



Holocene book reviews

The Holocene
22(10) 1199–1200
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DOI: 10.1177/0959683612442757
hol.sagepub.com



J Byron Sudbury

Quantitative Phytolith Analysis: A Working Example from Modern Prairie Soils and Buried Holocene A Horizons (Phytolith Press Research Monograph 1) Ponca City OK: Phytolith Press, 2011, 288 pp. US\$110.00 (hardback), US\$45.00 (paperback). ISBN 978-0-9789-0835-5

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The scarcity of pollen records in the south-central Great Plains represents an enormous hole in the palaeovegetation record of North America. This is the result of several inherent problems, mainly the scarcity of continuous lacustrine and palustrine stratigraphic sequences for pollen analysis, and poor pollen preservation. But in a grassland-dominated environment such as the Great Plains, grass opal phytoliths represent a great potential for palaeovegetation and climatic reconstruction. Unlike pollen, opal phytoliths are preserved in a number of environments (alluvial, aeolian, soils and lacustrine). This has prompted many studies that explored the palaeoenvironmental potential of opal phytoliths.

This volume contains the research results of opal phytolith analyses in several modern soils along an east–west climatic gradient in the south-central Great Plains of North America. Along the same climatic gradient, the author carried out a parallel study of phytolith assemblages in buried A horizons spanning most of the Holocene, and in one of them the Terminal Pleistocene. There is no doubt that this study is a great contribution to the various aspects of palaeoclimatic and palaeoenvironmental reconstruction using grass phytoliths in the Great Plains. Sudbury's research has gone a long way from the pioneering work by Fredlund and Tieszen (1994, 1997). The book shows many aspects of extraction methods, analysis, and interpretation of data.

Chapter 1 is the introduction to the study. It contains the main objectives of the research and a short review of the definition of opal phytoliths and their palaeoecological and palaeoclimatic significance. Chapter 2 is an extensive literature review of phytolith research beginning with aspects of historical use of phytoliths and methodology in the fields of palaeoecology and archaeology. The chapter includes also a review of the extant research on phytolith research in the Great Plains, as well as the main research problems still to be solved in this region.

Chapter 3 is devoted to methods of this research, including sampling procedures, processing, microscopy and quantitative techniques. I find that this chapter is not only relevant to the research itself, but also highly informative in terms of procedures. Because it contains a number of diagrams and photographs, it could be of great use to students and those who are being trained in phytolith research.

Chapter 4 contains the results and discussion of the research. It begins with the analysis of the reference collection, for which the author included a number of very useful photographs of the most common grasses of the Great Plains. One aspect that is very useful in this chapter is that the author provides some tips to avoid misinterpreting some morphotypes, which he calls 'impostors'.

These impostors are sometimes broken short cells that may not provide the real information or transitional forms that may not define the real morphotype. This is the case of broken lobes of Panicoid bilobates that are often taken for Chloridoid saddles. Another issue discussed in this chapter is the gradational forms of the same short-cell morphotype that have created multiple morphotypes in some classification. The author shows the example of the keeled morphotype (e.g. Fredlund and Tieszen, 1994, 1997), which is a gradational form of trapezoids often referred to as pyramids. This gradational sequence is illustrated in a high resolution photograph under light microscope (figure 47).

The same Chapter 4 contains all the data obtained from modern surface samples from soils in unplowed prairies, as well as the data from the stratigraphic sections. In this chapter the author also presents an analysis of sponge spicules, another aspect of biogenic silica microfossils found in phytolith assemblages. Finally, Chapter 5 contains the conclusions of his research. Additionally, the volume contains an extensive bibliography and 11 short appendices with information relevant to the research.

Without underestimating the many contributions of this research, some aspects of the study and data presentation have some problems and limitations. Although perhaps subjective, one of the problems I see with the data presentation is the diagrams that the author presents. Unlike the typical phytolith sequence diagram, where many sets of data can be seen on the same figure, data are presented here in separate graphs and profiles throughout several pages. Likewise, radiocarbon dates are not included in some graphs. This forces the reader to flip pages back and forth to appreciate the full picture. Another problem is that in this study's diagrams the trapeziform bilobates, often referred to as *Stipa*-type short cells, are not singled out from the Pooideae group, despite the fact that in other publications the author presented them separated. It should be presented as a separate curve in diagrams because the *Stipa*-type short cell has a strong correlation with cold and dry climates in North America. The maps presented by Fredlund and Tieszen (1994, 1997) show this distribution pattern clearly.

Other than these two problems, the work and sets of data presented in this book are sound. This volume could be of great use for those phytolith specialists working in the region. But it can be also a great reference for those interested in laboratory techniques, interpretation, quantitative methods and aspects of grass-short cell morphology. Both hardback and paperback versions are printed on good quality glossy paper. Diagrams and photographs are in color. The numerous microscopy photographs are in high resolution. The book may be obtained via the publisher's website where other volumes on biogenic silica and microfossils can also be found.

References

- Fredlund GG and Tieszen LL (1994) Modern phytolith assemblages from the North American Great Plains. *Journal of Biogeography* 21: 321–335.
- Fredlund GG and Tieszen LL (1997) Calibrating grass phytolith assemblages in climatic terms: Application to Late Pleistocene assemblages from Kansas and Nebraska. *Palaeogeography, Palaeoclimatology, Palaeoecology* 136: 199–211.