Book Reviews

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Terrane Processes at the Margins of Gondwana

Editors A.P.M. Vaughan, P.T. Leat and R.J. Pankhurst
Geological Society of London Special Publication, 2005
ISBN 1-86239-179-3. 456 pages. £95/$171 (members £47.50/$103).

As a relative newcomer to tectonic processes along the Gondwanan margin, I have been eagerly awaiting a publication such as this that seeks to synthesize data from many areas and by many workers. The scope of the book is massive and follows from several specialist meetings and contributes directly to a number of organised programmes, by the British Antarctic Survey (SPARC) and the International Geological Correlation Project 436 ('Pacific Gondwana Margin'). As such, this leaves the reader in no doubt as to the veracity of the data and particularly as each chapter is peer reviewed by internationally renowned researchers, as is common practice for the Geological Society Special Publications.

What is unusual and highly commendable about this publication is the level to which the editors (Vaughan, Leat and Pankhurst) set the scene in the first chapter, detailing nomenclature used and specifying exactly what they mean by the term "terrane", whose use has been rather widely interpreted in recent years. This will afford the publication longevity since future workers will be able to readily interpret exactly what the authors were describing in their terrane models.

The Pacific Gondwanan Margin is an extremely elongate and long-lived feature, extending from eastern North America through western South America, Antarctica, New Zealand and Australia, and from Neoproterozoic through late Mesozoic times. As such, any collection of papers that purports to comprehensively cover all aspects of terrane processes through this extensive area of space and time will surely be lacking in some areas. Having said that, this publication does indeed cover many key areas and the authors and editorial team are to be congratulated for keeping largely to a review style. Of particular note are the chapters on the Tasmanides (Glen) and the New Zealand tectonostratigraphy (Wandres & Bradshaw). It is these regional review chapters that are likely to be of most use in the long term to anyone interested in studying or conducting further research in these areas. There are also useful regional accounts of the Appalachian peri-Gondwanan realm of eastern North America (Hibbard *et al*.), the Famatina complex of NW Argentina (Miller & Sölner), the Puncoviscana complex of NW Argentina (Zimmermann) and terranes from Northern Victoria Land, Antarctica (Tessensohn & Henjes-Kunst). There is a very useful compilation of Nd and Sr isotopic signatures of Palaeozoic–Mesozoic metasedimentary rocks around the South Pacific margin (Adams *et al*.) that will be of great value for future provenance studies. Aside from these, there are also more specialized accounts, such as Early Jurassic magmatism in NW Patagonia coeval with the Karoo mantle plume (Rapela *et al*.), a discussion of the Early Palaeozoic orogen in the central Andes (Lucassen & Franz), palaeomagnetic constraints on the latest Proterozoic to Late Palaeozoic accretionary history of southern South America (Rapalini), geochronology of Proterozoic basement inliers within the Columbian Andes and their bearing on Rodinia reconstructions (Cordani *et al*.), exotic Archaeocyathan limestone blocks within tillites of the Falkland Islands of a probable Antarctic origin, transported during Permo-Carboniferous gondwana-wide glaciation (Stone & Thomson), lithospheric mantle domains beneath Antarctica (Leat *et al*.), and the kinematic history of western Marie Byrd Land, West Antarctica (Siddoway *et al*.). These accounts report exciting new advances in areas currently receiving attention. If another similar volume was to be organized in a decade, I would imagine that a completely different set of specialist papers would arise, reflecting the interest of the day. Nevertheless, these papers stand alone as being important advances within the larger topic of terrane processes at the margins of Gondwana.

I would single out a further two contributions that set apart this publication as a whole from similar Geological Society Special Publications. The first is a short but insightful paper on investigating the deep structure of terranes and terrane boundaries from earthquake seismic data (Reading). I found this contribution to be an excellent example of how to incorporate techniques that one can use to address the problem in question into these types of publications, within an otherwise fairly straight set of regional tectonic papers; such contributions should be strongly encouraged. In fact, it would have been good to have had a few more accounts of techniques as short, stand alone chapters such as detrital zircon/mica provenance and Nd, Sr, Hf and Pb isotopic terranology (perhaps this could have gone as an extended introduction in Adams *et al*.). My point is that all too often the Geological Society Special Publications are not much more than a coherent set of peer reviewed papers that could happily go in a special edition of a journal. In my view, the book format, and consequent relatively hefty price, demands much more, not the least in longevity but also in comprehensiveness. By having a chapter at the start of the book on terrane processes, and at least one paper on techniques of terrane discrimination, this publication goes some way towards being an academic book of scholarly value in the broader area of "Terrane Processes" as well as one concerned solely with the Gondwanan Margin. The other contribution that stands out

is one that addresses terrane accretion around the whole of Gondwana during the Mesozoic (Vaughan & Livermore). These authors very elegantly demonstrate, by reviewing all of the published evidence, that terrane accretion occurred in mainly two distinct, short-lived episodes and that these were global and synchronous with probable super-plume events. The hypothesis is a fairly simple one: that the arrival of a super-plume beneath an actively spreading ocean plate or a continent, results in a temporary change in dynamics at the opposing plate margins from being in tension (normal subduction environment and due to rollback of old, cold subducting crust), to being in compression due to plate reorganisation, resulting in deformation and accretion of material. What is particularly interesting is the scale, demonstrating that Gondwanan studies have global implications and the fact that this is a fairly brave and bold contribution, presenting a new hypothesis with fairly far-reaching consequences. For example, one wonders whether an apparent causality between global tectonic events and super-plume activity might equally argue for a causal link between global tectonism and large meteorite impact. If so, then there is yet another spanner in the works for unravelling the culprit in mass extinction events. I suspect this paper will make quite a splash and be a talking point for some time, which makes buying the book even more enticing. It would have been particularly nice if a similar large-scale contribution from Palaeozoic times were included, particularly regarding the controversial issue of the apparent Laurentian provenance of the Precordillera and its implications for complex terrane interactions between Gondwana and Laurentia during the Palaeozoic. However, that topic is still well and truly alive and most likely to result in its own Special Publication at some point.

Overall, this publication is strongly recommended, particularly for those researching any aspect of the Gondwanan margin, but also for those interested in tectonics in general. Geological Society Special Publications tend to be prevalent in University libraries, and I'm sure this one will be no exception. However, I suspect that this one may well be more thumbed than most in years to come.

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