



Government of Western Australia
Department of Mines and Petroleum



Madura Province: lithological characteristics and structural evolution



Catherine Spaggiari, Hugh Smithies and Dick England

Eucla stratigraphic drilling results release, September 2015

Geological Survey of
Western Australia



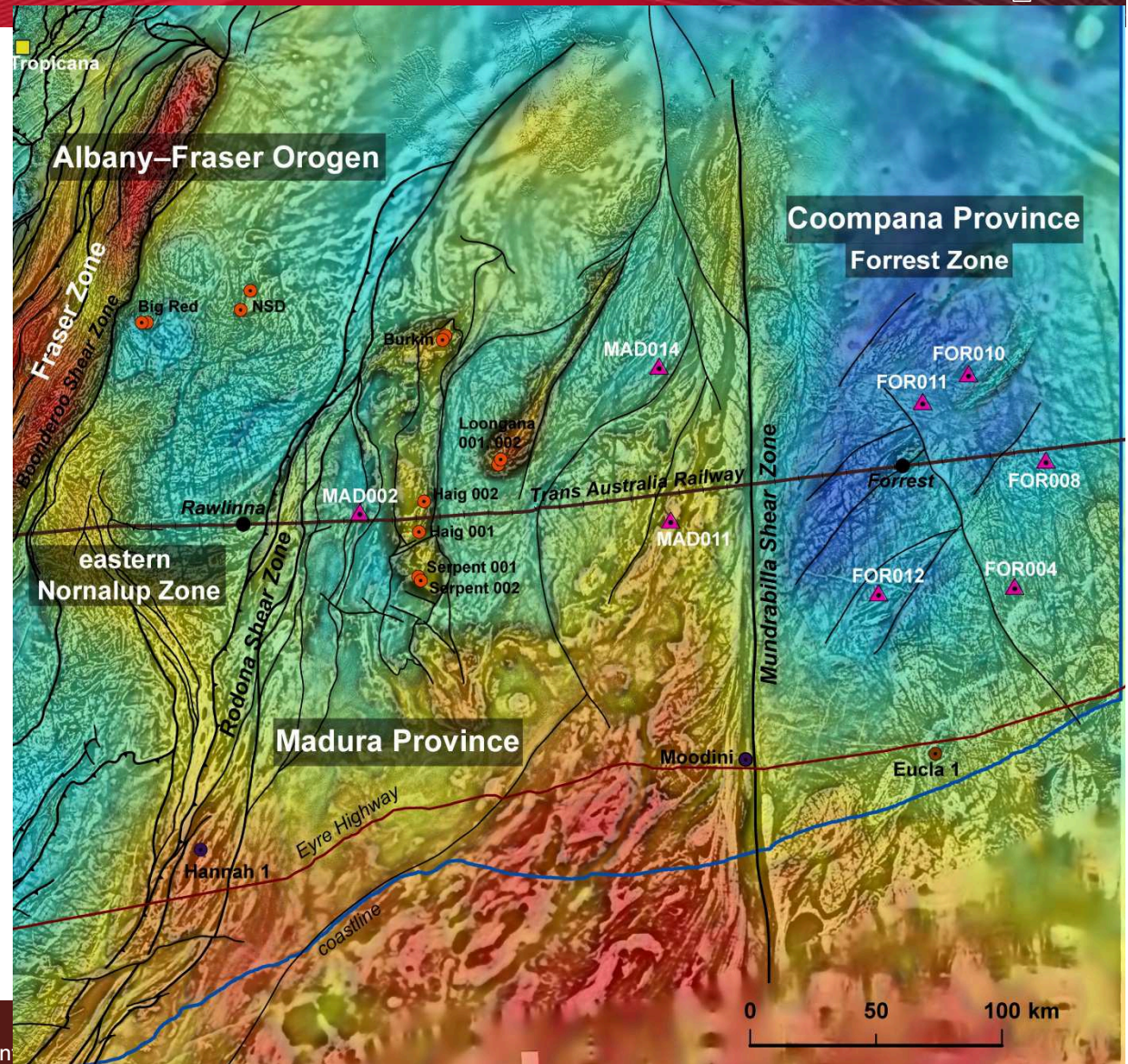
Introduction

- ▲ GSWA stratigraphic drill hole
- EIS co-funded drill hole
- Company donated core site

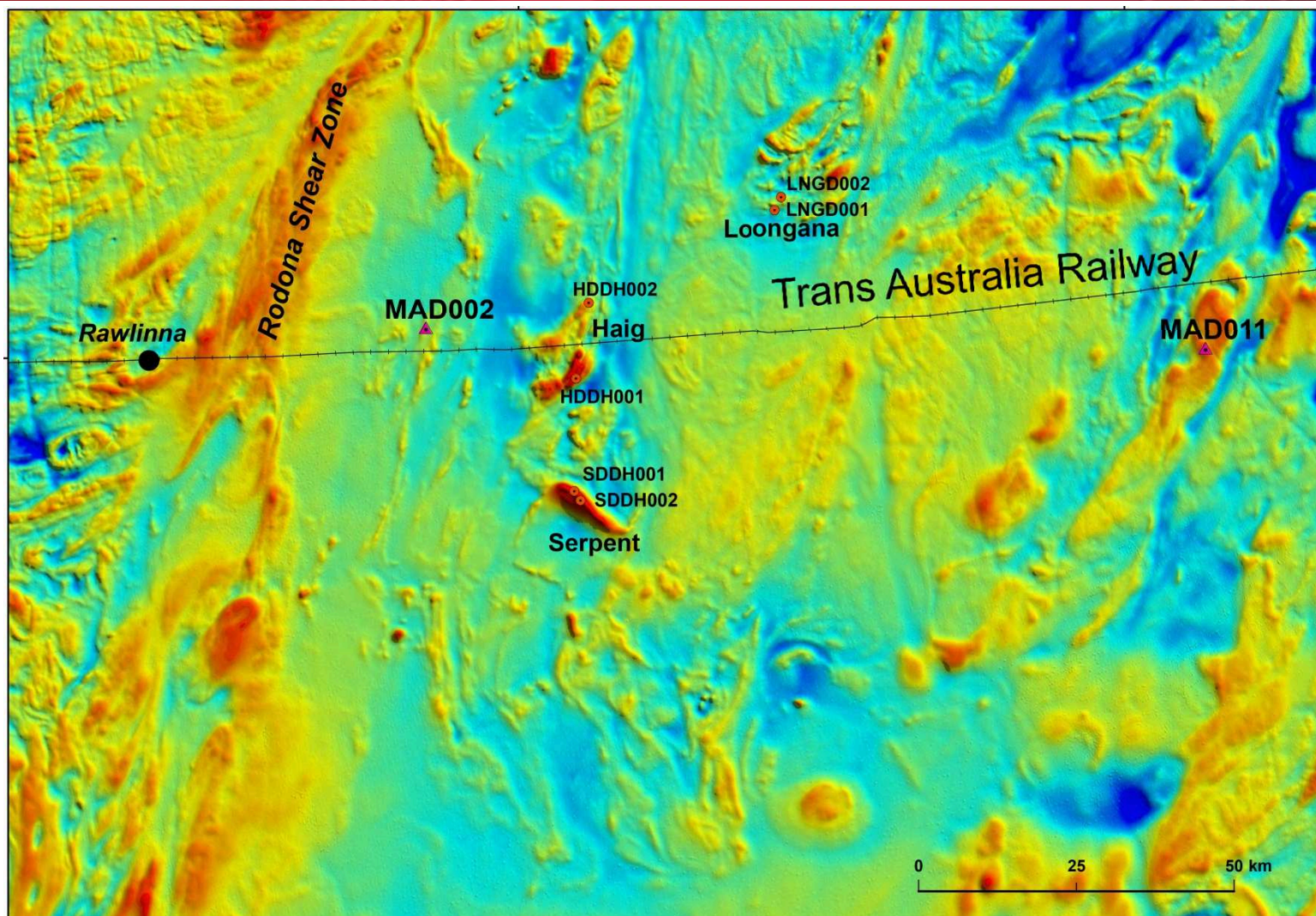


- Madura Province bound by Rodona and Mundrabilla Shear Zones
- Three stratigraphic cores drilled to complement existing company cores
- Sites based on geophysical criteria
- Start with the most complex core, MAD002

Gravity (colour) with 1VD
magnetics (greyscale)



Magnetics; MAD002 drill site





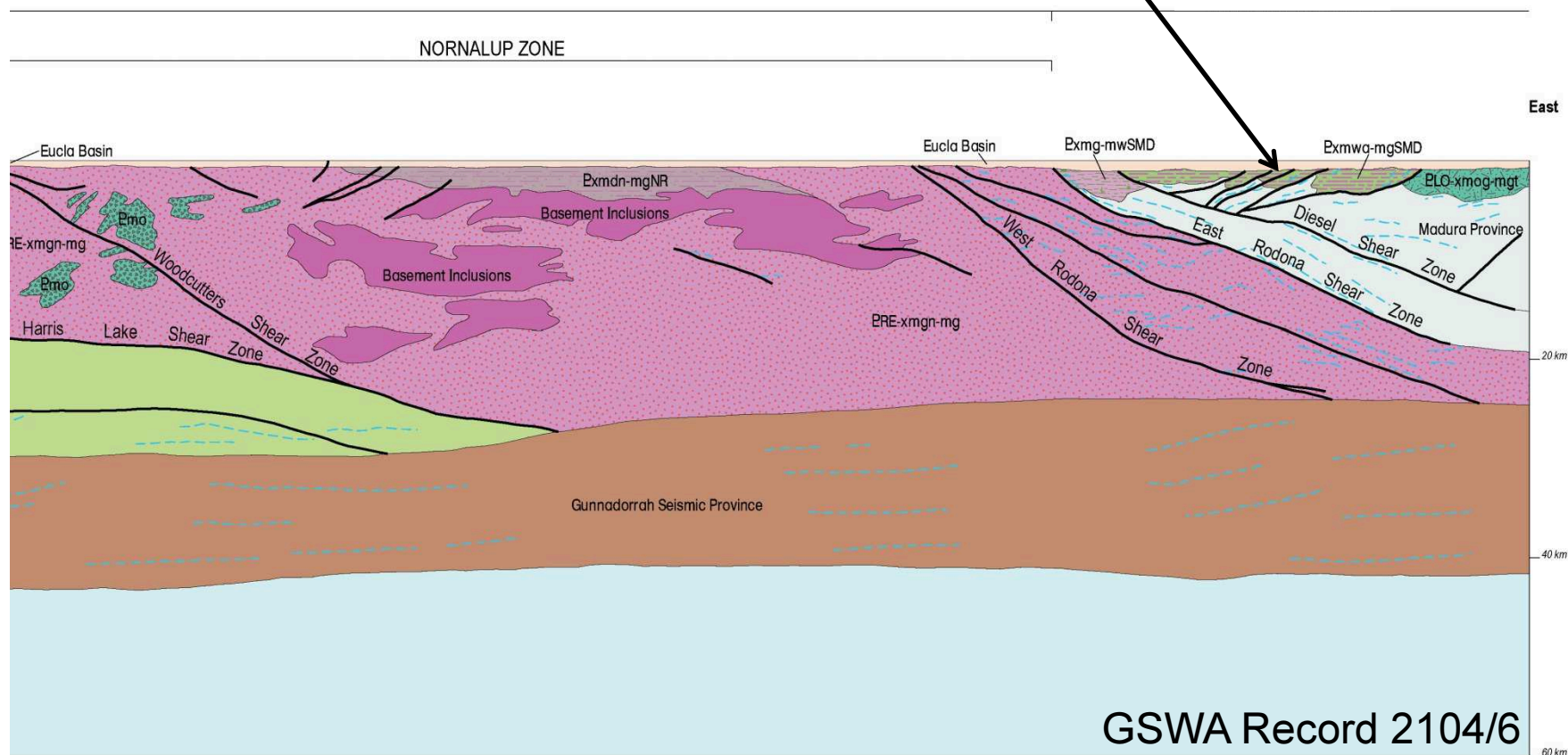
MAD002 drill site; 12GA-AF3 seismic line

Located in the hanging wall of the southeast-dipping Rodona Shear Zone

MAD002 drill site

Albany-Fraser Orogen

Madura Province

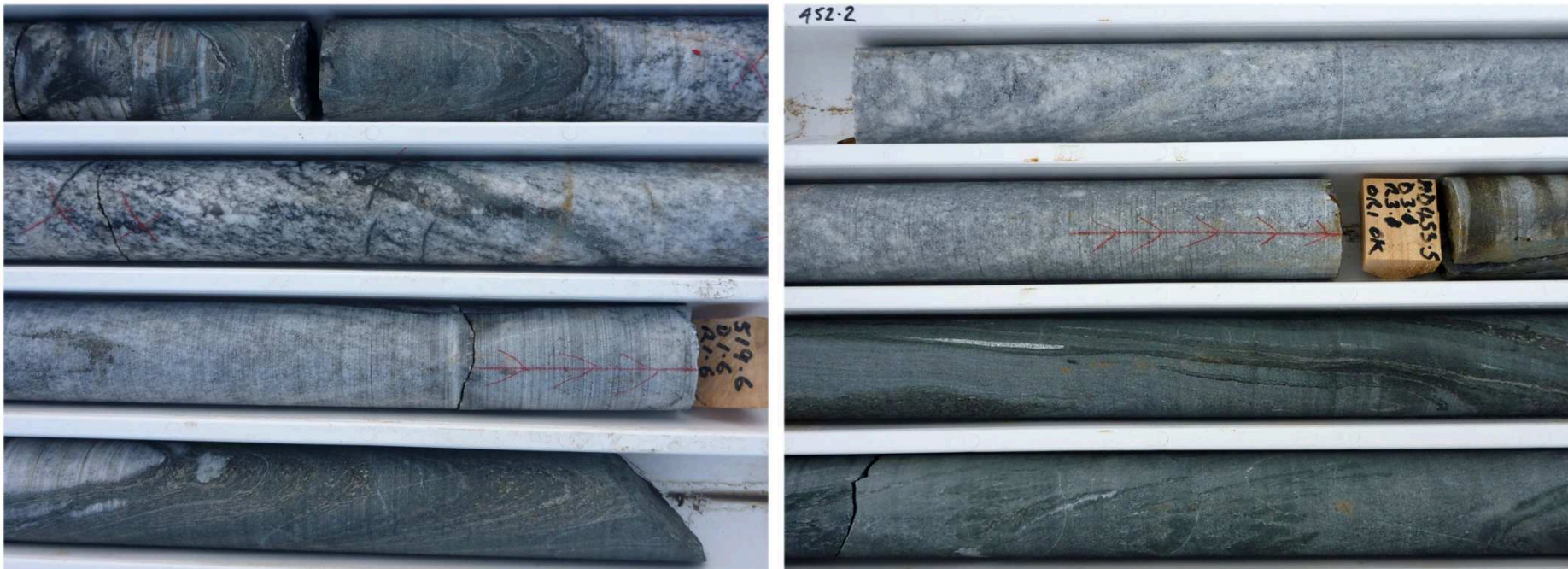


MAD002 drill core, basement at 390 m



Two main units:

- Fine-grained, laminated (blue-green hbl-plag-biotite-epidote-quartz-titanite) mafic schist interpreted as a metabasalt (E-MORB/OIB)
- Estimated lower amphibolite facies peak metamorphism
- Intruded by medium-grained leucogranite (plag-qtz-biotite-hbl) (adakite)

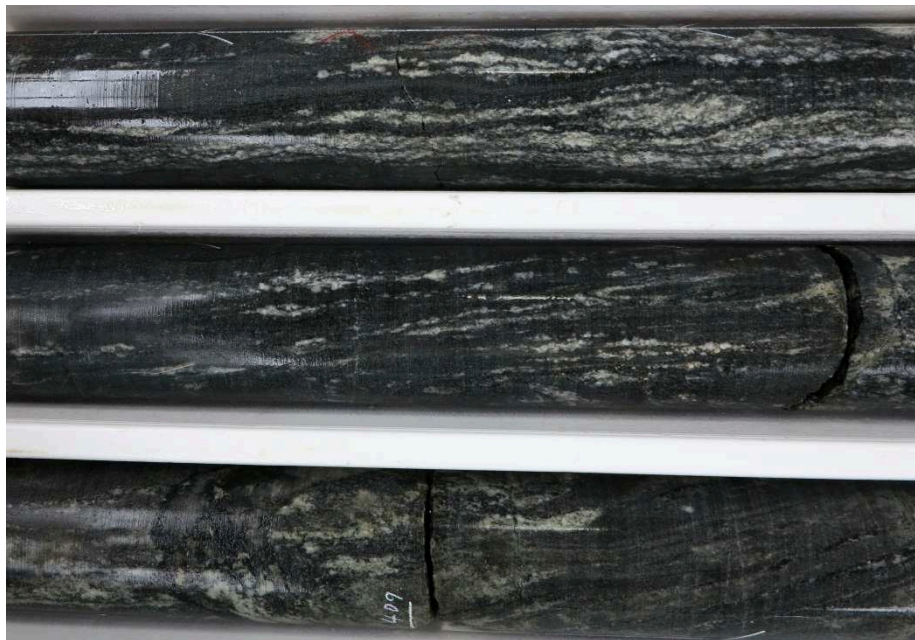


MAD002 drill core



Two main units:

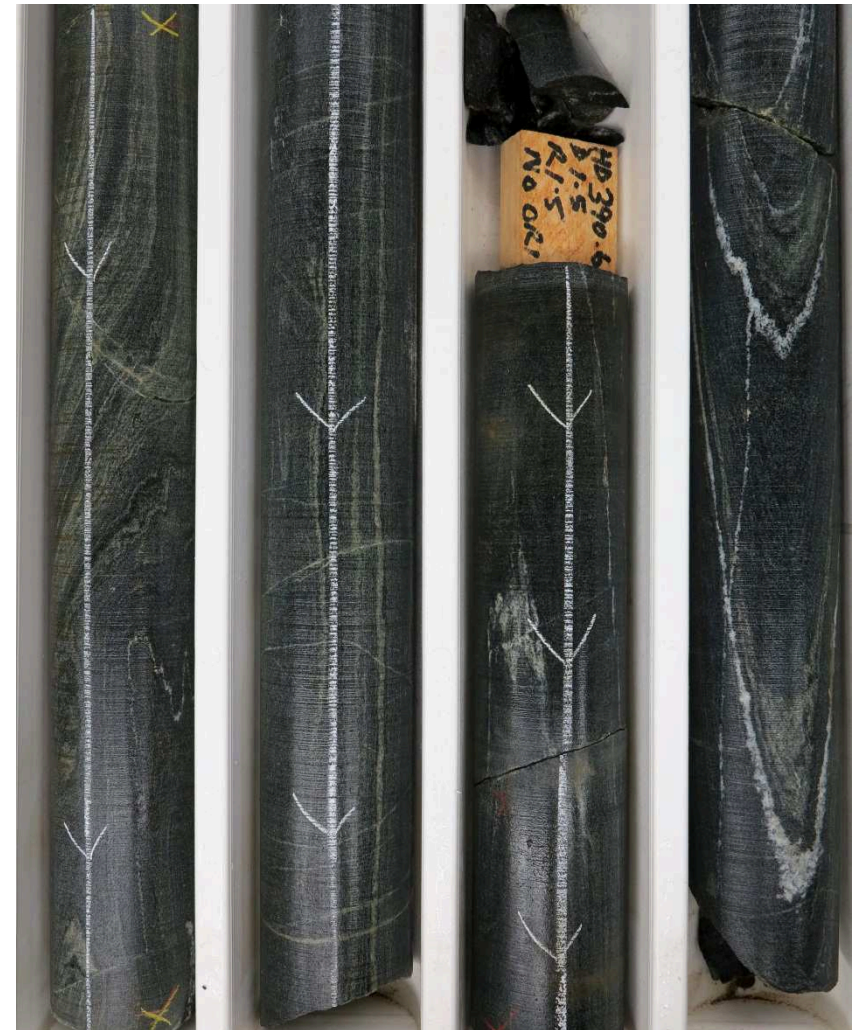
- The metabasalt has a well-developed foliation; hbl-bearing axial planar to folds
- The leucogranite veins are subparallel to the metabasalt layering and also folded, but locally transgress the folds – intrusion pre- to syn-folding



MAD002 drill core structure



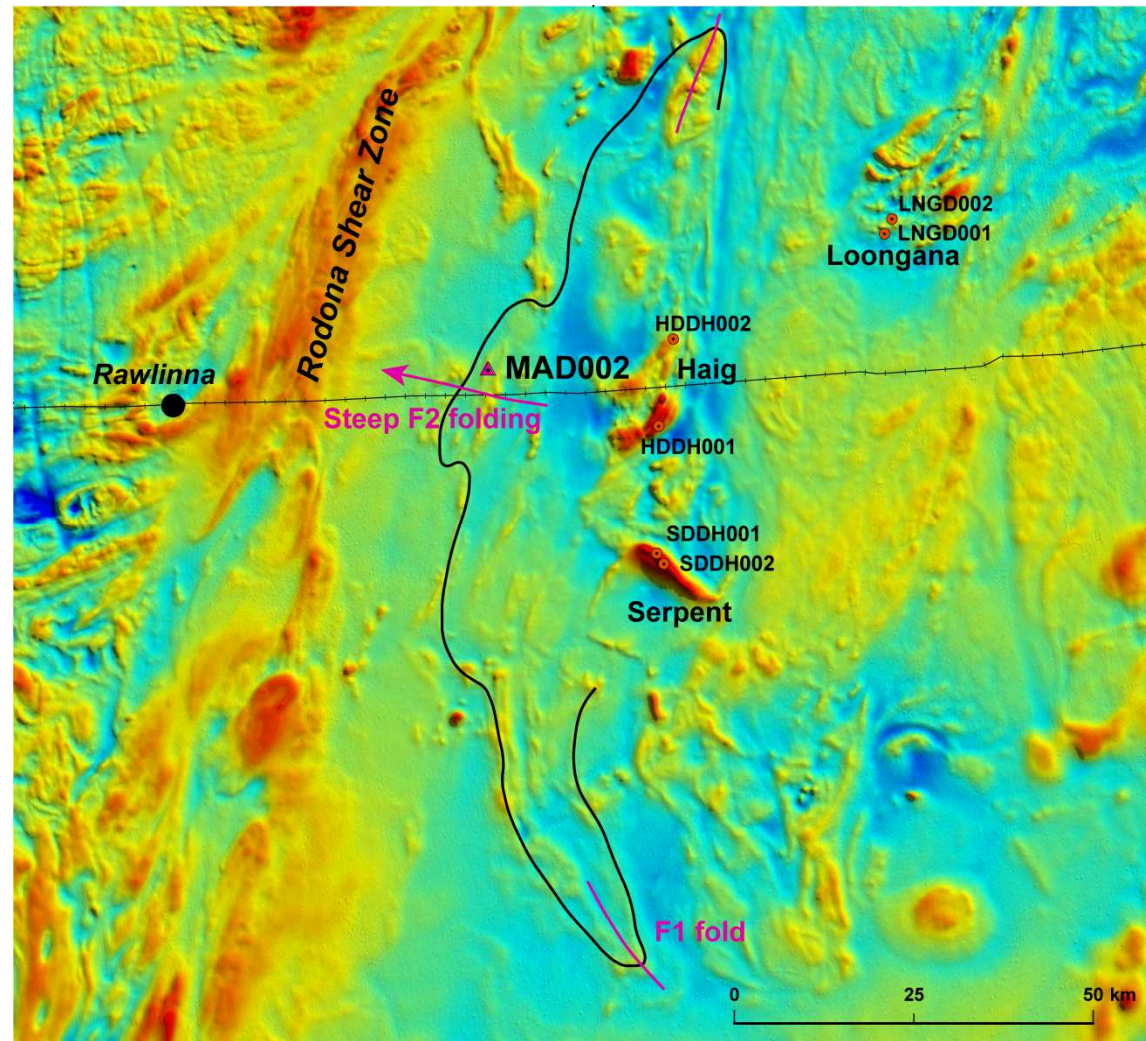
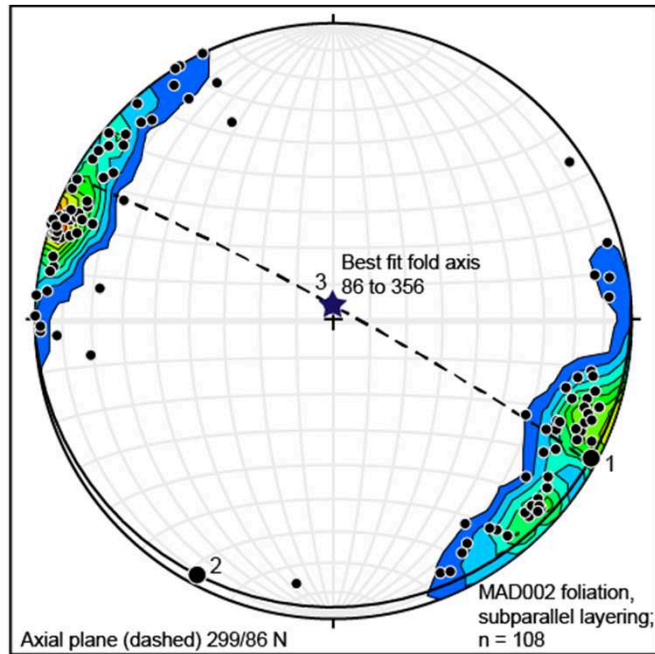
- Refolded folds
- Sub-vertically plunging, F2 folds of the layering in the metabasalt and the leucogranite veins; S- and Z-folds



MAD002 drill core structural interpretation



- Stereonet analysis: fold axis 86° to 356 , similar to measured folds.
- Best fit axial plane: 86° to 029 .



MAD002 drill core: sulfides



Occur in minor amounts in both units:

- Disseminated, in stringers, and in thin veins similar to host rock composition
- Veins cut the foliation, latest veins associated with small brittle faults



Disseminated pyrite, pyrrhotite, and chalcopyrite

MAD002 drill core: sulfides

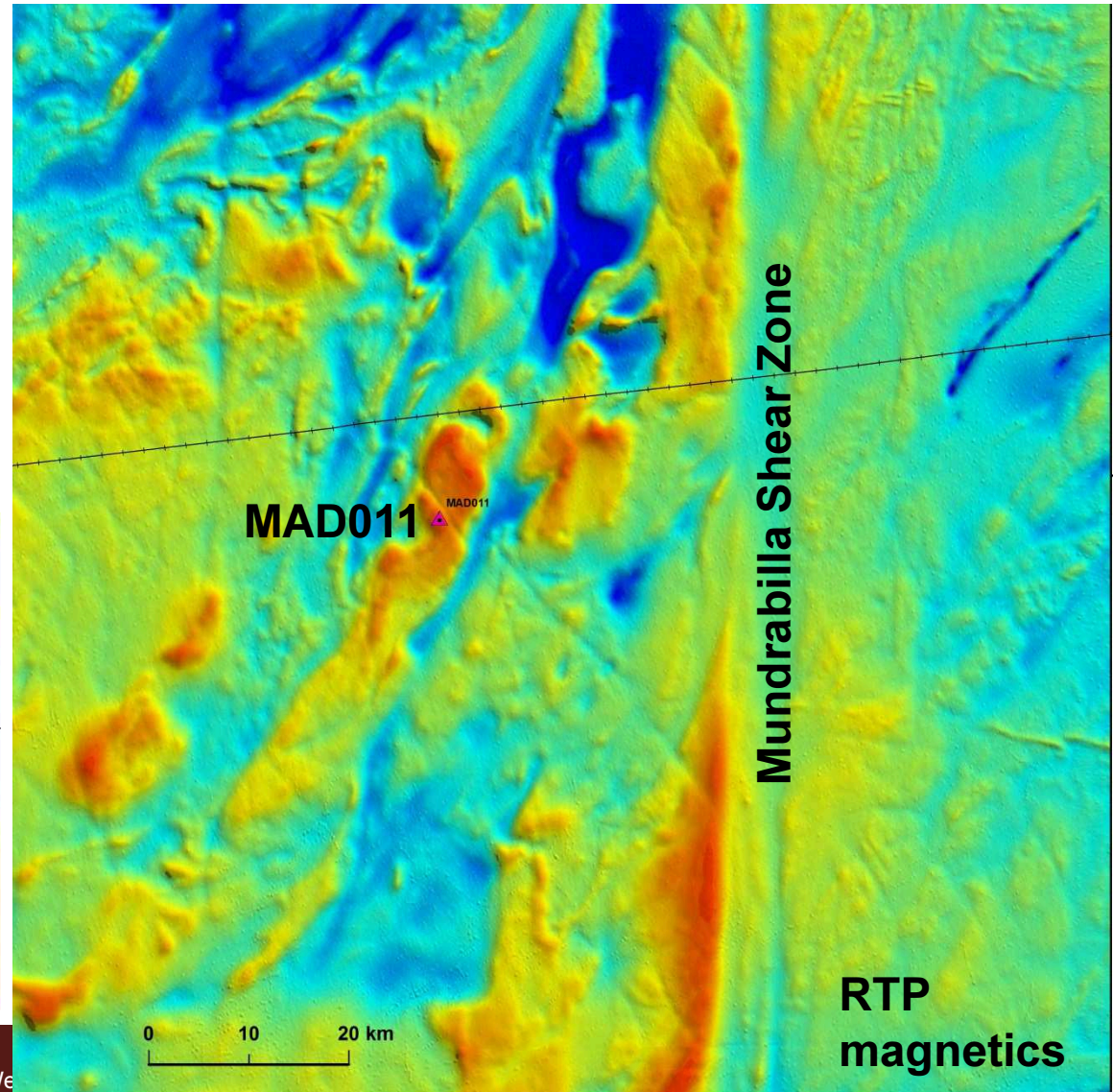
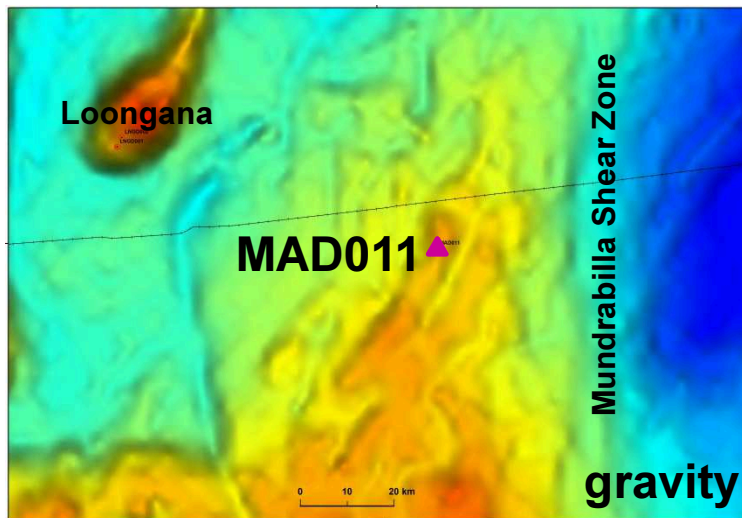
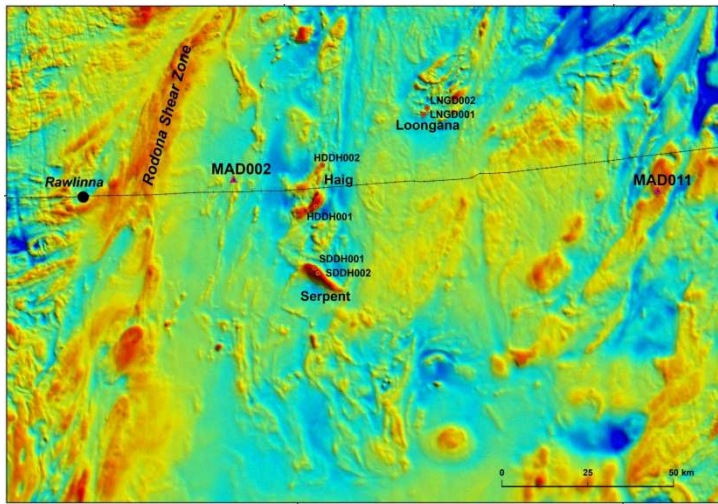


In metabasalt:

- Stringers: pyrite-chalcopyrite-hornblende-titanite-magnetite; likely at metamorphic peak
- Up to 2146 ppm Cu (GSWA 206770, 17cm 1/2 HQ core) in sericitised plagioclase-rich vein with chalcopyrite



Magnetics and gravity; MAD011 drill site



MAD011 drill core, basement at 435 m



Two main rock types:

- Medium- to coarse-grained ferro-monzogabbro, grades to a coarse plagioclase-rich leucogabbro (High-KFe series Moodini Supersuite)
- Rafts or xenoliths of fine-grained, layered and foliated mafic amphibolite (N-MORB metabasalt)



Photographed wet



Photographed dry

MAD011 drill core



- Ferro-monzogabbro typical assemblage plag-qtz-mafic clots (hbl-bt)-magnetite, locally opx (retrogressed to cummingtonite)-cpx.
- Metabasalt, thinly layered and locally foliated, typical assemblage opx-cpx-hbl-plag-ilmenite, locally magnetite and bt – possibly hornfels due to gabbro intrusion






MAD011 drill core; sulfides



- Both rock types cut by thin felsic veins, and quartz-epidote veins, some of which contain sulfides
- Pyrite and chalcopyrite associated with magnetite

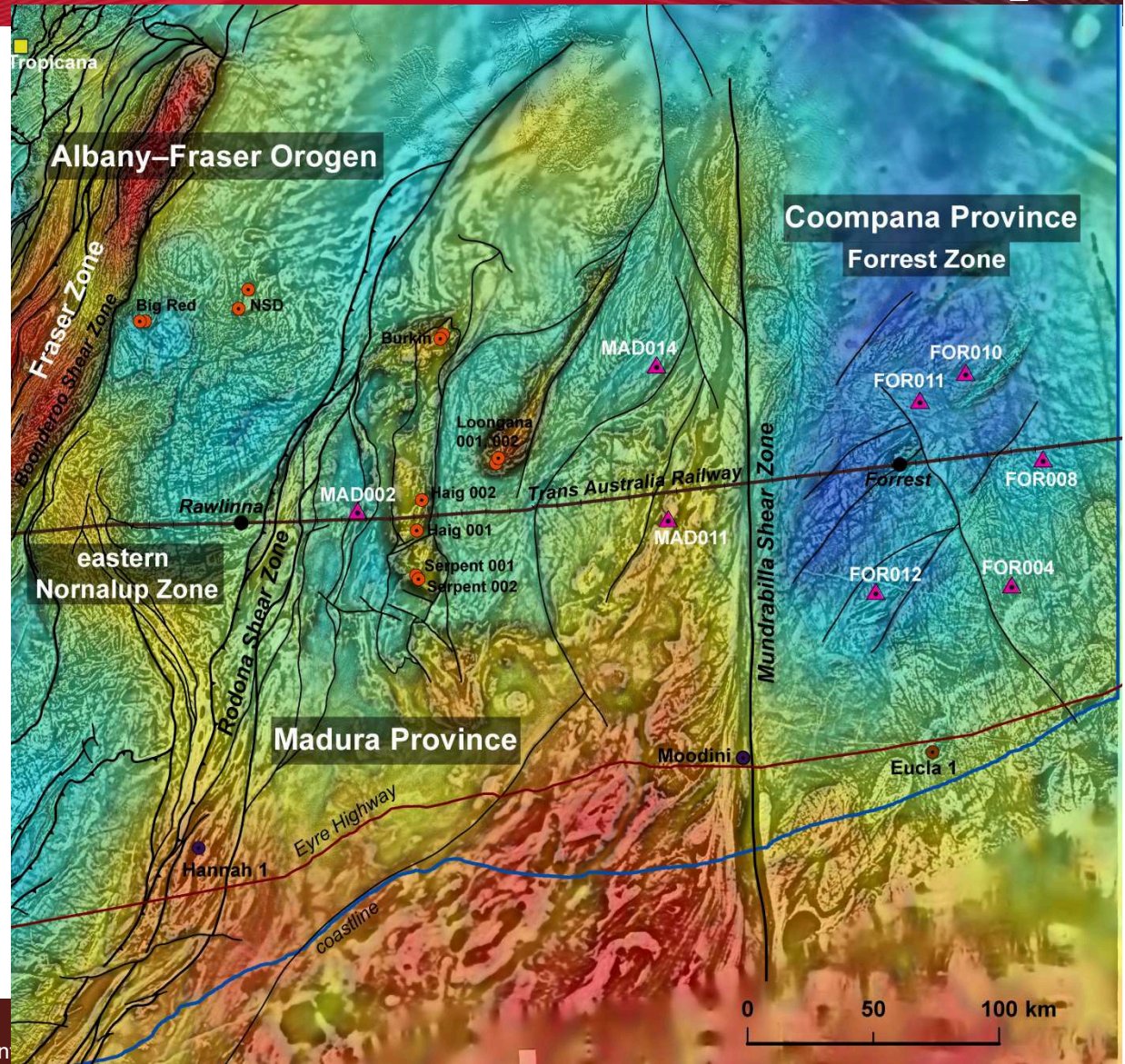


MAD014 drill site

-  GSWA stratigraphic drill hole
-  EIS co-funded drill hole
-  Company donated core site

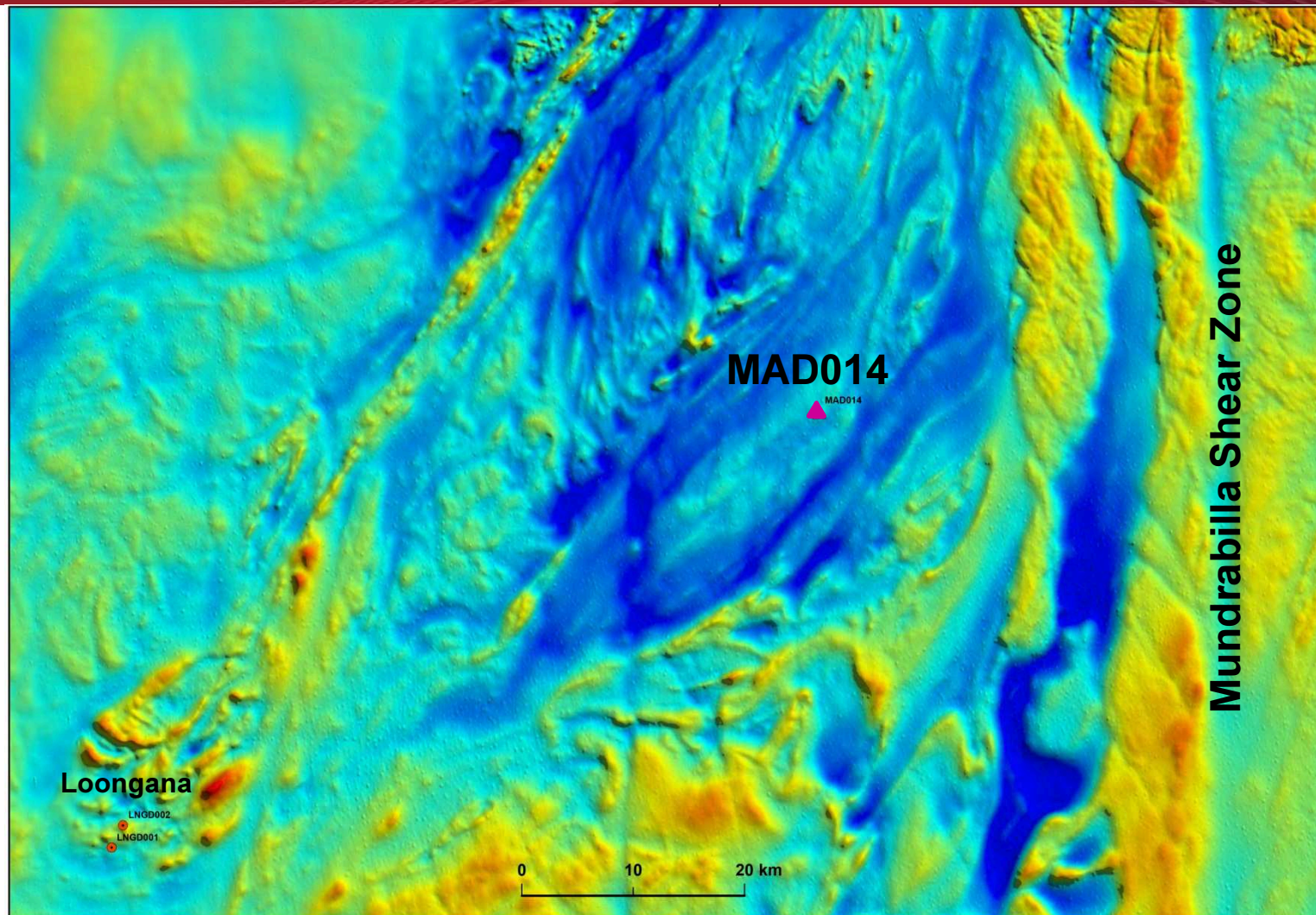


- Located east of Loongana, north of MAD011 – all looks the same on the surface.....



Gravity (colour) with 1VD
magnetics (greyscale)

Magnetics; MAD014 drill site



MAD14 drill core, basement at 250 m



Two main rock types (High-KFe series, high Th, Moodini Supersuite):

- Medium- to coarse-grained, unfoliated mesocratic granodiorite to monzogranite
- Intruded by veins of fine-grained, unfoliated equigranular monzogranite to syenogranite, typically with pegmatitic margins



MAD014 drill core; sulfides



- Granites cut by minor quartz, quartz-epidote, or quartz-biotite veins, locally with sulfide



Summary



- Madura Province is dominated by mafic-intermediate (juvenile) rocks, including the c. 1400 Ma gabbro-peridotite intrusions and leucogranites from Loongana, Haig and Serpent
- Includes different types of metabasalts (E-MORB/OIB and N-MORB), intruded by gabbroic rocks
- Metabasalt and leucogranite in MAD002 within steeply-plunging fold architecture
- Apparently undeformed, granitic and gabbroic intrusions (MAD014 and MAD011)
- All three stratigraphic cores contain sulfides; high Cu in MAD002.

