Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05891, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05891
EGU General Assembly 2008

Remote sensing of fluvial architecture of the Murray River, southern Australia

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The Murray River forms the border between New South Wales and Victoria, before flowing into South Australia. It has been extensively investigated by state and national agencies as part of wide ranging environmental studies for management of floodplain, riparian, and riverine health (e.g. Hollingsworth 1990, Jolly *et al.* 1994, Overton *et al.* 2004, Overton and Jolly 2006). It is perhaps the most studied floodplain in Australia. Therefore it is ironic that the geomorphology of the floodplain has had almost no detailed investigation. High-resolution airborne LiDAR surveys allow geomorphic mapping at high hierarchic levels, these maps are useful for the interpretation of geophysical surveys and regolith landform maps, and, in conjunction with these additional data, the preparation of more derived products such as recharge and flush zone maps and groundwater and salt budget models (Tan *et al.* 2007).

The Murray River in part occupies the Murray River Gorge (Twidale *et al.* 1978) a valley incised through a Late Cainozoic succession consisting of the Blanchetown Clay and the Loxton-Parilla Sands. These are mantled by Pleistocene aeolian sands of the Woorenin Formation (Brown and Stephenson 1991).

The modern floodplain consists of three distinct generations of meander belt sediments composed of scroll bars and oxbow billabongs. These show distinct up and down-stream morphologies reflecting spill-over of sands during river floods. A conventional fine-grained floodplain is absent, because the meander belt sediments extend across the full width of the floodplain within the confines of the gorge. However, older meander deposits are draped by floodplain silty clays with thicknesses increasing to

more than a metre with the older deposits. The oldest floodplain deposits also show distinctively longer meander wavelengths and wide channels than does the modern channel, indicating a diminished flow over time.

Sinuous fixed anastomosing channels (anabranches) are related to drainage during high water levels. These channels and oxbow billabongs are mostly clay-lined. Distal to the river small clay pans abut against the cliffs forming the edge of the trench and are several metres lower than the rest of the floodplain. They form evaporation basins for water draining off the proximal floodplains along the fixed channels.

Remnants of high level terraces of inferred Pleistocene age are correlated with those reported by Rogers and Gatehouse (1990) further south along the Murray River as being of Late Pleistocene age. The small size of the terraces makes it difficult to infer much about the depositional system that formed them. However, further upstream in the Lindsay-Wallpolla Islands reach of the river, similar terraces are mantled by aeolian silts and sands through which ghosts of channels and billabongs are visible in satellite imagery.

Drilling has shown that the River Murray Gorge in South Australia is flat-floored and overlain by a coarse sand unit sometimes referred to as the “Monoman Sand” (Firman 1966). This unit, which has no formal stratigraphic status, is inferred to represent a braided stream facies deposited during the earliest phase of Late-Pleistocene to Early Holocene aggregation. The top of this facies is marked by a buried forest and palaeosol (Gill 1973) which may mark the transition from braided to meandering deposition that characterises the modern river. At Chowilla in South Australia the inferred latest Pleistocene to Holocene sediments are up to 40 m thick. Upstream the sediments thin markedly to less than 20 m in the Lindsay-Wallpolla region dur to thinning of the “Monoman Sand”.

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