A One-Way Ticket from Antarctica to the Tasman Abyssal Plain via the Great Barrier Reef – Sediment Dispersal on the Eastern Australian Margin*

Ron Boyd[1]

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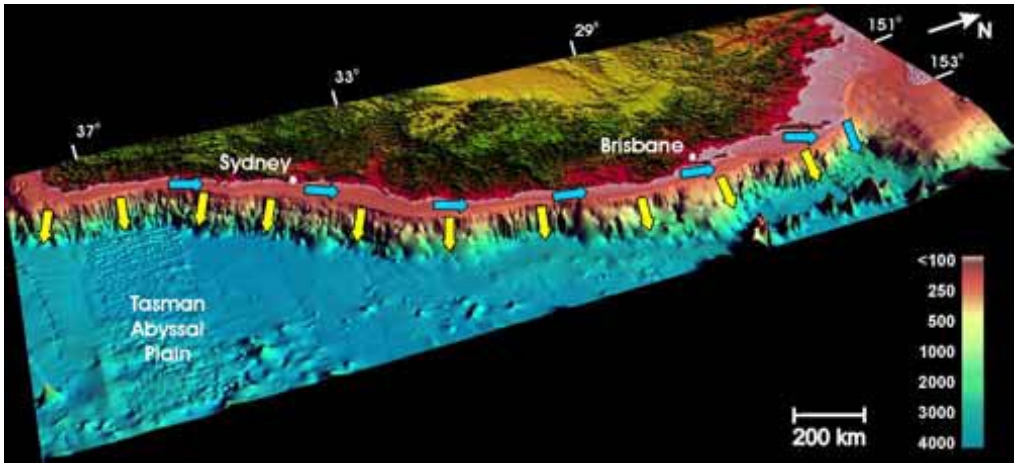
[1]ConocoPhillips (Ron.L.Boyd@conocophillips.com)



The modern coastal sediment dispersal system of eastern Australia operates from sources in the Sydney Basin 1000 km northward to sinks on the coastline of south-east Queensland and the adjacent Tasman Sea abyssal plain. Individual sand reservoirs of over 203 km3 have accumulated in less than one million years, from longshore transport rates averaging 500,000 m3 per year. Zircon dating techniques enable the tracing of this entire sediment dispersal system from its original source in Antarctica to its final sink on the floor of the Tasman Sea. Igneous rocks with a characteristic age of around 600 Ma produced zircons and associated source rocks on the current northern margin of Antarctica prior to continental breakup with Australia. Triassic uplift shed sediments and associated zircons 1000 km northward in a braided river before intermediate deposition in the Sydney Basin of eastern Australia. Continental rifting in the late Cretaceous produced the modern Tasman Sea and an uplifted escarpment along eastern Australia, including the Sydney Basin. Escarpment erosion of the 600 Ma zircons and associated quartz sands by river processes feeds the modern Tasman Sea longshore transport system, delivering reservoir quality sand 1000 km north for storage on the SE Queensland shelf. In the Holocene at sea level

highstand, this sand river has intersected the shelf edge and is currently supplying the east Australian longshore transport sands directly to the floor of the Tasman Sea via a network of wave, tide and gravity driven flows through a 4 km-deep network of submarine gullies and canyons. Elsewhere the margin is dominated by mass transport processes, including slab slides, box canyons and retrogressive linear canyons. Holocene submarine landslides range in volume up to 20 km3 and represent potential tsunami geohazards, as well as an alternative mechanism to transfer sediment to deep water on the SE Australian continental slope and Tasman Abyssal Plain. Eastern Australian provides an important example of a margin characterized by high wave energy, low subsidence, and coupled gravity mass transport and longshore transport processes.