Supplement of

Contrasting pH buffering patterns in neutral-alkaline soils along a 3600 km transect in northern China

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**Figure S1** A 3600-km long transect (1900 km with carbonate-containing soils and 1700 km with non-carbonate containing soils) in arid and semi-arid regions of northern China was sampled.

**Figure S2** Changes of mean annual precipitation (MAP) and temperature (MAT) from east to west along the longitude gradient.

**Figure S2** Titration curves for selected carbonate containing soils (#12, #23, and #36) and non-carbonate containing soils (#45, #58 and #62). Points show data and lines show the fitted curves.

**Figure S3** Relationships between soil pH buffer capacity (pHBC) at the mid-point of the titration curve and pHBC at fixed values of pH (pH7.5 in the carbonate containing soils and pH 5 and 6 in the non-carbonate containing soils).

**Figure S5** Relationships between soil clay content and cation exchange capacity (CEC) for the carbonate containing soils and the non-carbonate containing soils.

**Figure S6** Soil pH buffering capacity (pHBC) as a function of pH for the carbonate containing soils (#12, #23 and #36) and the non-carbonate containing soils (#45, #58 and #62).

**Figure S7** Relationships between soil variables (carbonate content, organic carbon content, soil cation exchangeable capacity) and initial pH along the transect in northern China.

**Figure S8** Relationships between soil pH and aridity index along the transect in northern China.
Figure S2
Figure S3
Figure S4
Figure S5
Figure S6
Figure S7