Alleghanian faulting in the southern Gaspé Peninsula of Quebec

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ABSTRACT

Transcurrent faults and associated compressional structures affecting post-Middle Devonian rocks are recognized for the first time in the southern Gaspé Peninsula (Quebec). This region was previously thought to have experienced only minor normal fault readjustments after the Middle Devonian Acadian Orogeny. Four SW-striking fault systems with post-Acadian sinistral motion that have been identified along the north shore of Chaleur Bay are described here. These faults are kinematically compatible with large NW-striking dextral faults in eastern Gaspé, and suggest that these structures reflect a widespread Alleghanian paleostress system that probably affected the entire Quebec Appalachians.

RÉSUMÉ

Des failles de décrochement et les structures compressives qui leur sont associées affectent des roches post-Dévonien moyen dans le sud de la Gaspésie (Québec) et sont reconnues pour la première fois. Cette région était auparavant considérée comme n'ayant connu que des réajustements mineurs de failles normales après l'orogenèse Acadienne (Dévonien moyen). Quatre systèmes de failles orientées SW-NE ont connus des déplacements senestres post-acadiens et sont analysés dans cet article. Ces failles sont compatibles avec de grands décrochements dextres orientés NW-SE dans l'est de la Gaspésie et suggèrent que ces structures sont associées à des paléostress alléghaniens ayant possiblement affecté les Appalaches québécoises dans leur totalité.

[*Traduit par la rédaction*]

INTRODUCTION

Following identification of post-Acadian (post-Middle Devonian) paleostress indicators in the Quebec Appalachians by Faure *et al.* (1996), significant Alleghanian deformation was recently reported in the eastern Gaspé Peninsula near the town of Percé (Jutras *et al.* 2003) (Fig. 1, inset). The present paper reveals that transcurrent and associated compressive structures also affected the narrow belt of Carboniferous rocks that is exposed on the northern shore of Chaleur Bay, in southern Gaspé (Fig. 1). The eastern Gaspé structures are dextral faults striking NW to NNW, but the southern Gaspé structures discussed herein are sinistral faults striking NE (Figs. 2 and 3).

This paper provides a structural analysis of faults affecting Carboniferous rocks in southern Gaspé, which contains the northwesternmost rock exposures of the composite Upper Devonian to Permian Maritimes Basin (Fig. 1; inset). The fault traces tend to form well defined scarps because of the juxtaposition of poorly-indurated post-Acadian rocks with more resistant pre- and syn-Acadian rocks. Hence, some geomorphic descriptions are included, as they help to delineate the faults.

GEOLOGICAL SETTING

Pre-Carboniferous rocks in southern Gaspé range in age from Neoproterozoic to Early Devonian (Brisebois *et al.* 1992). Upper Neoproterozoic to Cambrian metasedimentary and volcanic rocks of the Maquereau Group were first deformed by the Late Cambrian to Early Ordovician Gaspesian Orogeny (Ayrton 1967). Middle Ordovician sandstone and mudrock of the Mictaw Group were first deformed by the Middle Ordovician Taconian Orogeny, which for most authors includes the Late Cambrian to Early Ordovician Gaspesian deformation as an early phase (Rodgers 1967; St-Julien and Hubert 1975; de Broucker 1987). Upper Ordovician to Lower Devonian sedimentary rocks of the Honorat, Matapedia and Chaleurs groups, as well as volcanic rocks of the latter group, were first deformed by the Early to Middle Devonian Acadian Orogeny (Malo and Béland 1989; Malo *et al.* 1992, 1995; Malo and Kirkwood 1995; Bourque *et al.* 2000; Kirkwood *et al.* 1995) (Figs. 2 and 3).

The post-Acadian succession in southern Gaspé starts with the Frasnian Miguasha Group (Brideaux and Radforth 1970;

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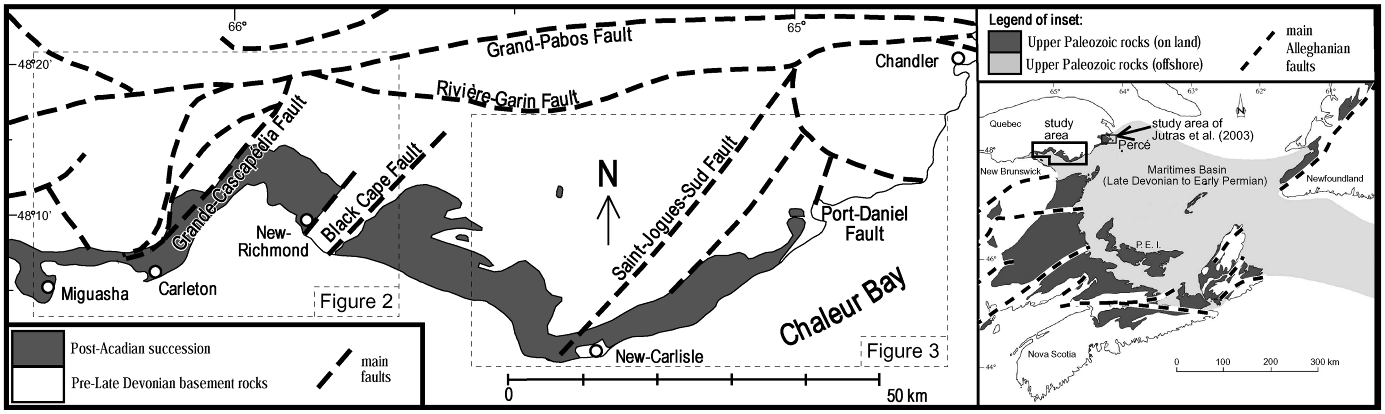

Fig. 1 Simplified geology of the southern Gaspé Peninsula (modified from Brisebois *et al.* 1992) showing only post-Acadian relationships, with map areas of figures 2 and 3 outlined. Inset is modified from Gibling *et al.* (1992).

Hesse and Sawh 1992; Prichonnet *et al.* 1996), which was gently deformed prior to deposition of the Late Devonian to Early Mississippian Saint-Jules Formation (Jutras and Prichonnet 2002) (Fig. 4). The latter occupies approximately the same stratigraphic position as the Fountain Lake Group of Nova Scotia and is also lithologically similar.

The overlying fanglomerates of the La Coulée Formation of eastern Gaspé (Jutras *et al.* 1999), which are stratigraphically constrained to the Viséan (Jutras *et al.* 2001), have not been recognized in southern Gaspé. However, the groundwater calcretization event that is contemporaneous with this formation affected the southern Gaspé area as well, above the Saint-Jules Formation and unconformably below the Viséan Bonaventure Formation (Jutras *et al.* 1999, 2001; Jutras and Prichonnet 2002) (Fig. 4). The calcrete locally digested a karstified regolith developed in the upper beds of the Saint-Jules Formation, suggesting that a significant hiatus separates the Saint-Jules and La Coulée formations (Jutras and Prichonnet 2002) (Fig. 4).

The youngest sedimentary rock unit in southern Gaspé is the early Namurian Pointe Sawyer Formation (Fig. 4), which has very limited exposure (Fig. 3) and which disconformably overlies the Bonaventure Formation. This unit was correlated with the early Namurian Mabou Group of Nova Scotia on the basis of spore-age and lithological similarities (Jutras *et al.* 2001) (Fig. 4).

The entire post-Acadian succession of eastern Gaspé, up to the Namurian Chemin-des-Pêcheurs Formation (Jutras *et al.* 2001), which is not exposed in southern Gaspé, was affected by compressive deformation and kilometric strike-slip displacements (Jutras *et al.* 2003). Four additional strike-slip fault corridors recognized in the post-Acadian succession of southern Gaspé are described below.

THE GRANDE-CASCAPÉDIA FAULT SYSTEM

Steeply dipping strata of the Bonaventure Formation along the Petit-Montréal and Mont-Saint-Joseph faults in the Carleton area (Fig.2) have been attributed to a ~600 m normal splay of that fault system (Bernard and St-Julien 1986), although no kinematic indicators were documented. Gosselin (1988) also postulated that the Bonaventure Formation was affected by a normal splay of the Grande-Cascapédia Fault (Fig. 2) on account of its anomalously steep dip adjacent to the associated fault scarp (Fig. 5).

Gosselin (1988) considered the converging Petit-Montréal, Mont-St-Joseph and Grande-Cascapédia faults (Grande-Cascapédia fault system) as steeply dipping late Acadian reverse faults that were active subsequent to regional Acadian folding, but also reports evidence for sinistral and, to a lesser degree, dextral movement along subordinate structures of the deformation corridor. The possibility that the present disposition of the Mississippian strata could have been related to that reverse splay, rather than to a subsequent normal splay, has never been evaluated.

Near Carleton (Fig. 2), the measured dips of Mississippian beds increase from east to west in the proximity of the Grande-Cascapédia fault system, until they become slightly overturned (Fig. 6a). The strikes of these beds rotate counter-clockwise along with the dip increase (Fig. 2a).

The subvertically tilted Mississippian beds that are exposed near the Grande-Cascapédia fault system at Carleton, which is not exposed at its contact with Mississippian rocks, are affected by brittle fault planes (n=5) striking NNE and plastered with sinistral slickensided calcite fibers (Figs. 6b and 2, stereonet 1; Table 1). One WNW-striking dextral fault plane with a similar fabric was also identified (Fig. 2, stereonet 1; Table 1). Moreover, two minor east-striking reverse fault planes plastered with calcite slickenfibers were identified in Mississippian rocks of the nearby Saint-Jules-de-Cascapédia quarry (Fig. 2, stereonet 2; Table 1).

The described structures are incompatible with the normal fault hypothesis formulated by previous authors (Bernard and St-Julien 1986; Gosselin 1988). However, they are compatible with sinistral movement along the Grande-Cascapédia fault system, with the sinistral and dextral shears (Fig. 2, stereonet 1) being interpreted as, respectively, R and R' synthetic Riedel

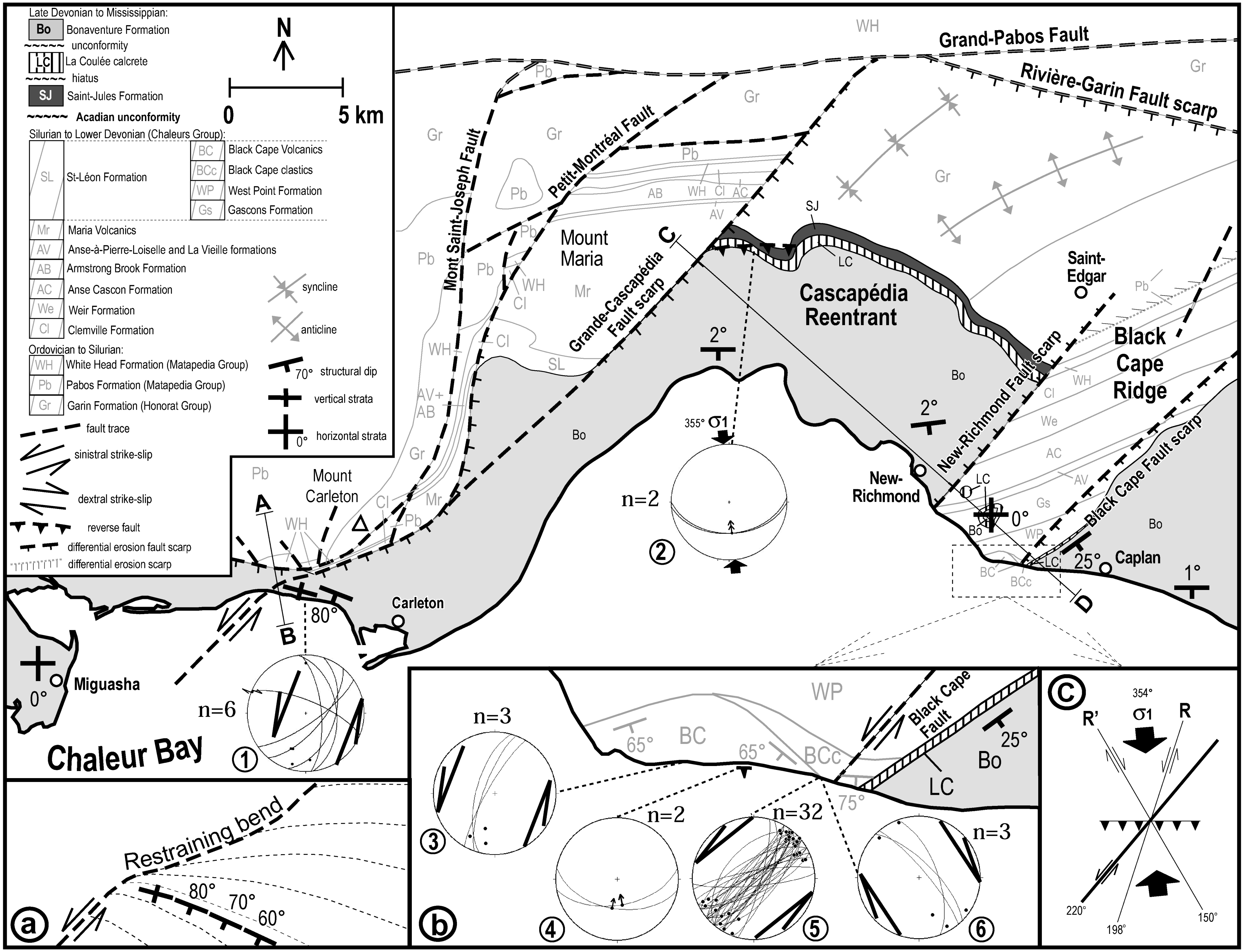

Fig. 2 Geology of the southwestern Gaspé Peninsula (modified from Jutras and Prichonnet 2002), together with orientations of fault planes (great circles) and slickenfibers (dots and dotted arrows) in (1) vertically uplifted Mississippian strata near the Grande-Cascapédia fault system, (2) groundwater calcrete of the Saint-Jules quarry, and (3, 4, 5, and 6) the Black Cape Volcanics. Mapping of pre-Mississippian units was by Bourque and Lachambre (1980) and Gosselin (1988). Inset a: sketch of the drag fold near Carleton. Inset b: enlargement of the Black Cape area. Inset c: interpretation of the subsidiary structures of the Black Cape Fault (bold axis).

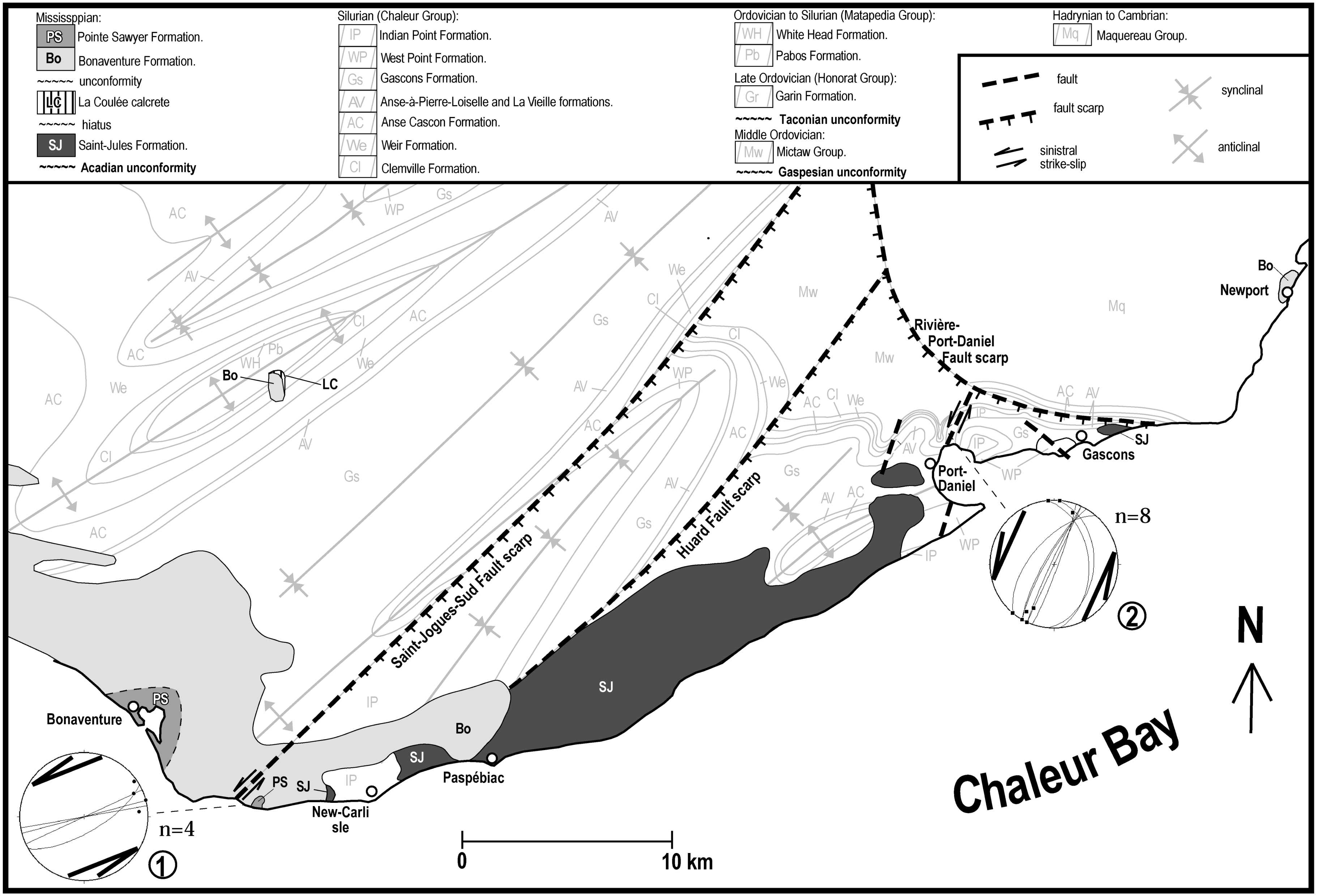

Fig. 3 Carboniferous geology of the southern Gaspé Peninsula, with orientations of fault planes (great circles) and slickensides (dots) in (1) the Saint-Jogues-Sud fault system and (2) the Port-Daniel fault system. Pre-Carboniferous geology by Bourque and Lachambre (1980). Modified from Jutras and Prichonnet (2004).

Table 1. Structural data used in this study.

Stereonet locality	Fault plane strike (°)	Fault plane dip (°)	Slickenfibre plunge (°)	Slickenfibre trend (°)	Sense of displacement
Southwest Gaspé (Fig. 2)					
1	353	46	14	360	sinistral
1	18	48	10	195	sinistral
1	40	66	34	203	sinistral
1	55	75	35	200	sinistral
1	355	68	20	175	sinistral
1	292	72	0	292	dextral
2	85	45	45	175	reverse
2	90	45	45	175	reverse
3	200	75	18	190	sinistral
3	220	80	20	210	sinistral
3	195	65	39	195	sinistral
4	80	55	55	170	reverse
4	100	50	50	190	reverse
5	40	89	30	215	sinistral
5	211	89	30	200	sinistral
5	259	81	15	70	sinistral
5	221	75	20	220	sinistral
5	58	80	20	60	sinistral
5	242	65	30	240	sinistral
5	85	80	7	85	sinistral
5	245	86	10	245	sinistral
5	51	85	15	50	sinistral
5	52	65	10	50	sinistral
5	241	84	60	15	sinistral
5	221	50	40	15	sinistral
5	35	81	8	35	sinistral
5	31	79	5	210	sinistral
5	251	80	10	70	sinistral
5	41	77	10	40	sinistral
5	60	80	20	60	sinistral
5	21	86	20	40	sinistral
5	30	78	10	50	sinistral
5	225	82	10	45	sinistral
5	31	81	15	30	sinistral
5	39	60	18	40	sinistral
5	21	69	4	200	sinistral
5	210	83	12	30	sinistral
5	219	72	5	40	sinistral
5	29	76	2	39	sinistral
5	52	84	15	52	sinistral
5	49	88	8	50	sinistral
5	41	78	15	41	sinistral
5	39	87	12	38	sinistral
5	51	72	1	52	sinistral
5	35	73	11	215	sinistral
6	160	80	35	160	dextral
6	317	70	8	315	dextral
			5	135	dextral
6	340	65	5	340	dextral
			7	160	dextral
Southern Gaspé (Fig. 3)					
1	75	90	0	75	sinistral
1	60	70			
1	260	90	15	85	sinistral
			5	55	sinistral
1	245	90	15	65	sinistral
2	205	86	0	205	sinistral
2	220	60	0	220	sinistral
2	205	90	25	205	sinistral
2	210	78	15	210	sinistral
2	20	85	15	20	sinistral
2	210	80	0	210	sinistral
2	5	38	0	5	sinistral
2	355	45	0	355	sinistral

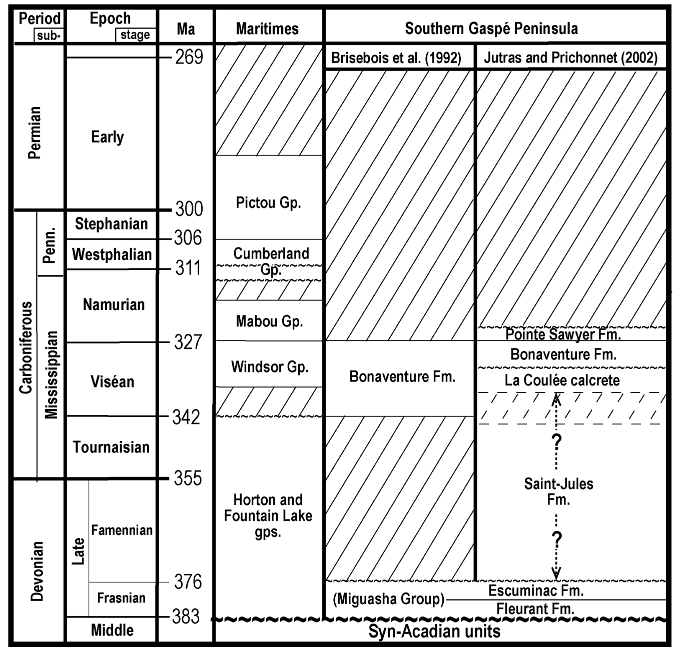

Fig. 4 Post-Acadian stratigraphic record in the Maritimes and in the Gaspé Peninsula. Time-scale after Okulitch (1999). Wavy lines represent unconformities and diagonal rulings represent major hiatuses. The stratigraphy of the Maritimes Basin is modified from Bell (1944), Mamet (1970), Howie and Barss (1975), Utting (1987), Utting *et al.* (1989), Ryan *et al.* (1991), Martel *et al.* (1993) and Calder (1998).

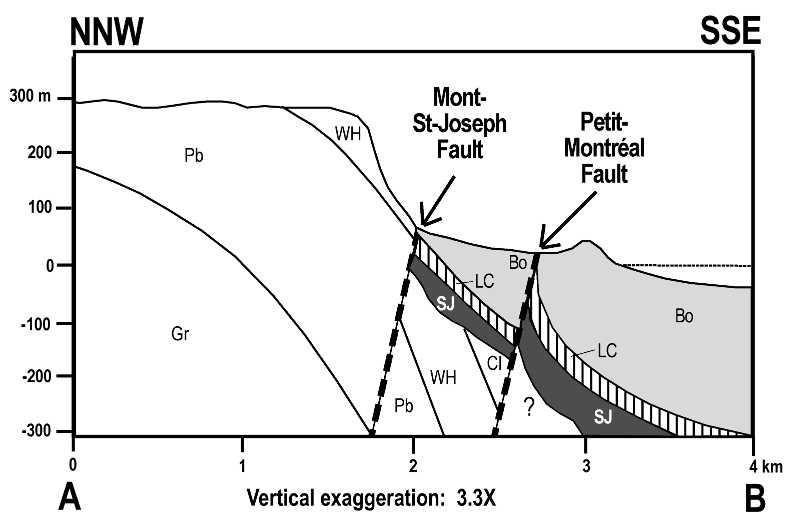

Fig. 5 Cross-section A-B (legend and transect shown on Fig. 2), showing the attitude of Carboniferous beds at the contact with the Petit-Montréal and Mont-St-Joseph faults of the Grande-Cascapédia fault system near Carleton.

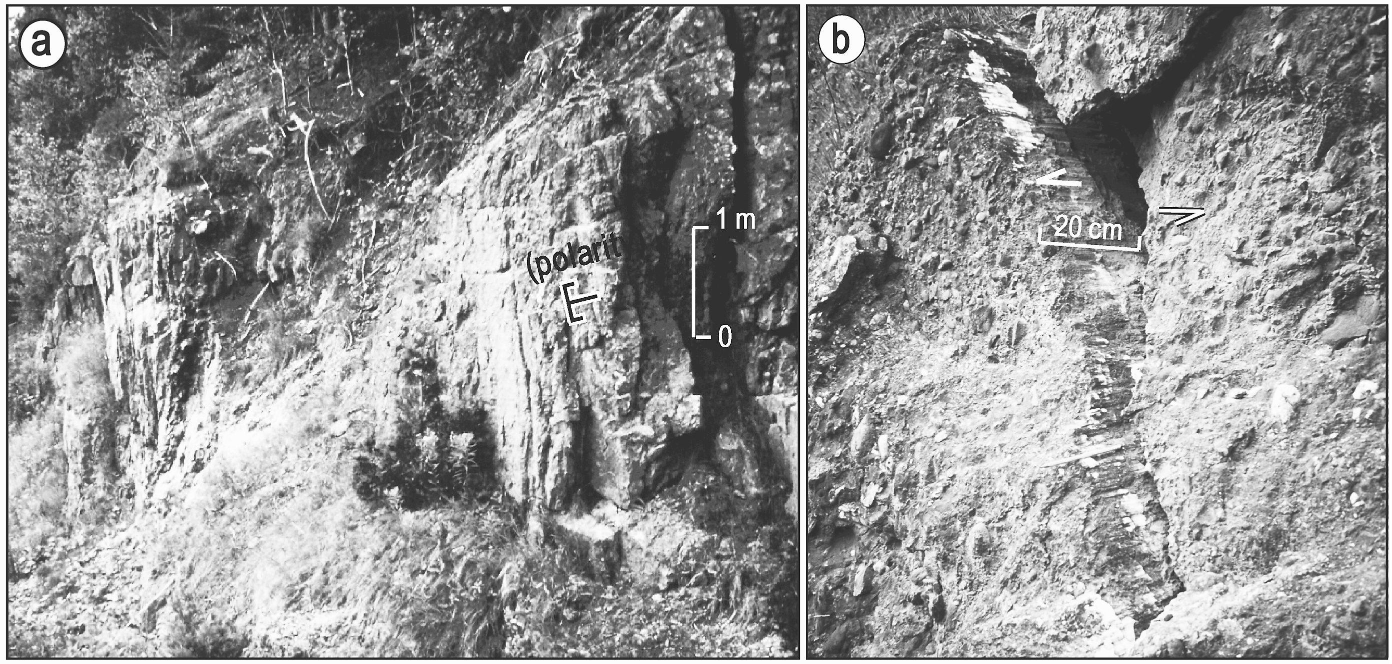

Fig. 6 **(a) Vertical to slightly overturned strata of the Bonaventure Formation in the vicinity of the Grande-Cascapédia fault system. View is to the northwest. (b) Small sinistral fault delineated by white calcite slickenfibers and offsetting the tilted-on-edge strata. View is to the northwest.**

structures on account of their angle with each other and with the main fault trace. The 175° trend of slickensided fibers on the reverse faults is interpreted as corresponding closely to that of the main principal stress (σ_1), ~30° clockwise from the main fault trace and compatible with the approximately NNW-SSE σ_1 suggested by the conjugate R and R' structures (Wilcox *et al.* 1973). As for the overturned strata near Carleton, they are interpreted as the result of counter-clockwise rotation of a strike-slip drag fold along a restraining bend on the SE block (Fig. 2a), suggesting sinistral movement as well (Biddle and Christie-Blick 1985).

THE BLACK CAPE AND NEW-RICHMOND FAULTS

Jutras and Prichonnet (2002) identified and named the New-Richmond and Black Cape faults, which limit the Black Cape Ridge on each side and which locally affect the Mississippian succession (Figs. 2 and 7). No kinematic markers were found in the unexposed New-Richmond Fault trace, except for an apparent vertical displacement of 50 m (minimum) to 920 m (maximum) (Jutras and Prichonnet 2002).

The Black Cape Fault affected a Late Silurian to Early Devonian clastic unit that is unconformably overlain by the Viséan La Coulée calcrete and Bonaventure Formation (Figs. 2 and 7). This clastic unit below the unconformity was tentatively correlated with the New Mills Formation by Bourque *et al.* (2000). However, because it contains abundant limestone reef clasts from the Pridolian (uppermost Late Silurian) West Point Formation (Bourque and Lachambre 1980), correlation with the New Mills is not supported by the Ludlow (lowermost Late Silurian) zircon U-Pb dating (423 ± 3 Ma) from the Benjamin Volcanics (Walker and McCutcheon 1994), which overlie the New Mills Formation in its type section (Greiner 1967). The red beds that were assigned to the New Mills Formation at Black Cape (Bourque *et al.* 2000) are possibly also younger than similar red beds of the Harrison Member of the West Point Formation farther west, which are separated from the Black Cape Volcanics by the Late Silurian Indian Point Formation (D. Brisebois, personal communication, 2003). Instead of referring to these red beds as the New Mills Formation, we propose to informally refer to them as the Black Cape clastics until they are more solidly incorporated into the regional stratigraphic context.

No exposures of Mississippian rocks were found directly on the New-Richmond and Black Cape fault traces. However, as shown on Figs. 2 and 7, they form scarps that truncate an erosional surface developed within rocks that were deformed by the Acadian Orogeny and therefore post date the latter event. Moreover, the Mississippian succession dips 25° down from the Black Cape Fault on the SE block, but is sub-horizontal on the NW block, suggesting that it has been affected by movement on that fault. Hence, because the Mississippian succession of the Gaspé Peninsula is deformed only along faults and is otherwise flat-lying, it is postulated that the brittle deformation features observed in pre-Carboniferous basement rocks and described below are related to post-Viséan fault activity, although this interpretation is not fully demonstrated by available exposure. This interpretation is supported by the similarity and compatibility of these brittle structures with those affecting the Mississippian succession in the Carleton and Saint-Jules areas.

No kinematic indicators were identified directly on the SW-

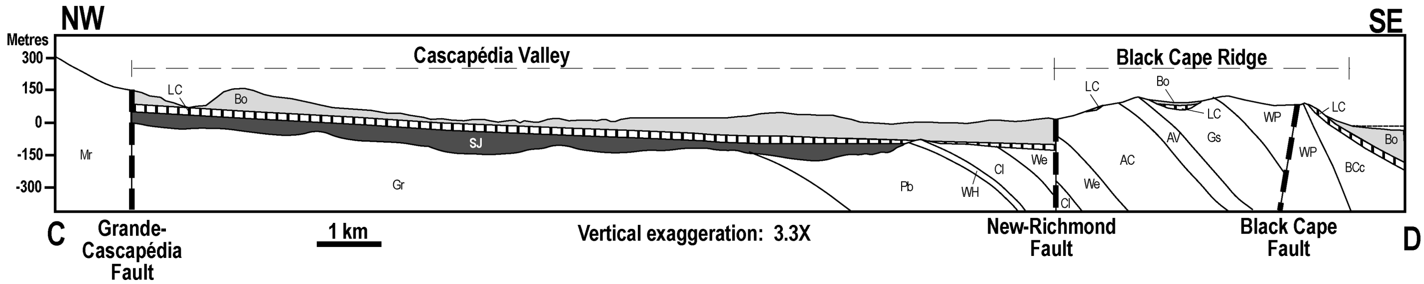

Fig. 7 **Cross-section C-D (legend and transect shown on Fig. 2), showing the attitude of Carboniferous beds at the contact with the Black Cape Fault. Thickness of the La Coulée calcrete is exaggerated for better visibility. Modified from Jutras and Prichonnet (2002).**

striking Black Cape Fault trace, which is characterized by a 30 cm thick cataclastic corridor. Less than 1 km west of the Black Cape Fault along the shoreline, a thin succession of red clastic rocks, which Bourque and Lachambre (1980) informally refer to as the Lazy Cove sedimentary unit, is intercalated between two lava flows of the Early Devonian Black Cape Volcanics. This clastic unit is almost entirely pulverised within a cataclastic corridor that contains no reliable kinematic indicators. However, at the contact between this deformed sedimentary unit and the adjacent lava flow, well developed NNE-striking brittle sinistral fault planes plastered with calcite slickenfibers can be observed (Fig. 2b, stereonet 3; Table 1).

Approximately 750 m west of the Black Cape Fault, a brittle reverse fault, striking E-W, occurs within the Black Cape Volcanics (Fig. 2b). It is characterized by a 5 m thick cataclastic corridor developed in volcaniclastic rocks. Two subordinate reverse fault planes developed in basalt on the footwall of the main fault are plastered with calcite slickenfibers that are steeply plunging toward the south (Fig. 2b, stereonet 4; Table 1).

Within 50 to 150 m west of the Black Cape Fault, a dense network of brittle sinistral fault planes striking roughly NE and plastered with calcite slickenfibers (Fig. 2b, stereonet 5; Table 1) is truncated by a less dense network of dextral fault planes with similar fabrics striking NW (Fig. 2b, stereonet 6; Table 1). It is noteworthy that these Riedel fault planes (Fig. 2b, stereonets 3–6) are restricted to the Black Cape Volcanics and do not extend into the underlying 'Black Cape clastics' (Fig. 8). The fault planes abruptly stop at the contact between the two steeply dipping units. This observation indicates that movement on each of these secondary fault planes was centimetric in scale and only generated clearly defined brittle offsets in the volcanic rocks, whereas the underlying Black Cape clastics only responded to the stress by bending slightly. It also underlines the poor capacity of clastic rocks to develop Riedel structures, even when they are as well indurated as the 'Black Cape clastics', which experienced the Acadian Orogeny.

Data on stereonets 3–6 (Fig. 2b) are compatible with sinistral motion on the Black Cape Fault (strike 040°), with the sinistral planes of stereonet 3 being interpreted as R structures, the dextral planes of stereonet 6 as R' structures, and the sinistral planes of stereonet 5 as a poorly constrained combination of P and R structures, the average orientation of which (044°) closely reflects that of the main fault trace (~040°) (Fig. 2c). Also compatible with sinistral motion on that fault is the geometry of drag folding along the fault (Fig. 8). No reliable stratigraphic markers were identified to quantify the displacement, but kilometric displacement is considered unlikely due to the lack of major stratigraphic breaks along the fault. A main principal stress with a trend of 174°–354° is obtained halfway between the average R structures of stereonet 3 and the average R' structures of stereonet 6, which is compatible with the strike and slickenfiber orientation of the two reverse faults of stereonet 4 (Fig. 2b, c).

THE SAINT-JOGUES-SUD FAULT

Jutras and Schroeder (1999) named the Saint-Jogues-Sud Fault (Fig. 3) and attributed it to post-Acadian tectonic activity because it sharply truncates a post-Acadian erosional surface. As is the case for the Grande-Cascapédia and Black Cape faults, the NW block is uplifted with regards to the SE block. On air photos, the fault forms a well defined linear feature that transects the Bonaventure Formation west of New-Carlisle (Fig. 3), but the fault zone is not exposed within this unit. However,

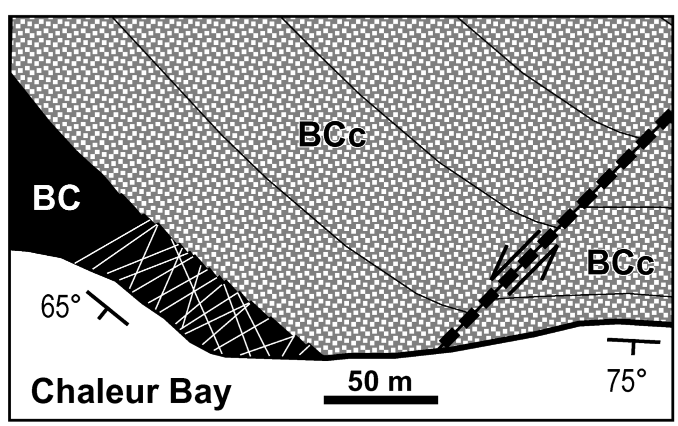

Fig. 8 **Schematic representation of the field observations at Black Cape, where a tight network of Riedel structures (white lines) abruptly stops at the sub-vertical contact between the Black Cape Volcanics (BC) and older strata informally assigned to the Black Cape clastics (BCc) in the vicinity of the Black Cape Fault (dashed line).**

four ENE-striking brittle fault planes, two of which have surfaces that exhibit sinistral slickensides, are postulated to represent P structures associated with a sinistral splay of this fault because of their acute angle (~25°) with it (Fig. 3, stereonet 1; Table 1). The lack of major facies differences in Bonaventure Formation strata on either side of the trace of the Saint-Jogues-Sud Fault suggests minimal displacement, although this is difficult to establish within horizontal clastic beds that typically show significant lateral variability.

THE PORT-DANIEL FAULT

The Port Daniel area (Fig. 3) is characterized by a rugged Late Devonian paleosurface dominated by the Clemville Hogbacks, which are sculpted in Silurian limestone of the La Vieille and West Point formations (Bourque and Lachambre 1980; Bail 1983; Jutras 1995; Peulvast *et al.* 1996; Jutras and Schroeder 1999). After being buried by red clastic sediments of the Saint-Jules Formation during the Late Devonian or the early Mississippian, these hogbacks developed karstic features during early stages of their subsequent exhumation, which occurred after deposition of the Bonaventure Formation (Jutras and Schroeder 1999). Material derived from the Carboniferous cover synchronously filled the karsts.

A limestone quarry in one of the hogbacks, on the northeastern side of Port-Daniel, exposes a dense network of NNE-striking brittle fault planes with minor N-striking fault planes affecting both the limestone of the La Vieille Formation and the red clastic rocks within the karsts (Fig. 3, stereonet 2; Table 1). Slickensided calcite fibers plastered on several fault planes indicate sinistral movement. No major structures were recognized in the local Silurian succession, and therefore the SSE-striking fault planes may have accommodated most of the stress, whereas N-striking fault planes could correspond to R structures developed around them.

Karst is preferentially developed along the fault planes, which also affect the karst-fill. Hence, it is concluded that fault activity, karst formation, and karst infill were contemporaneous in this sector. If correlation of the karst-fill with the Bonaventure Formation detritus is correct (Peulvast *et al.* 1996; Jutras and Schroeder 1999), the deformation was post-Viséan.

LATE TENSILE FRACTURES

Vertical tensile fractures filled with calcite, ranging from a few millimetres to more than 10 cm in width, are common throughout the post-Acadian succession in the Gaspé Peninsula. The veins are either laminated or massive. Orientation of the tensile fracture-cast veins is extremely regular, from one end of the peninsula to the other, where they strike 040°–220° (± 5°). They are not concentrated in the above-mentioned fault zones, which suggests that they are not coeval with them. The tensile veins are parallel to large Mesozoic mafic dykes cutting through the New Brunswick Platform, less than 100 km to the south (New Brunswick Department of Natural Resources and Energy 2000). Both features are probably related to extensional stress associated with the initial opening of the Fundy Rift and Atlantic Ocean in the Triassic to Jurassic.

DISCUSSION AND CONCLUSIONS

The paucity of paleostress indicators in Mississippian rocks of the Gaspé Peninsula led several authors to conclude that these rocks were not affected by late brittle strike-slip deformation affecting older rocks (Alcock 1935; St-Julien and Hubert 1975; Bernard and St-Julien 1986; Kirkwood 1989; Bourque *et al.* 1993), which Malo and Kirkwood (1995) and Kirkwood *et al.* (1995) associated with the "Acadian Phase III". However, this scarcity can be explained by the poorly consolidated, coarse-grained nature of the rocks involved. The Black Cape exposures, where abundant slickensided fault planes abruptly end at the contact between Early Devonian basalt and underlying clastic rocks (Fig. 8), underline the fact that coarse clastic rocks are poor recorders of paleostress indicators compared to more massive, fine-grained and competent rocks such as basalt. A similar contrast between the respective abundances in Riedel structures in massive fine-grained rocks (carbonate in this case) and coarse clastic rocks was also noted in the eastern Gaspé area (Jutras *et al.* 2003).

The SW-striking sinistral faults of southwestern Gaspé (Fig. 2) are possibly coeval with the NW-striking dextral strike-slip faults that were identified by Jutras *et al.* (2003) in eastern Gaspé, as both sets of faults are compatible with a NNW- to N-trending main principal stress (σ_1) (Fig. 2c). Contrary to the eastern Gaspé area, where only Alleghanian Riedel structures related to a late NE-trending σ_1 are well preserved, Alleghanian Riedel structures related to an early NNW- to N-trending σ_1 are well represented in southern Gaspé and support the more indirect evidence for this paleostress orientation in eastern Gaspé, which is thought to have generated the most important block displacements in that area (Jutras *et al.* 2003).

Whereas evidence for the reactivation of inherited faults is present in eastern Gaspé (Jutras *et al.* 1999, 2003), such evidence is lacking in southern Gaspé. None of the brittle structures described in this paper intermingle with older ductile-brittle structures, apart from the Acadian folding. Only the Grande-Cascapédia fault system shows significant displacement of pre-Carboniferous units, but this fault system is also the only one in southern Gaspé that overturned Carboniferous rocks and seemingly generated kilometric displacement, as movement of such a scale is necessary to form the large drag fold that developed along its trace (Fig. 2a).

The lack of large post-Acadian SW-striking sinistral strike-slip faults in eastern Gaspé may be related to the former presence of NW-striking faults, which easily accommodated a roughly N-S main paleostress by experiencing dextral motion. On the other hand, sinistral strike-slip occurred on SW-striking faults in southern Gaspé as a response to the same stress, possibly reflecting the SW-striking Acadian tectonic grain in that area (Figs. 2 and 3), along which rocks were mechanically weaker.

Although we cannot identify evidence for a clockwise rotation of paleostress from the NNW to the NE in southern Gaspé, as was proposed for eastern Gaspé (Jutras *et al.* 2003), it should be pointed out that Faure *et al.* (1996) recorded evidence for such rotation in Carboniferous rocks of the Carleton area, but did not conclude that any significant block displacement was involved. Faure *et al.* (1996) also recorded evidence for this clockwise rotation of paleostress in Late Devonian plutons of southern Quebec, more than 500 km to the southwest. Hence, post-Acadian faults in the Gaspé Peninsula may be local expressions of a regional stress regime that may have affected much of the Canadian Appalachian orogen.

Jutras *et al.* (2003) proposed that both the formation and deformation of the Maritimes Basin occurred in response to plate readjustments related to the closure of the Theic (Rheic for some authors) Ocean during the Carboniferous. Transcurrent Carboniferous structures similar to those presented in this paper have been reported in several areas of the nearby Maritime Provinces (Fralick and Schenk 1981; Bradley 1982; Keppie 1982; Ruitenberg and McCutcheon 1982; Nance and Warner 1986; Gibling *et al.* 1987, 2002; McCutcheon and Robinson 1987; Nance 1987; Yeo and Ruixiang 1987; Reed *et al.* 1993; Murphy *et al.* 1995; Pascucci *et al.* 2000) and are thought to be distal expressions of the Alleghanian Orogeny, which was most penetrative in the southeastern United States (Hatcher 1989).

In conclusion, results presented here indicate that the Alleghanian structures of eastern Gaspé are part of a set of structures that affected a large area, although their magnitude does not compare with that of older Acadian or Taconian structures. From this observation, it is suggested that Alleghanian block displacements also affected the southwestern sectors of the Québec Appalachians, which are devoid of Carboniferous rocks, but which are closer to areas of peak Alleghanian metamorphism in the southeastern United States.

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