CONGO BASIN PEATLANDS AS A BASELINE RECORD FOR PAST HYDROLOGY AND CLIMATE [W-68]

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INTRODUCTION

Recent satellite mapping and coring of the peatland complex of the Congo Basin's *Couvette Centrale* region underscores the global significance of this area. Freshwater tropical peatlands in the Congo Basin make up one of Earth's largest terrestrial carbon sinks (Dargie et al. 2017) which forms an important nexus between global climate, biogeochemical cycling, and biodiversity. These peatlands are also a unique record of past climates, containing microfossil and geochemical proxies documenting past climatic and hydrological conditions in the region, yet there are no published studies of these peatland deposits south of the Congo River in the Democratic Republic of Congo (DRC). Recent coring and radiocarbon dating of peatland core sequences collected from the Mai Ndombe region of DRC provides new data on the timing of peatland establishment in the Congo Basin. Furthermore, preliminary results of palynological and isotope geochemical analysis shed light on the spatial and temporal variability in regional rainfall regimes for this region.

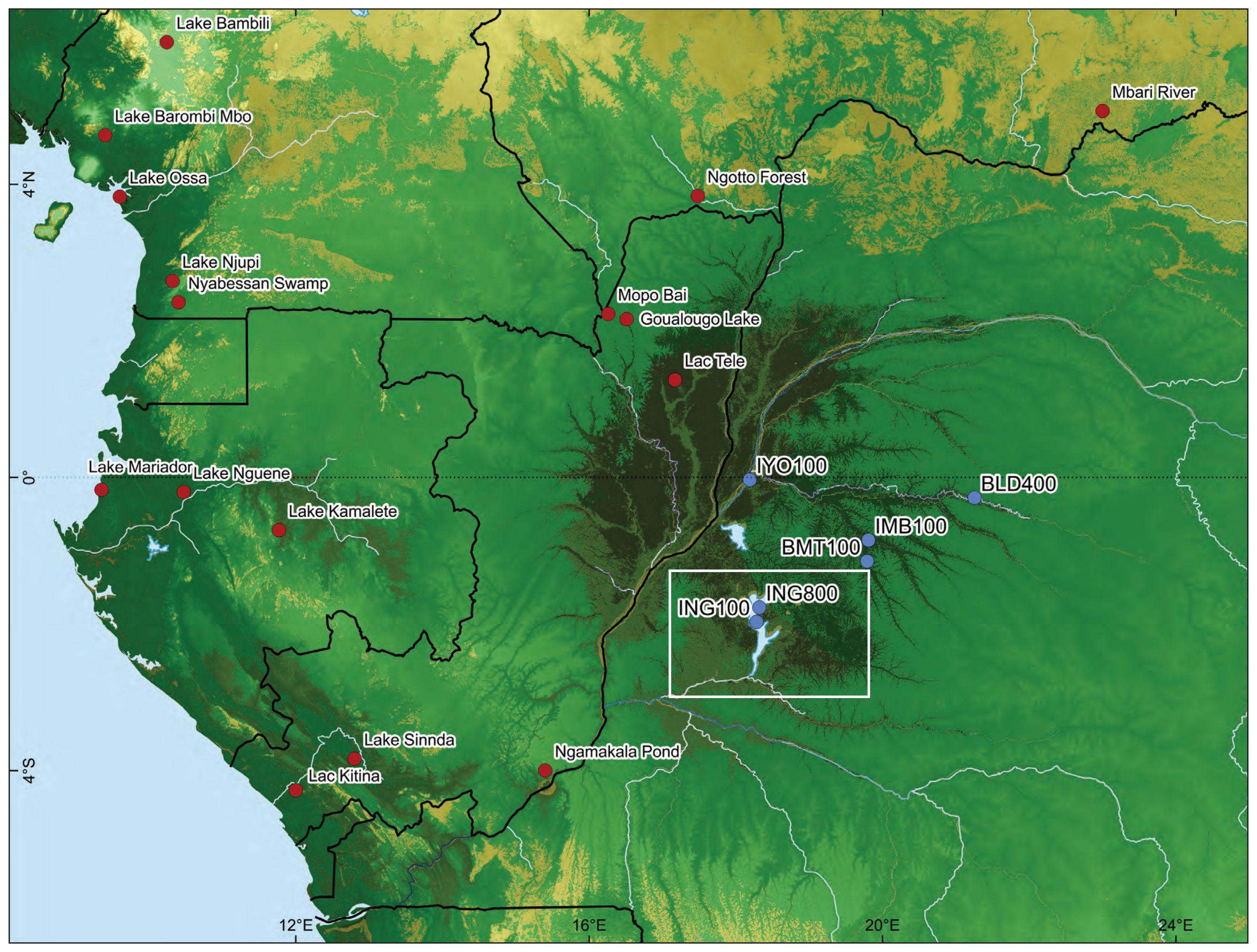

Figure 1. Map of Congo Basin showing published palynological studies (red), peatland deposits (shaded), new cores (blue), and modeled by Dargie et al. (2017), and the study region (box).

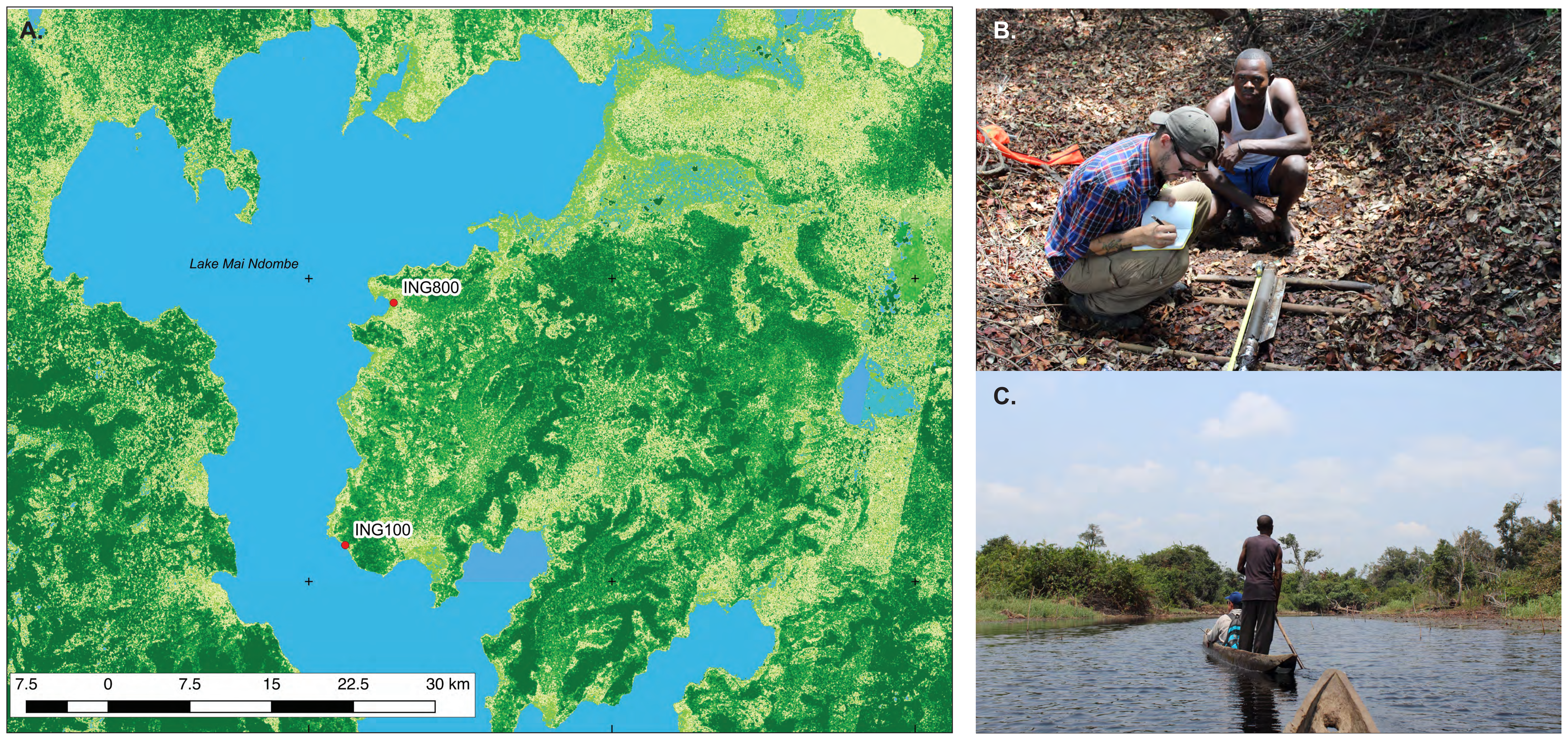

Figure 2. A) Map of Mai Ndombe study region showing coring locations. **B)** ING100 Corinig locality. **C)** ING800 Coring locality.

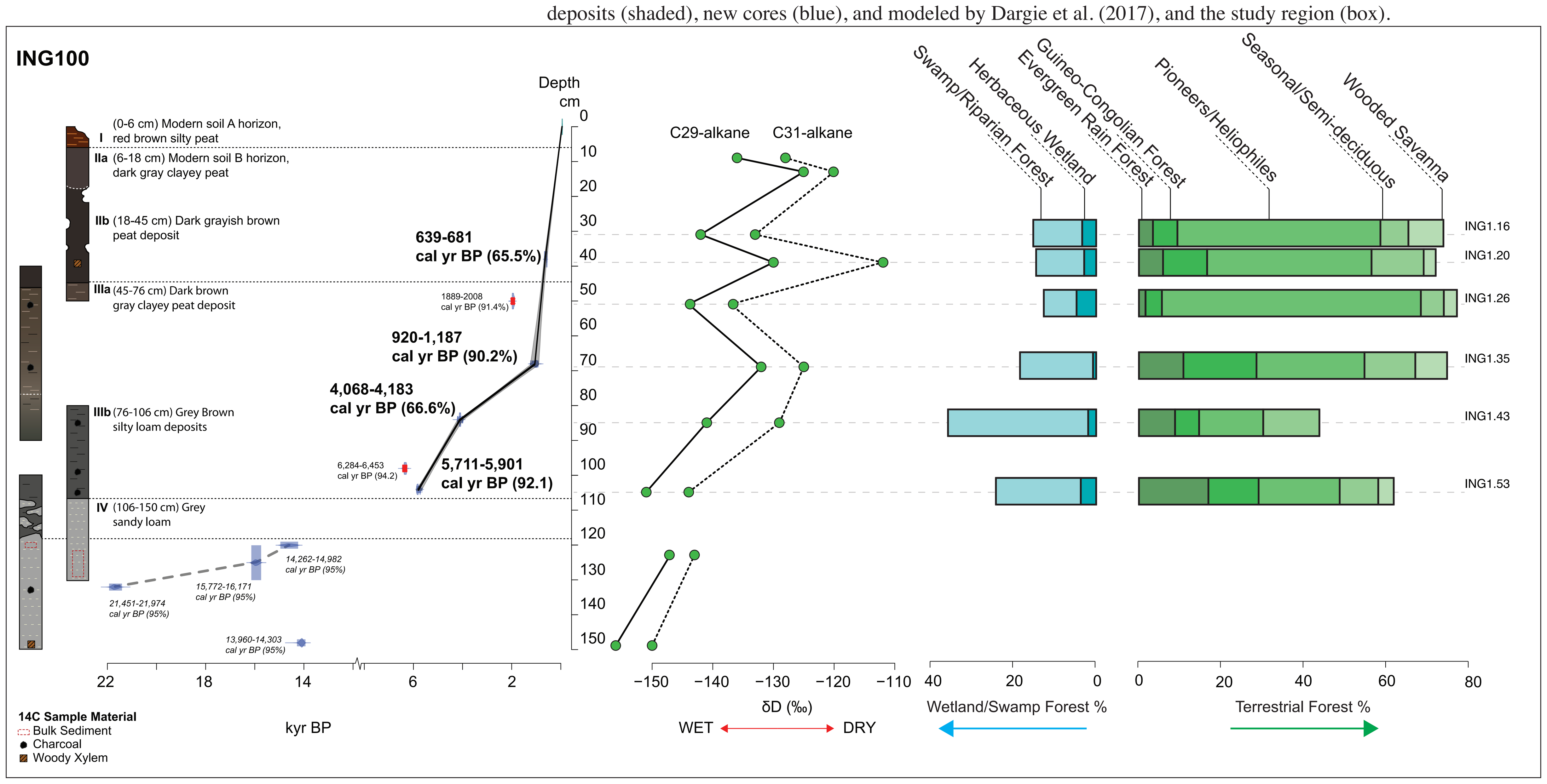

Figure 3. ING100 core showing (L to R) major sedimentary units, radiocarbon chronology, δD results, and summary palynological results grouped by vegetation type.

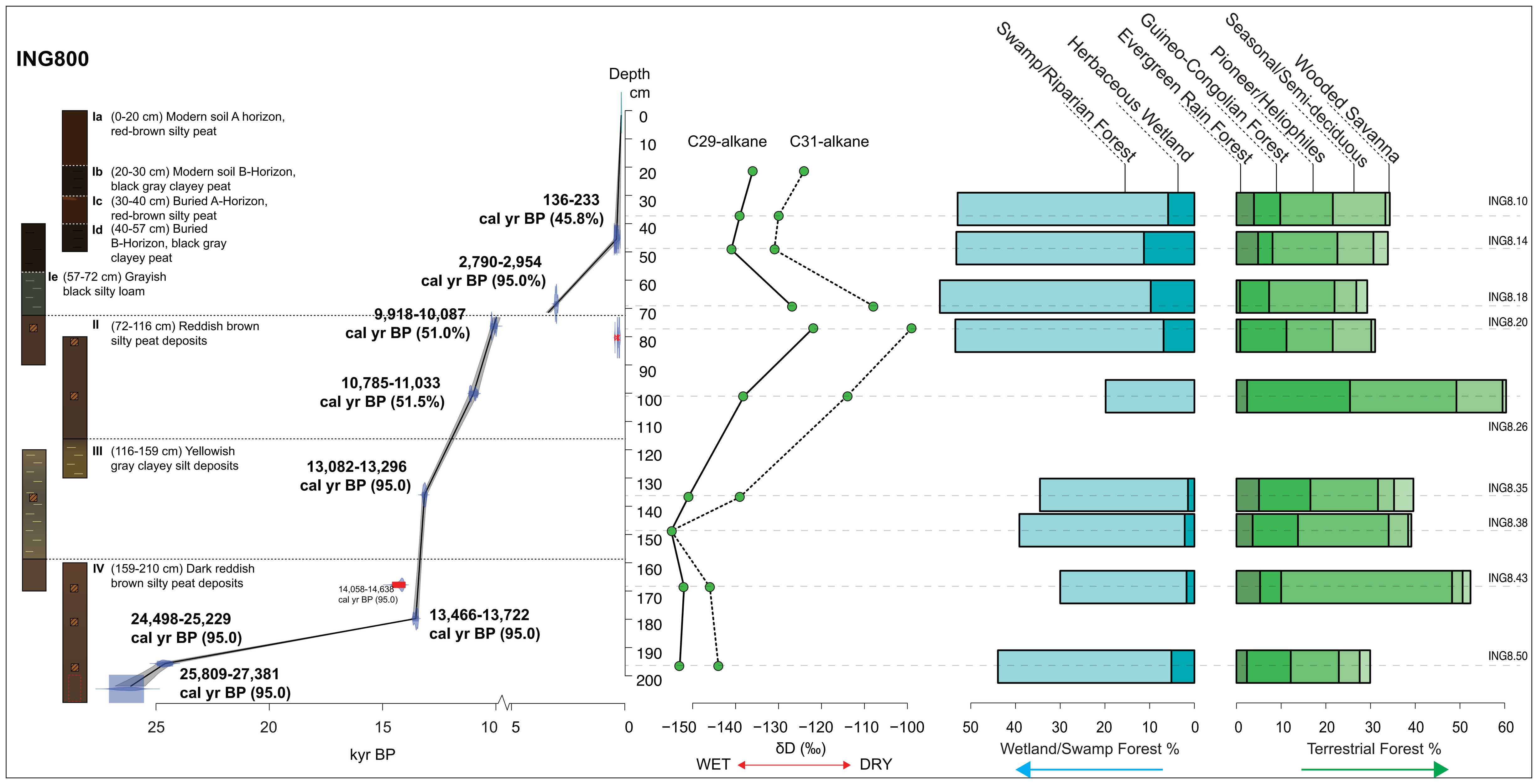

Figure 4. ING800 core showing (L to R) major sedimentary units, radiocarbon chronology, δD results, and summary palynological results grouped by vegetation type.

RESULTS

Together, the ING100 and ING800 cores show three phases of peatland development at 25-13 kya, 12.8-9.9 kya, and 2.8 kya - present (FIG. 3 & 4). Measurement of δD from these samples shows some dramatic changes in precipitation at these coring localities. These samples show a comparatively greater range of varaition compared with marine records and identify significant drying trends peaking at 10 kya and 0.6 kya as well as minor drying trends from 5.7-0.9 kya and after 0.5 kya. Vegetation responses visible in the palynological record show broad shifts in the representation of hydrophilic vegetation cover compared with terrestrial vegetation, with a major shrinking of the representation of wetland vegetation between 13.0-10 kya and again after 4.0 kya. Two major sedimentary discontinuities at 24.4-13.4 kya and 9-5.7 kya signal phases of peatland erosion and major phases of carbon evasion from the Mai Ndombe hydrological system.

METHODS

Two cores collected from the Mai Ndombe region yielded radiocarbon chronologies spanning the Terminal Pleistocene and Holocene. Both cores were collected using a Russian Peat Corer and were sampled in the field at arbitrary intervals between 5 cm and 2 cm. ING100 comes from the lake's overbank deposits near the mouth of a spring-fed channel (FIG 2:B). ING800 comes from a somewhat larger ancient fan located in a protected lagoon setting (FIG 2:C). Macrobotanical and the fine-fraction (<150 micron) of bulk sediment samples were selected for radiocarbon dating.

Palynological samples were preparing using standard methods (Faegri & Iversen 1989) at the Universität zu Köln and stable isotope analysis was conducted at the MARUM laboratory at Universität Bremen. Pollen samples were analyzed at 40x and 100x magnification and identifications were made in consulation with published pollen atlases (Gosling et al. 2013) and comparative collections at Université Pierre et Marie Curie in Paris and Goethe Universität in Frankfurt. The preliminary results presented here represents a limited sample size (200-100 identifications) from a selection of the available pollen samples, which match a preliminary selection of stable isotope samples.

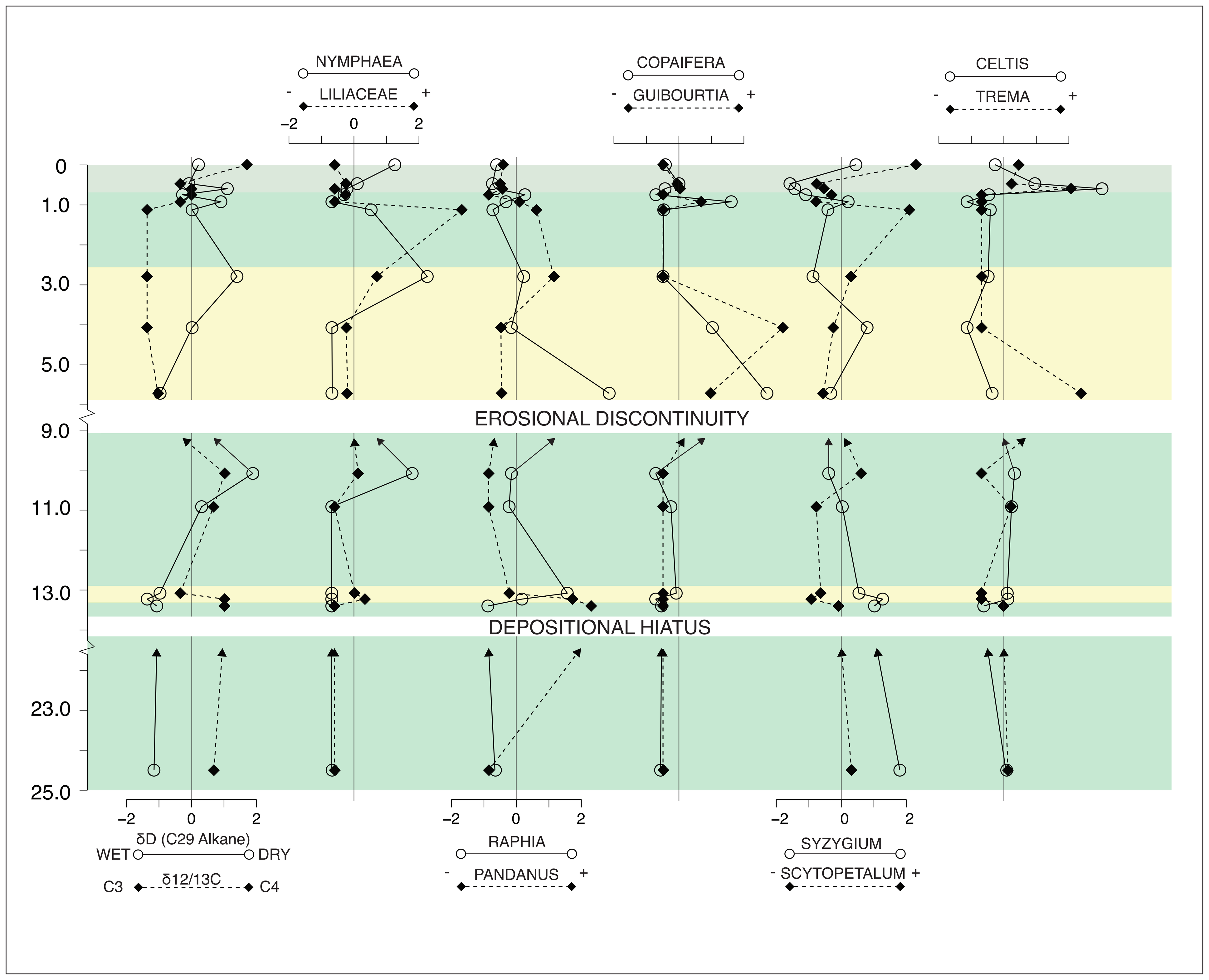

Figure 5. Synthetic results showing normalized (Z-score) results for (L to R): stable isotopes and representative pollen types from inundated wetlands, hydrophilic palms, mature swamp forest, river banks/swamp margins, and seasonal/semi-deciduous forest.

CONCLUSIONS

The preliminary results presented here illustrate the variability in the timing and conditions of peatland development in the Congo Basin (FIG. 5), showing surprisingly humid conditions during dry phases such as the Last Glacial Maximum at 25 kya, associated with a greater representation of gregarious swamp colonizers such as *Syzygium*. The Terminal Pleistocene through Early Holocene phase of peatland development took place under increasingly dry conditions, showing a turnover from swampland dominated by palms to one dominated by plants which tolerate permanent inundation such as *Nymphaea* and *Scytopetalum*. During the middle Holocene, mature swamp forest is much more common up to 4.0 kya, after which there is a shift towards forests with a greater representation of semi-deciduous forest and, perhaps, anthropogenic impacts in the local catchment. Additional analyses have significant potential to highlight the timing and conditions of peatland development as well as major phases of climatic change in the Mai Ndombe region.

REFERENCES

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