ARCHITECTURE OF RIBBON CHANNEL FILLS

The architectural characteristics of the studied ribbon channel bodies are summarized in this section via an account of the external geometry of the bodies, of the geometry and nature of their internal bounding surfaces, of their specific lithofacies organization, and of the observed relationships with adjacent bodies; peculiar features of each body are highlighted. In the article, channel-body examples and paleocurrent data are presented in Figures 7, 8, and 9; representative vertical sections are included in Figures 10 and 11.

Channel body A

This channel body is exposed in sections both parallel and orthogonal to its axis. The top of this body occurs 21 m above the TCSB. It has an observed maximum thickness of 6.5 m and a partial width (due to outcrop termination) of 75 m. Internally, vertically stacked beds and bedsets with a generally sheet-like geometry and sub-horizontal attitude are recognized; these packages possess sharp bases, although major erosional surfaces marked by relief and lag deposits are lacking (Fig. 7a, 7b). Toward the channel-body axis, the base is overlain by a dm-thick massive sandstone package, followed by a ~4 m-thick package composed of interbedded cross-stratified and convoluted sandstones. The uppermost part of the body (1.1 m) is characterized by beds of ripple lamination, rare herringbone cross-bedding, cross lamination, and subordinate laminated mudstone. Bottomset organic drapes associated with *Sp* lithofacies are present at 2.4 m from the base. Landward-directed paleocurrent directions are restricted to the uppermost portions. The left-hand (when facing the direction of paleoflow) channel margin is poorly exposed, but appears to be erosively cut by a sand-body of uncertain origin (Fig. 7a).

Channel body B

This channel body is only partially exposed along a cut oriented oblique to its axis. The top of this body occurs 27 m above the TCSB. It has an observed maximum thickness of 4.3 m. Internally, vertically stacked accretion increments with generally sheet-like geometries and sharp bases are recognized. Toward its margin of this body, the facies organization is

dominated by massive and cross-stratified clean sandstone. Its top is truncated by another channel body (Fig. 7b).

Channel body C

This channel body is exposed in two different outcrops (outcrops 2 and 3) oriented both parallel and orthogonal to its axis (Fig. 7c, 7d); its top occurs 15 m above the TCSB. It has an observed maximum thickness of 5.5 m and a real width of ~100 m. At outcrop 2, the cross-stream cut reveals an internal organization consisting in at least three different storys, each with a lenticular cross-sectional geometry, laterally offset axes, and vertically offset tops. Within these storys vertically stacked horizontal planar tabular beds are recognized. These packages show sharp bases, some of which are erosional surfaces marked by relief and lag deposits (*Gh/cm*); in addition, individual beds within the storys exhibit erosive bases. Overall, this arrangement testifies to scour occurring at multiple physical and genetic scales (channel-, story-, bedset- and bed-scale). At the channel axis, the lowermost 3 m of the infill is particularly rich in intraclast conglomerates and breccias, overlying scour surfaces, and massive and faintly laminated sandstones. The uppermost 2 m are dominated by cross-stratified sandstones, and notably record convex-upward bedding at ~4 m from the base. At the axis, and ~3.5 m from the base, organic drapes are seen associated with bottomsets and foresets of *St* lithofacies. At outcrop 3, only a portion of channel body close to its left-hand margin crops out. The body is here characterized by a dm-thick bed of *Sm/s* overlying the channel base and containing several scour surfaces. This is itself overlain by a succession of m-scale packages of cross-stratified, cross-laminated, and massive sandstone. A single *Skolithos* trace fossil is seen in the basal 2 m. Paleo-landward-directed (i.e. broadly westerly and opposite to dominant readings) paleocurrent directions are recorded exclusively in the uppermost portions (Fig. 7e). Considering observations at both outcrops, both right- and left-hand margins of the channel body are well exposed and demonstrate steep cutbanks incised into organic mudstones. The base of the channel body at outcrop 3 incises down to 1.5 m above a tabular sandstone that is itself of probable paralic origin, being characterized by

heterolithic planar or wavy horizontal lamination, herringbone-ripple cross-lamination with rare mud drapes, and massive structure associated with abundant bioturbation and horizontal and vertical burrows (Skolithos).

Channel body D

This channel body is exposed in a section oriented orthogonal to its axis, and its top occurs 19 m above the TCSB. It has an observed maximum thickness of 4.4 m and a real width of 35 m (Fig. 7f). Internally, two vertically stacked accretion increments with broadly sheet-like geometry are separated by a sub-planar erosional surface occurring at ~3 m from the base. Lithologically, the body comprises trough cross-stratified and convoluted sandstones, with a package of climbing ripple cross-laminated sandstone topping the lower accretion increment. Landward-directed (i.e. westerly) paleocurrent directions are measured from the lower third of the body (Fig. 7f). Both right- and left-hand channel margins are well exposed and demonstrate steep cutbanks mostly incised into organic mudstones.

Channel body E

This channel body is exposed both along its axis and orthogonally to it, and it was studied at two different outcrops (outcrops 5 and 6) (Fig. 8a-d); its top occurs 3 m below the TCSB. It has an observed maximum thickness of 5.4 m and a real width of 77 m. Internally, vertically stacked accretion increments are recognized. At outcrop 5, two amalgamated storys that appear lenticular in section and which have comparable thickness are separated by a sharp erosive base; individual beds within the lower story exhibit erosive bases, especially toward the base of the body. Less than 300 m downstream, at outcrop 6, beds with planar tabular geometries are recognized to have sharp bases, which have no significant erosional relief. At outcrop 5, the multiple cross-cutting scour surfaces occurring toward the base of the channel body are overlain by a variety of deposits, attributable to *Gh/cm*, *Sm/s*, *Sl* and *St* lithofacies types, which determine marked lateral heterogeneity; *Sm/s*, *Sl*, *St*, *Sp*, *Sc*, *Sσ* and *Sr* lithofacies types compose the upper story. Organic drapes in bottomset deposits are observed close to the channel base where *Sl* deposits are present; the abundance of

organic drapes increases significantly above the base of the upper story, especially in *Sl* deposits that transition laterally to *Sc*, and decreases again toward its top. *Skolithos* trace fossils are present toward the top of the body. In the lower story, horizons with oxidized iron marks form cm-thick sheets that likelly represent sideritized sandstone. Although measured paleocurrents mostly indicate consistent seaward directions (i.e. easterly transport), apparent herringbone cross-stratification is observed on cliff face within the upper story. Considering observations at both outcrops, both right- and left-hand channel margins are well exposed and demonstrate steep cutbanks incised into coals or coaly mudstones. The channel base incises into a tabular sandstone bed (Fig. 8a) of probable paralic or shallow-marine origin, being characterized by heterolithic planar and wavy horizontal lamination, herringbone-ripple cross-lamination, wave-ripple cross-lamination locally mud-draped or forming wavy bedding, and massive structure associated with abundant bioturbation. In this tabular sandstone, horizontal and vertical burrows (including *Skolithos*) are very common, u-shaped burrows (*Arenicolites*) and dm-wide pillow-shaped flat-topped structures interpreted as resting traces are also present. The top of the channel body is sutured by a coaly package underlying the TCSB.

Channel body F

This channel body is exposed in sections oriented both parallel and orthogonal to its axis, and its top occurs 5 m below the TCSB (Fig. 9a, 9b). It has an observed maximum thickness of 6.1 m and a partial width (due to outcrop termination) of 45 m. Internally, it is possible to distinguish several vertically stacked accretion increments, which exhibit a lenticular or tabular geometry and a sharp erosive base, and are composed of intraclast-bearing sandstone. Lithologically, the body is chiefly made of *Gh/cm*, *Sm/s*, *St*, *Sp*, *Sl* and *Sr* lithofacies, whose vertical distribution does not display any apparent trend; convex-upward laminae with sigmoidal profiles (*Sc* or *Sσ*) occur within 1 m of the top of the body; soft-sediment deformation is locally seen. Very thin bottomset or toeset muddy (and possibly organic) drapes are observed in cross-strata only rarely but where present occur at different

levels, even close to the base of the body. A single *Ophiomorpha* burrow is seen at ~2 m from the base. In the uppermost 2 m, just above a scour surface associated with an intraclast lag, oxidized iron on the outcrop marks levels containing discontinuous cm-thick sheets that likely represent sideritized sandstone. Reworked and possibly diagenetic equant to prolate siderite nodules are seen mostly in the lower half of the infill, together with what appears to be pervasive siderite cementation defining halos developed within few centimeters above and below of some scour surfaces. Landward-directed paleocurrent directions are measured from the middle of the body (Fig. 9c). The left-hand channel margin is cut into a coaly mudstone and, in a relationship similar to that associated with body E, this channel body is sandwiched between two m-thick coaly packages, which themselves occur between a wave-rippled tabular sandstone, at the base, and the TCSB, at the top.

Channel body G

This channel body is exposed in a section oriented oblique to its axis, and its top occurs 17 m above the TCSB (Fig. 9d). It has an observed maximum thickness of 4.8 m and a calculated real width of 67 m. Internally, it is possible to distinguish two storys, each with a lenticular cross-sectional geometry, and each composed of several vertically stacked, horizontal or gently inclined beds with broadly tabular geometries and sharp bases. Erosional surfaces bound the two storys and minor erosional surfaces bound some of the beds within them. Lithologically, the body contains dm-thick beds of *St*, *Sl*, *Sm*, *Sr* and *Su* lithofacies; *Sr* deposits tend to be thicker and exhibit climbing-ripple geometries toward the top of the body. Siderite nodules are seen within silt-bearing deposits above the base of the upper (right-hand) story. Both right- and left-hand channel margins are well exposed and demonstrate steep cut-banks incised into organic mudstones.