A Comment on “Chemical and Morphological Distinctions between Vertical and Lateral Podzolization at Hubbard Brook” by Bourgault et al.

The interesting article by Bourgault et al. (2015) describes vertical and lateral podzolization at Hubbard Brook. A major setback of this article is that it discusses morphological features without presenting sufficient detail to support their theses. In addition, the authors avoid or neglect a number of aspects of podzolization that would nevertheless better explain the described results.

1. The podzolization mechanism. The authors cite the classical theory, which postulates that podzolization is exclusively due to vertical transport and consecutive precipitation of dissolved organic matter (DOM). This is an oversimplification that ignores the essential difference in source of soil organic matter (SOM) in well-drained and poorly drained podzols. As early as 1980, DeConinck (1980) distinguished polymorphic (pellet-like) organic matter (OM) that dominates in well-drained horizons and monomorphic OM (coatings) that dominates poorly drained B-horizons. His idea that monomorphic OM is related to DOM and polymorphic OM to in situ decay of root litter was substantiated by research on the chemical composition of these two kinds of humus: the chemical signature of the two kinds is essentially different (Nierop and Buurman, 1999; Buurman et al., 2005). This was again found in the podzols from Itaguaré (coastal Brazil, not Amazonia). Although the authors cite the morphological paper on the Itaguaré podzols (Buurman et al., 2013a), they ignored the companion paper on OM chemical composition (Buurman et al., 2013b), in which the different chemical composition of OM in the two kinds of podzol-B horizons is again illustrated.

2. The solubility of the organic-metal complexes is supposed to decrease on increasing pH, but actually the potential of OM to bind cations increases at higher pH, as a result of increased dissociation of the organic acids. Thus, at higher pH, a larger amount of metals is necessary to precipitate the complex. This was illustrated by Buurman (1985).

3. The distinction between vertical and lateral podzolization is far from new. A catena similar to that found in Hubbard Brook was first described from Sweden by Mattson and Lönnemark (1939) and later by Tamm (1950). This was later modified into a dynamic model by Buurman (1984) in a book with Benchmark papers on podzolization. Later, this model was used again by Van Breemen and Buurman (2002) in their textbook on soil formation. None of these references appear in the paper.

4. Although the Hubbard Brook podzols do show effects of lateral flow, it appears that this process did not have a dominant effect on profile morphology.

Abbreviations: AOC, amorphous organic complexes; DOM, dissolved organic matter; OM, organic matter; SOM, soil organic matter.