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Title : Relaunching the African Pollen Database : Abrupt Change in Climate and Ecosystems

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African ecosystems hold enormous ecological and economic value due to high biodiversity[1] and multiple valuable ecosystem services provided to urban and agrarian populations[2]. However, these services and biodiversity are vulnerable to climate change and land use[3]. Long paleoecological records from Africa provide iconic examples of abrupt ecosystem and environmental change, offering critical evidence for tipping points in the Earth system. Datasets in the region are notoriously difficult to access, with the African Pollen Database (APD), launched in 1996, largely unsupported for the last decade. Poor data accessibility has been a community complaint for over a decade.

Hosted by the Institut de Recherche pour le Développement in Paris, France, 32 participants from 12 countries met to revive the African paleoecology community and relaunch the APD as a community curated data resource (CCDR)[4]. This workshop was funded through and the LOCEAN of the Centre National de la Recherche Scientifique and the Belmont Forum for Science-driven e-Infrastructure Innovation and its project Abrupt Change in Climate and Ecosystems (ACCEDE): Where are the Tipping Points? The Belmont e-Infrastructure initiative seeks to enhance open, FAIR scientific cyberinfrastructure[5] to meet pressing, policy-relevant scientific challenges.

African Pollen Database: History and Plan

The APD began in 1996. The initial workshop and follow-on efforts established methods of collating modern and late Quaternary pollen data, developed a standardized pollen nomenclature[6], generated updated age models for sites, collated images of pollen grains, and created a searchable web interface. Currently, the APD contains 288 fossil sites and 1985 modern samples. Due to a lack of funding, the APD lapsed in 2007, making its extant data holdings largely inaccessible and leaving no home for newer paleoecological records.

Workshop participants identified three critical, interlinked elements of the APD: 1) stratigraphic and modern pollen samples with associated chronological controls and other metadata; 2) standardized taxonomy for pollen morphotypes; and 3) images of pollen grains. Participants developed a two-pronged plan for rebuilding these APD components. The APD webpage will be relaunched to meet region-specific needs, including taxonomy-development, led by Lézine and colleagues, and hosting of pollen images. Further, modern and stratigraphic data from the APD will become a constituent database of the Neotoma Paleoecology Database[7], an international community-curated paleoecological data resource that meets FAIR standards and is registered with ICSU-WDS and COPDESS. A data stewards training workshop in Amsterdam is planned for January 2020 to begin uploading modern and

fossil pollen data to APD/Neotoma. The participants saw the value in these combined efforts for assuring the longevity of a living, community-curated APD data resource.

Building a community and plan

Six subregions were differentiated based on phytogeography (Central, Southern, East, West, Arabia, Madagascar/Indian Ocean Islands, and marine), and regional experts identified records produced post-2007 and legacy datasets not included in the APD. The recent increase in researchers working in Madagascar and Central Africa is particularly notable, given prior underrepresentation of these regions. Specialists reported 365 known sites not in the APD, ranging in age from 1000 years to Plio-Pleistocene intervals. 1985 modern samples are also available, with more to be added. Some of these modern samples were collected as early as 1954 and should be used with caution to represent the modern vegetation. In sum, these sites include a wealth of new information: marine and terrestrial, from diverse archives, many well-dated with high temporal resolution. This will facilitate the accessibility of a burgeoning number of new studies and spatio-temporal meta-analysis of ecosystem-climate linkages, closing the gap with other regions.

Further, a governance body was launched, co-led by Sarah Ivory and Anne-Marie Lézine, with multiple scientists volunteering to serve as representatives and data stewards from each region. As the APD council is launched, attention is being paid to including equal numbers of both African/non-African scientists and early-career scientists. Through representation within the APD and improved access to open data resources and software, we hope to build opportunities for young researchers from Africa.

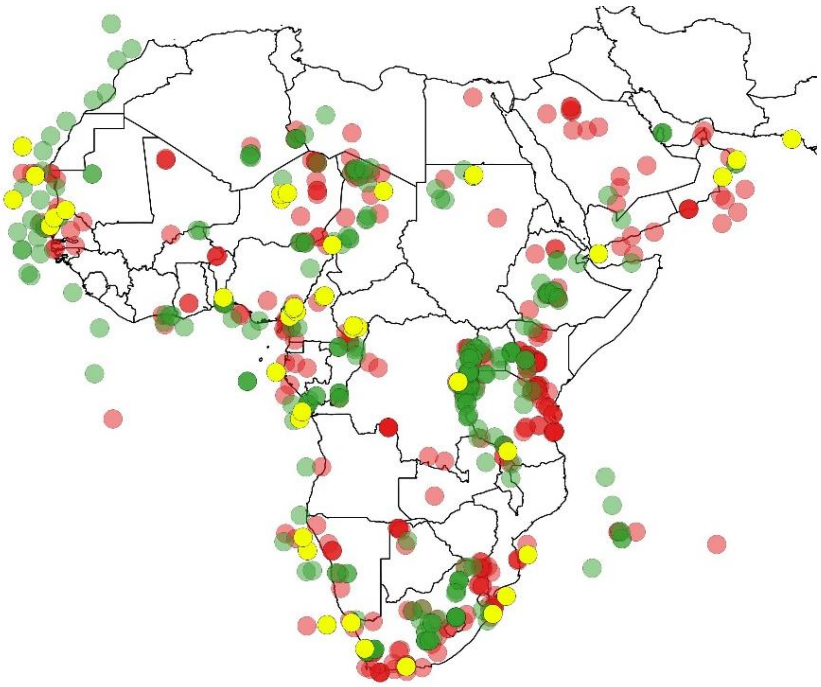

Figure 1. Map showing existing paleoecological sites currently within the African Pollen Database (green), datasets obtained but not yet within APD (yellow), and known datasets not currently contributed to the APD (red dots).

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