WIDESPREAD EXTENSION IN THE NEW HEBRIDES BACK-ARC AREA (VANUATU, SOUTH-WEST PACIFIC).

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Back-arc basin (BAB) are generally related to extensional processes associated with subduction and/or global plate kinematics. We infer from new geophysical data that New Hebrides (NH) back-arc tectonics are mainly related to this second process.

The NH arc-trench system is associated with the N70° subduction of the Indo-Australian plate under the associated BAB: the North-Fiji basin (NFB). The NFB results of several phases of spreading. A former N130° spreading axis, active between 10 and 3 Ma produced a clockwise rotation of the NH arc. A N-S active spreading axis is known in the southern part of the NFB and is continued northward by a N160° axis. The northern and southern parts of the NH back-arc are characterized by well defined, but discontinuous, extensional back-arc troughs (BAT), whereas compressional stresses, related to the subduction of the d'Entrecasteaux ridge, affect the central back-arc domain . During the Seapso leg 2 cruise, on board the R/V Jean CHARCOT, a large survey of the northern and southern BAT domain was realized using Seabeam, seismic reflection, magnetics and gravity measurements and completed by 30 dredgings.

Morphology and structure – The northern troughs consist of a complex succession of horsts and grabens trending NNW-SSE to NNE-SSW and discontinuous along strike. They suddenly disappear south of 13°30'S at the junction with the Hazel Holme fracture zone (HHFZ), a major feature bisecting from east to west the NFB. The eastern end of the HHFZ is composed of a succession of tight ridges and grabens striking N90°-N100°E. In the northern BAT, seismic reflection cross-sections show a 0.5 to 1.5 s (two way travel time) thick sedimentary series divided in two sequences. The uppermost layers of the lower sequence are synchronous with the incipient extensional tectonics whereas the upper sequence postdates the major extensional phase but is affected by a still active extension.

The southern troughs are composed of 1- two side-by-side NNW-SSE grabens located east of Efate and 2- southward a NNW-SSE trough bounded by normal fault scarps. These scarps are well-developed on the eastern flank and trend N135° or N165°.

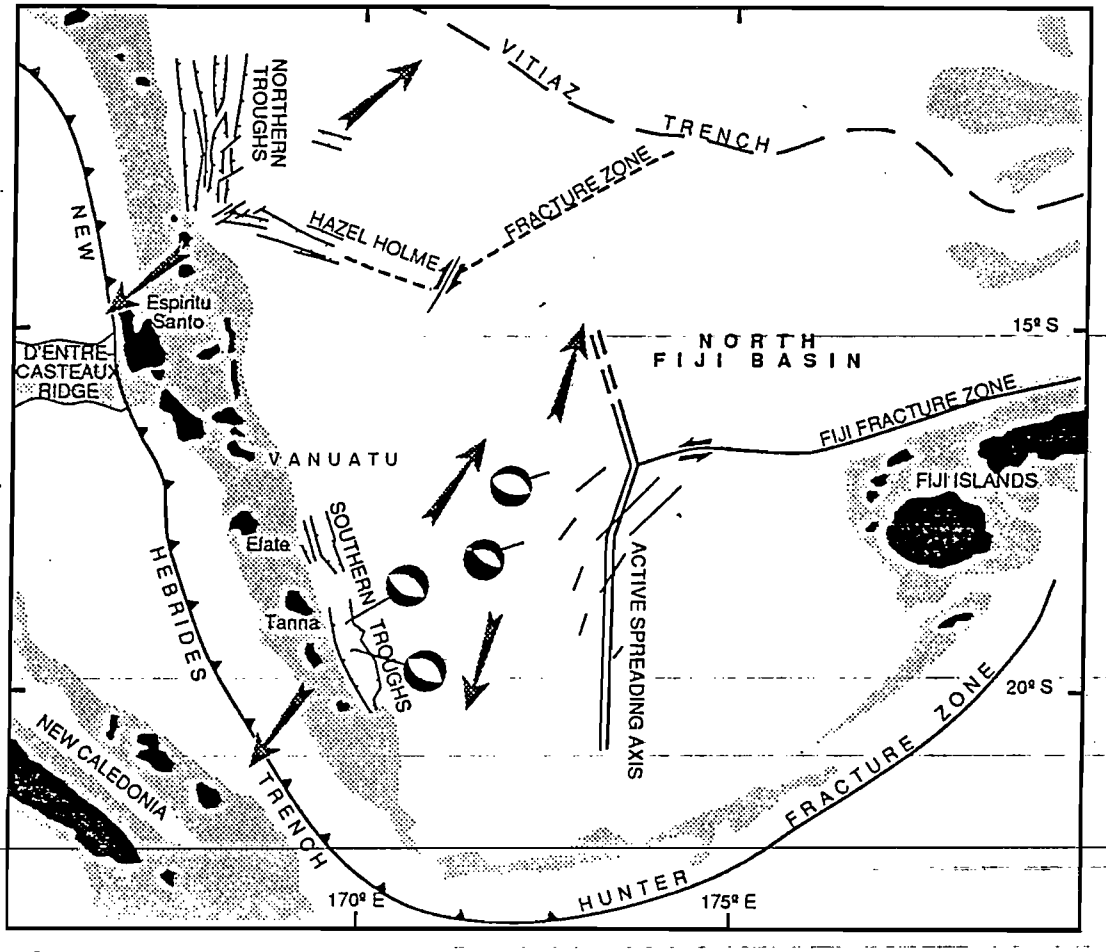
Normal faults and associated strike slip faults observed in the northern and southern BAT and as well as in the HHFZ suggest that these features are related to a recent and still active N45° extension.

Volcanism – An abundant volcanism is developed on the flanks and bottoms of the northern and southern BAT. This volcanism presents no important geochemical difference with the NH arc volcanism and is almost continuous from 4 Ma to present.

Magnetism – Both northern and southern troughs are characterized by alternate positive and negative magnetic lineations trending NW-SE. Magnetic lineations of the northern troughs are clearly continuing the N130° lineations belonging to the oldest part of the NFB. This implies that northern BAT lies on the NFB oceanic crust and then postdates the incipient spreading of this marginal basin.

We infer from morphology (i.e. Seabeam) and structure that the NH BAT and HHFZ are related to a N°45 extensional stress. This tectonic phase affect the uppermost sedimentary layers and so is still active. This is confirmed by several earthquakes located in the southern BAT resulting from a NNE-SSW extension. A very recent graben trending WNW-ESE was described by Pelletier et al. (1988) east of the northern BAT in the NFB. The NS active spreading centre is crosscut by N45° and N25° transverse tectonic lineations (Auzende et al., 1986). Those tectonic features described in the NFB as well as two recent earthquakes located west of the NS spreading axis and related to a N45° extension argue for a widespread NE-SW extension affecting a large part of the NFB.

The New Hebrides back-arc troughs, the eastern part of the HHFZ, and possibly other tectonic features observed in the NFB, are the consequence of an active NE-SW extension related to the instability of the NFB located between the Pacific and Indo-Australian plates. These features as well as the observed spreading centre are oblique with regard the NH converging plate boundary. In this case the global plate kinematics seems to be the main constraint to back-arc basin tectonics.



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