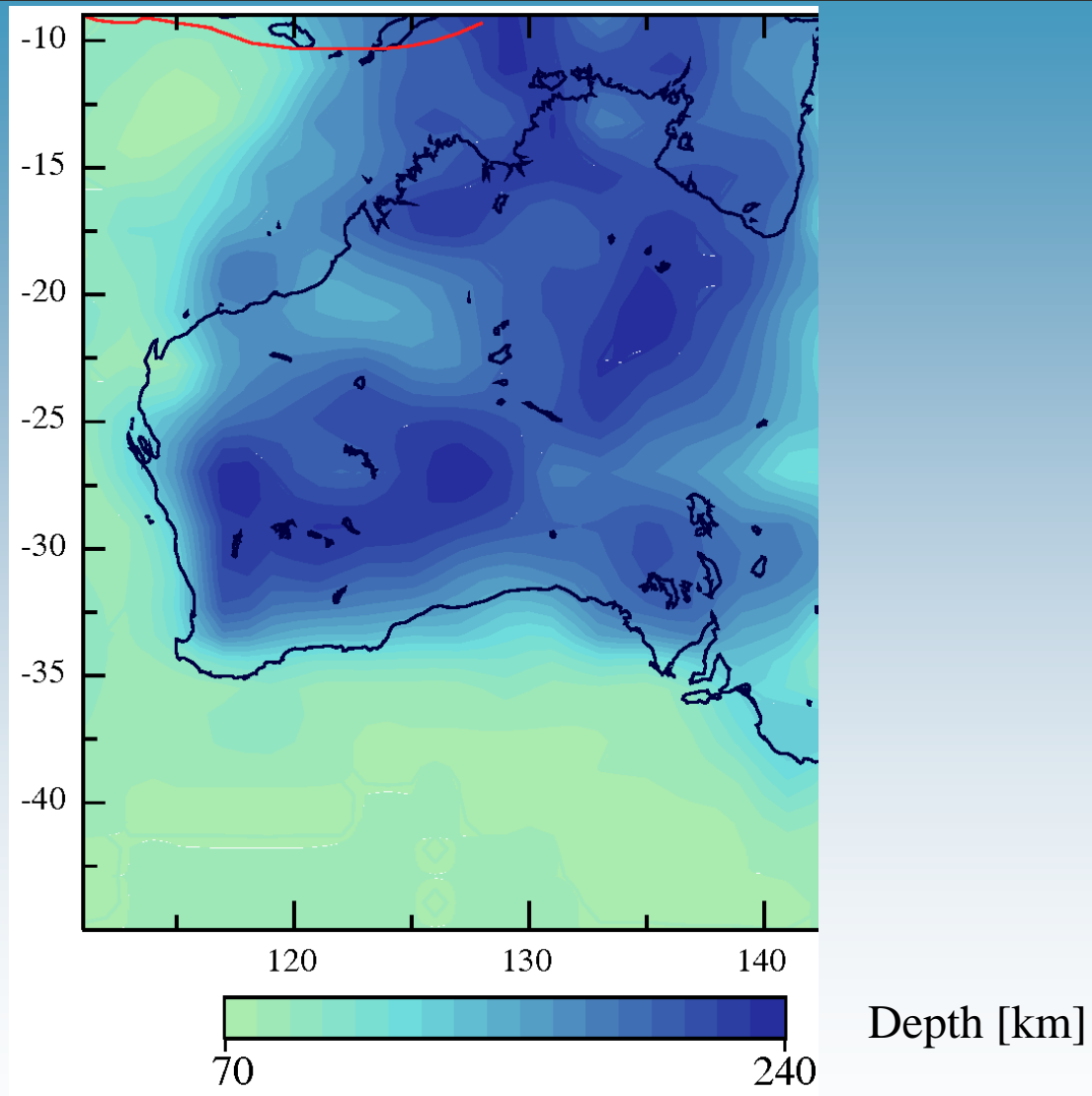


- Primary source of information comes from seismic surface wave tomography (multiple studies)
- Representative model has been developed to capture the features of a range of studies for SV and SH
- Body wave studies and regional tomography provide useful constraints on the relation between P and S wavespeeds.
- The mantle model extends beyond the continent and so covers a larger area than for the crust.
- Below 300 km and in the surrounding area AuSREM is linked to the S40RTS model (Ritsema et al., 2011).

SV wavespeed beneath WA



Base of Lithosphere



Depth to base of lithosphere based on wavespeed gradients

Acknowledgments

- Surface Wave Tomography: S. Fishwick, K. Yoshizawa, A. Fichtner
- Receiver Functions (WA): A. Reading
- Ambient Noise Tomography: E. Saygin
- AuSREM Crust & Moho map compilation: M. Salmon

- All the members of RSES who have helped with the collection of portable seismic data and subsequent data handling.