scale (1–5 m) slightly consolidated sandstone units within the Virgelle Member at Writing-on-Stone Provincial Park (WOSPP), southern Alberta. Among the details of the data, I can single out two aspects in particular: (i) most of the permeability distributions can be approximated by the square-root function, rather than normal or lognormal distributions; and, (ii) vertical permeability (kV) distributions often appear more homogeneous than the corresponding horizontal permeabilities (kH). Inferred homogeneity of kV distribution appears to decrease from lithofacies with strongly current laminated structure, to bioturbated/burrowed, poorly laminated intervals.

Small-scale probe permeability measurements on differently oriented core faces of quartz-cemented Viking Formation sandstones also yield permeability distributions that appear to be diagnostic of the grain- and lamina-scale fabric. Permeability anisotropy of a single 'structureless'-appearing sample is low, reflected by a kV/kH-ratio = 0.7; corresponding k-distributions are homogeneous. Permeability anisotropy of a strongly laminated sample is variable, with kV/kH-ratios = 0.1 and = 2.8, thought to be a function of the variability of the pore network connectivity for any given lamina. Significantly, the pore network anisotropy established during deposition appears to have been maintained even after several kilometres of burial, and cementation and dissolution processes. As in the earlier study, lamina-perpendicular permeability distributions are relatively homogeneous, which is taken to imply that fluid-fluid displacement processes are potentially more efficient in that orientation.

Controls of sedimentary fabrics on permeability heterogeneity and anisotropy

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An important part of reservoir characterization is the definition of permeability anisotropy, that is, the relative magnitudes of horizontal and vertical permeabilities. In addition, essential for the consideration of enhanced recovery schemes is the permeability structure or, more simply, the relative heterogeneity of horizontal and vertical permeability distributions. Reservoir engineering parameters such as sweep efficiency or volume of bypassed oil are clearly dependent on the degree of homogeneity of the permeability structure. In this presentation I review the results of outcrop- and subsurface core-based studies of permeability distributions at different scales.

In the first study I categorize types of plug permeability distribution for different lithofacies corresponding to metre-