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Indicative value of non-pollen palynomorphs (NPPs) and palynofacies for palaeoreconstructions: Holocene Peat, Brazil

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ABSTRACT

The results of the palynological study of the samples from the core, performed in the Aguas Claras peatland, RS, Brazil (50°45′00″W, 30°00′15″S), focus on detailed taxonomic analysis of non-pollen palynomorphs (NPPs) and palynofacies from the Holocene peat and underline the Late Pleistocene mud and sandy mud that were represented. NPPs from the samples revealed taxonomic variety of fungal palynomorphs, presented by *Brachysporium*, *Clastesporium*, *Dicellaesporites*, *Dicellaeporisporites*, *Gelasinospora*, *Glomus*, *Sordaria*, *Helicoon*, and others. The habitats of above mentioned taxa are varied: aquatic, mycorrhizal, parasitic, organic matter decaying, and dung-coprophilous. Freshwater algal palynomorphs were composed of *Botryococcus*, *Closterium*, *Debarya*, *Mougeotia*, *Pseudoschizaea*, *Spirogyra*, and *Zygnema*. The percentage ratio between algal and fungal palynomorphs was changed from the different samples of the core, reflecting climatic oscillations (more humid-dryer). Prevalence of fungal palynomorphs was connected with dryer climate, and on the contrary, freshwater algal palynomorph predominance was related with increasing humidity. The six palynomorph zones that corresponded to the six principal phases of environmental and climatic changes were determined. The zone from the uppermost part of peat was characterized by relatively frequent dung-coprophilous and parasitic fungi, as a result of agricultural and domestic activities. Palynofacies analysis combined to NPPs was used for palaeoenvironmental and paleoclimatic reconstructions. Palynofacies from the samples were characterized by evident changes in relationship (%) between the different types of organic matter, their quality, and quantity and fluorescence index. The obtained data contribute to the understanding of the peat deposition. The combined use of NPPs and palynofacies analyses provided a valuable approach for the paleoenvironmental and paleoclimatic reconstructions.

1. Introduction

The implications of non-pollen palynomorphs (NPPs) for paleorconstruction of the Quaternary sediments are elaborated by many palynologists of the world. The principal and the most frequent from the sample NPPs are algal and fungal palynomorphs. The use of NPPs, composed of resistant sporopollenin-like polymer or chitin, frequently may be more informative for palaeoreconstructions than more delicate sporopollenin composed pollen and spores of vascular plants (van Geel, 2006).

Several publications have shown the importance of freshwater algal palynomorphs for palaeoecological interpretations as indicative for the depth, salinity, temperature, pH, and nutrient status parameters of aquatic palaeoenvironments (Hoshaw and McCourt, 1988; Komárek and Jankovská, 2001; Rull et al., 2008; van Dam et al., 1988; van Geel, 1976; van Geel and van der Hammen, 1978; van Geel et al., 1980, 1986). Fungal palynomorphs are usually represented by ascomycete remains, ascospores, and hyphoidia (Traverse, 1988). The use of fungal palynomorphs for palaeoreconstruction is very important, especially when other palynomorphs were absent in palynological slides. According to van Geel and Aptroot (2006), the recorded fungal palynomorphs are of strictly local occurrence. Their fossilization occurred near the place where they had been produced or were deposited at a short distance from the place where sporulation took place. Fungal palynomorphs are diverse by their ecology and habitat — parasitic, symbiotic, mycorrhizal, coprophilous, and cellulose decomposing, and fungi occurred on burnt remains.

Reports on biological affinities of fungal palynomorphs and their ecology are relatively scarce in literature (Pals et al., 1980; van Geel and Andersen, 1988; van Geel and Aptroot, 2006; van Geel et al., 2003). By this reason, many palynologists use informal classification for fungal palynomorphs based on their morphology (Elsik, 1983; Jansonius and Kalgutkar, 2000; Jarzen and Elsik, 1986). There are many ambiguities with fungal palynomorph identifications and consequently knowledge of their ecology makes palynological interpretations difficult.

Palynofacies analysis is the study of particulate organic matter assemblages (sensu Boulter and Riddick, 1986), concerned with

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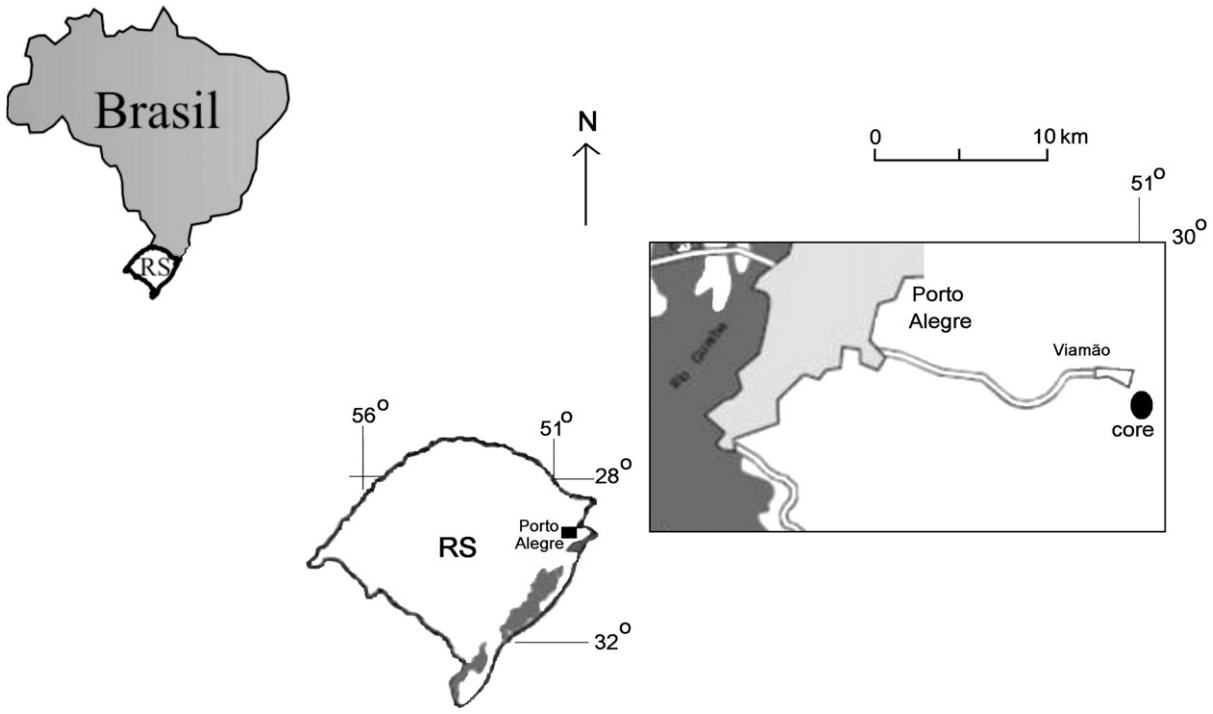

Fig. 1. The map showing locality of the core in Aguas Claras peat land.

changes in the relative abundance of various types of organic debris. According to Batten (1987), an understanding of the sedimentary context of a particular palynofacies is essential if an environmental interpretation is to be more than broadly based. Changes in paleonvironmental and paleoclimatic conditions may be inferred from differences in the composition of total organic matter.

Peat, composed predominantly of organic matter remains, is favorable material for the palynological study of NPPs and palynofacies. Palynological study of the Quaternary peat in Brazil showed a great variety of NPPs, especially fungal palynomorphs and freshwater algal palynomorphs of Chlorophyta (Garcia, 1997; Medeanic, 2006; Medeanic et al., 2008).

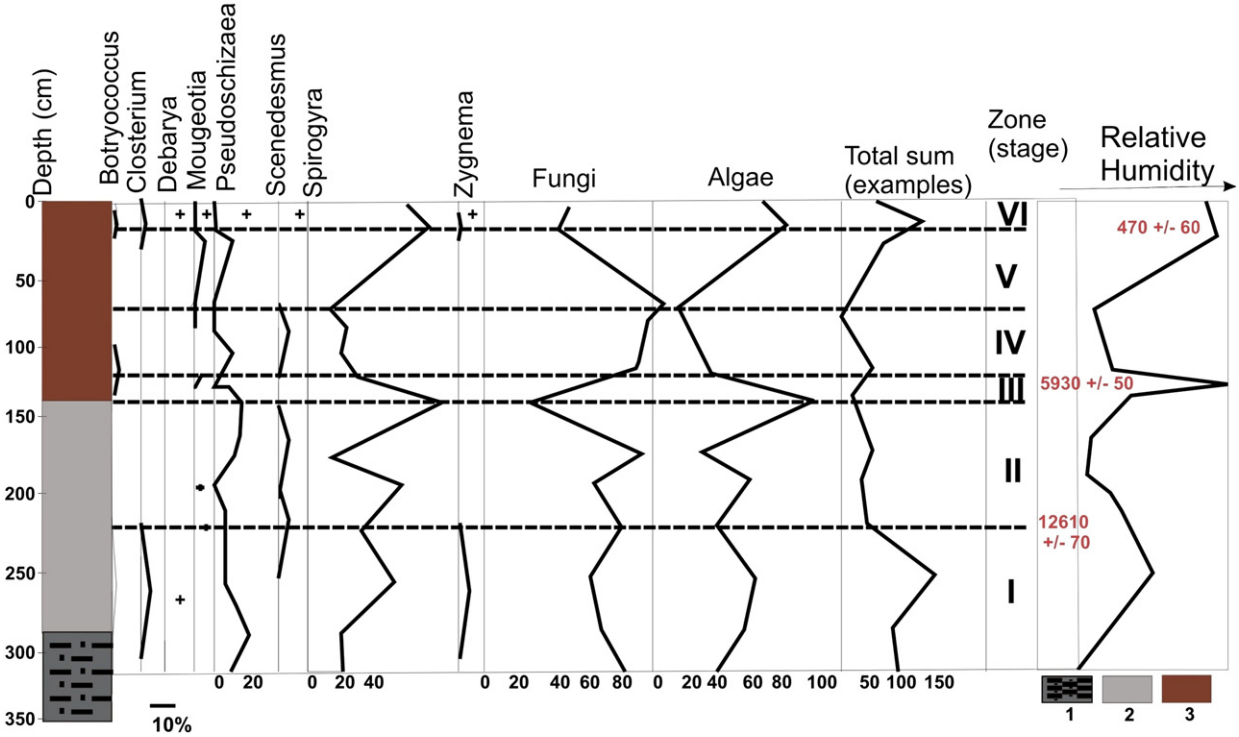

Fig. 2. Percentage diagram of algal and fungal palynomorph ratio from the samples of the core in Aguas Claras, RS and relative climatic changes (more humid-dryer) during the Late Pleistocene and Holocene: 1 — sandy mud, 2 — mud, and 3 — peat (modified from Barbosa et al., 2003).