Seafloor Mapping in the West, Southwest and South Pacific: Foreword

Thirty years ago the West and Southwest Pacific Oceans (Figure 1) were quite virgin regarding seafloor mapping. Conventional soundings started to be more intensively carried out around the 70's. Major breakthroughs in seafloor mapping technology occurred in the 70 and 80's allowing new mapping tools to be developed which simultaneously acquire detailed swath bathymetry and reflectivity of the seafloor. This new generation of mapping tools was designed to rapidly investigate the morphology and nature of large areas of the seafloor in both shallow and deep water regions. The understanding of plate kinematics and oceanic crust genesis, as well as sedimentary and tectonic processes at active and passive margins greatly benefited from this new technology. The first swath mapping cruise carried out in the south Pacific domain was by the French research vessel *Jean Charcot*, equipped with a SeaBeam system, around French Polynesia in 1979. Since this time swath mapping cruises have proliferated in the West and South Pacific with an average of ten swath mapping cruises undertaken each year in the area, by American, Australian, English, French, German and Japanese institutions and universities. The swath mapping systems used for these cruises include Seabeam, Hydrosweep, Simrad, Furuno, Gloria and Sea Mark systems. The use of GPS (Global Positioning System) improved considerably the quality of ship location and simplified the real-time and post data processing.

More than 100 swath mapping cruises have been carried out in the Southwest Pacific area alone. Among the most recent cruises, were those performed by the French RV *L'Atalante* in the SW Pacific along New Zealand (Geodynz cruise), Australia (Tasmante cruise), New Caledonia (Zoneco I and II cruises), Fiji, Vanuatu, Solomon Islands, Tuvalu (Sopacmaps I, II, III and Nofi cruises). The RV *L'Atalante* is equipped with a Simrad EM 12 Dual system, which allows a full bathymetric and seafloor reflectivity coverage over a maximum 22 km-wide strip of seafloor along each survey line. During more than eight months at sea, about 1 million square kilometers of seafloor have been mapped.

The considerable amount of new results obtained by swath mapping during the last ten years encouraged us to organize the "Seafloor mapping in the West and SW Pacific: Results and applications" Workshop at Nouméa (New Caledonia) in November 1994.

The papers presented in this Special Issue resulted from this workshop. They cover the South and Southwest Pacific area from the Antarctica up to the Okinawa Trough. They also cover different fields of science using indirect mapping and swath mapping techniques: Satellite Altimetry, Geophysics, Geology, Biology and Data Processing.

Nineteen papers were gathered for this Special Issue:

The first paper by Calmant and Baudry is a review of the methodologies of indirect determination of bathymetry from satellite data. The second by Baudry and Calmant, presents a new method dealing with the utilization of new altimetric data and focusing on the precision of the results. The third paper is presented by Matsumoto who, deriving the gravity field from altimetry deduces implications for the evolution and driving forces in the Lau and North Fiji back-arc basins.

Following these methodologic papers, 13 papers deal with detailed morphology, geophysics and geology of different seafloor areas of the West, Southwest and South Pacific Oceans. Five of them are related to the rifting and spreading processes in the back-arc basins located along the Australia-Pacific plates boundary, the others papers concern subduction, strike-slip and collision related-processes along this convergent plate boundary.

Hsu *et al.* in the Okinawa Trough, and Benes and Scott in the Havre Trough illustrate the intracratonic rifting related to the functioning of subduction zones. Martinez and Taylor, Lagabrielle *et al.* and Gracia *et al.*, respectively study the back-arc spreading systems of Manus and North Fiji basins. Both of them are considered as fast spreading ridges, but due to their different geodynamic environments they offer different

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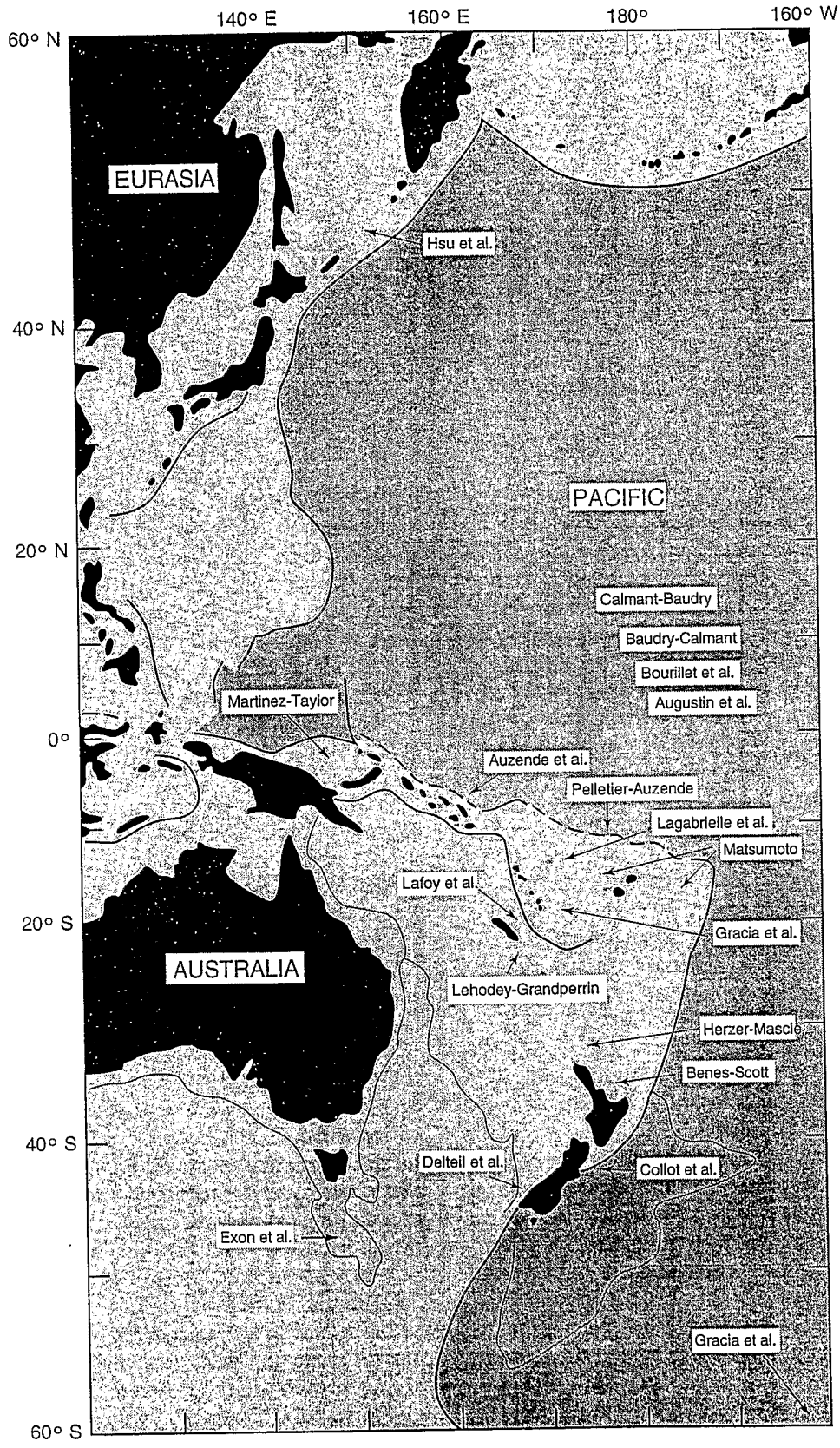

Fig. 1. Sketch of the west and Southwest Pacific domains showing the study areas of the different papers presented in the Special Issue.

levels of complexity of the spreading ridge geometry and evolution.

One paper by Exon *et al.* deals with the structures of the western margin of Tasmania, which is a key area for the reconstruction of the initial break-up of the eastern part of Gondwana.

Two papers, Auzende *et al.* and Pelletier and Auzende, are devoted to the study of the "fossil" boundary between the Australia and Pacific plate along the so-called Vityaz Trench Lineament.

The deformation of the Australia-Pacific plate boundary is described and discussed in three papers. Lafoy *et al.* emphasize the present-day deformation due to the collision between New Caledonia and New Hebrides, Collot *et al.* analyze the effects of the oblique subduction of the oceanic Hikurangi Plateau on the Southern Kermadec forearc and Hikurangi continental margin offshore North Island, New Zealand, and Delteil *et al.* study the transition from the Fiordland subduction and southern extension of the Alpine fault to the Puysegur trench and ridge south of New Zealand. Herzer and Mascle more precisely consider the continent backarc Veining Meinesz Fracture Zone in the northwestern part of New Zealand.

The Gracia *et al.* paper on Bransfield Basin is the only one dealing with the opening of a back-arc basin in the very low latitudes of the Pacific Ocean close to the Antarctica.

One theme of the Nouméa Workshop was the applications of swath-mapping. One of these applications is the use of detailed bathymetric and reflectivity maps for the precise location of fishing grounds in order to evaluate fish concentration around seamounts and shallow banks. In their paper Lehodey and Grandperrin, demonstrate the use of swath mapping for fishing deep species around New Caledonia.

The two last papers by Augustin *et al.* and Bourillet *et al.*, are technical papers related to the processing of swath mapping data and their merging with other geophysical or geological data for the use by the scientific community.

In conclusion we hope that the considerable amount of new data presented in this Special Issue will be useful to both the scientific and fishing communities working in the South, West and Southwest Pacific domain. This Special Issue is also the opportunity to thank the captains and crews of all the ships from different countries and institutions that were involved in the data acquisition. We also wish to acknowledge the invaluable contribution made by the 45 referees to ensure the scientific quality of the papers.

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