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Book Reviews

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***Continental transpressional and transtensional tectonics*, Holdsworth, R.E., Strachan, R.A., and Dewey, J.F.: Geological Society Special Publication No. 135, 1998, The Geological Society, London. ISBN 1-86239-0070X. 360 pp. £79, US $132.**

This recent addition to the long line of Special Publications by the Geological Society provides a timely and up-to-date assessment of research on oblique deformation in areas of continental crust. The volume consists of a broad spectrum of 22 papers, the first of which is an overview of transpressional and transtensional zones by editors Holdsworth, Strachan, and Dewey that provides background for the research papers that follow (the volume is, thankfully, devoid of uncritical review papers). In their overview, the editors list several caveats that apply specifically to investigations in areas of transpressional and transtensional deformation, such as the inapplicability of balanced cross-section techniques, the inappropriateness of two-dimensional strain-ellipse analysis, and the apparent lack of a simple or significant relationship between oblique crustal deformation and stress.

The remainder of the special publication is divided into four parts: Modeling Transpression and Transtension; Continental Transform Zones; Oblique Divergence Zones; and Oblique Convergence Zones. The modeling studies will be perhaps the most widely read part of the book because of their general applicability. The mathematical analysis of transpression and transtension by Fossen and Tikoff is impressive in its breadth of potential application; one of the more interesting conclusions they reach is the lack of parallelism between the oblique plate-motion vector and either the infinitesimal contraction (stress) direction or the finite shortening direction in areas of oblique convergence. The mathematical modeling of Jones and Holdsworth continues along this vein, analyzing strain related to oblique simple shear in zones of transpression. Lin, Jiang, and Williams describe a triclinic shear zone in the Canadian Appalachians and model it numerically, noting kinematic circumstances where apparent monoclinic symmetry may be produced. In an extraordinarily interesting paper, Schreurs and Colletta used brittle analogue materials over a thin viscous layer to model zones of continental transtension and transpression; their Experiment 1820 produced an array of strike- and oblique-slip faults that are remarkably similar to Laramide structures of controversial origin in New Mexico.

Most of the remaining papers in the volume are regional in their scope and field-oriented in their approach, although some include ancillary analogue modeling. Both brittle and ductile regimes of deformation are well represented. A great deal of variability exists between individual study localities with respect to accessibility, quality of exposure and of geologic data, and level of maturity of previous scientific investigations. As such, significant variation exists in the level of detail achieved among the regional papers, and similarly in the robustness of the interpretations which may be drawn from them. Papers in the Continental Transform Zones section include studies of the Lebanese restraining bend of the Dead Sea transform (authors Butler, Spencer, and Griffiths make a case for migration of the rotational pole between Africa and Arabia), the tectonic evolution of the northern Salinian block, California (Tavarnelli argues for strike-slip partitioning to explain the coexistence of strike-slip and contractional deformation), the transpressive "Big Bend" of the San Andreas fault, California (Rust), the Salar Grande pull-apart basin of the Atacama fault system, northern Chile (Reijs and McClay document the multi-phase evolution of this continental basin), and the nature of lithospheric scale transpression along the San Andreas fault (Teyssier and Tikoff invoke horizontal crustal stretching to explain the "San Andreas discrepancy").

The Oblique Divergence Zones section leads off with a paper by Krabbendam and Dewey on transpressional exhumation related to constrictional strain in the Scandinavian Caledonides. This is followed by three other regional studies of transtension: trans Mojave–Sierran shear zone, California (Dokka, Ross, and Lu invoke transtensional block rotations to link early Miocene continental extension to the east with the plate margin), Gondwana break-up in southeastern Africa (Watkeys and Sokoutis), and transtension in

the Bohai Basin, northern China (Allen, MacDonald, Xun, Vincent, and Brouet-Menzies).

The section on Oblique Convergence Zones consists of eight scientific papers which address processes of transpressional deformation in a variety of geologic environments scattered across several continents. Topics include the Precambrian transpressional tectonics of southeast Brazil (Ebert and Hasui), stress rotations during transpression in the Western Carpathians and Southwest British Variscides (Gayer, Hathaway and Nemcok attempt to distinguish between primary stress-trajectory deflections versus later rotations of paleostress vectors), Hercynian dextral transpression in the Pyrenees (Gleizes, Leblanc, and Bouchez), Late Cretaceous transpressive deformation in the Bohemian Massif, Germany (Tanner, Behrmann, Oncken, and Weber; this study incorporates constraints from a nearby 9 km-deep borehole), pure-shear dominated transpression, Ellsworth Mountains, Antarctica (Curtis documents kinematic partitioning related to pre-existing structures), Karakoram fault zone, northern Ladakh (Searle, Weinberg, and Dunlap challenge models of large-scale extrusion of Tibetan crust), Quaternary deformation along Pollino Ridge, southern Italy (Schiattarella). Also included in this section is a paper by Saint Blanquat, Tikoff, Teyssier, and Vigneresse on transpressional tectonics in magmatic arcs, in which they emphasize the role of "tectonic overpressuring" as opposed to simple buoyancy in the ascent of arc magmas.

Overall the book is clearly and concisely written. There are very few typographical errors. It is grammatically rather homogeneous despite the varied nationalities of the authors. The quality of figures is generally very good, although some line drawings and maps are rudimentary and could have benefited from more careful design and execution. Color figures are included in two papers.

Special Paper No. 135 is clearly intended for structural geologists and tectonicists. I would have preferred, however, to see a somewhat more multidisciplinary approach to the broad subject of transpressional and transtensional tectonics. Only two papers deal in any detail with related topics (stress, magmatism). The subject of sedimentary tectonics does not go much beyond the rudiments of "basin" and "uplift". The relatively narrow topical focus of the volume notwithstanding, this is clearly the most definitive treatment of transpressional and transtensional tectonics yet published and belongs in the library of any serious student of these subjects.

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***Structural Geology in Reservoir Characterization*, Coward, M.P., Daltaban, T.S., and Johnson, H. (eds), 1998. Geological Society Special Publication 127. ISBN 1-897799-94-2. List price: $115/£69.**

Efficient exploitation and management of hydrocarbon reservoirs that are dominated by structural heterogeneities depends largely on thorough technical characterization. Reservoir characterization is the study of subsurface, outcropping, or model geologic bodies that are capable of containing and conducting fluid. It is an applied science, chiefly practiced within the petroleum industry, often requiring integration of diverse data sets from geological, geophysical, and engineering disciplines. The sub-discipline of structural reservoir characterization distantly trails other areas such as stratigraphic and geophysical characterization in application, and therefore this volume is valuable in its timeliness. Its stated aim is to capture the wide range of research within this expanding field and to promote synergy between geoscience and engineering disciplines. To this end, 16 papers are offered covering faulted and fractured reservoirs, development and characterization of fault zones, fluid flow issues, and case studies of application. Included are two introductory papers, ten papers on faults and fractures, and four on case studies. The volume represents the efforts of 43 contributors, two-thirds of whom reside in academic institutions, and the remainder are from petroleum industry technology groups.

This review assesses the contribution of the book within the broad definition discussed above. Its principal weakness is that many of the included papers deal with topics that do not fall within the broadest definition of *Structural Geology in Reservoir Characterization* yet it contains many valuable contributions. I am struck by the fundamental lack of attention given to the integration between geoscience disciplines, which is one of the volume's stated goals. Perhaps this is a testimonial to the condition of the science. Another shortcoming is that it is too provincial (for my tastes). It is primarily authored by U.K. contributors, and its primary application focus is on North Sea reservoirs.

The following is an editorialized description of the volume beginning with the papers that I feel are most valuable. *Fault Seal Prediction: the Gouge Ratio Method* nicely summarizes the fundamentals of damage-related fault sealing processes and their interpretation. *Flow through Fault Systems in High Porosity Sandstones* thoroughly discusses the critical factors that impact flow in faulted, high-porosity sandstones. The discussion of scaling, fault connectivity, and compartmentalization provides background that supplements other papers in the volume. The flow modeling section deals primarily with fault con-