

## Supplementary materials

### *Appendix 1*

The results from a phosphorus analysis realized at the Severino Calazans (83 samples) and Jacó Sá (107 samples) sites pointed to an extremely low phosphorus content in the soil. The 10-g soil samples were collected during the 2007 field season in a grid at 30 m intervals at a depth of 30 cm. In addition, three vertical profiles comprising ten samples each collected between the depths of 10 cm and 100 cm were analyzed to determine the possible leaching of phosphorus deeper into the soil. No anthropogenic enrichment of soil phosphorus could be seen in any of the analyzed samples. The samples were analyzed by Paula Kouki (2009 November) in the University of Helsinki.

## *Appendix 2*

A geophysical survey using a GPR carried out in 2010 July by José Gouvea Luiz (Departamento do Geofísica da Universidade Federal do Pará) in the northern section of the JK site, revealed no outstanding anomalies within an area encompassing 7500 square meters. The detected anomalies were mainly cavities left by decomposed roots.

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### *Appendix 3*

The old wood effect is problematic specifically when it comes to dating the beginning of the earthwork construction phases, assuming that the region at that time was covered by dense upland tropical forest. After the earthwork structure was concluded and the ceremonial space was cleared and maintained, only secondary vegetation of short-lived plant species would grow on the sites and accumulate in the later cultural deposits together with refuse or offerings originated from the ceremonial activities. Also the <sup>14</sup>C measurements from the El Círculo earthwork site in Bolivian Amazon (29), where samples collected from various contexts (charcoal from cultural layer, soot on ceramic surface, wood charcoal from a hearth structure, and carbonized seed from cultural layer) in the same excavation yielded contiguous dates, show that the old wood effect may not be an overwhelming problem when dating tropical archeological contexts.