Late Quaternary Pollen Records in South Korea: Preliminary Data Compilation and Bibliometric Analysis

Eunji Byun Department of Earth System Sciences, Yonsei University, Seoul, South Korea (contacting email: <u>eb@yonsei.ac.kr</u>) Soo Hyun Kim Center for Anthropocene Studies, Korea Advanced Institute of Science and Technology, Daejeon, South Korea

Background

- Reconstructing past vegetation changes from fossil pollen records has many applications in Quaternary science. Applicable sediment samples are available from lakes and wetlands almost worldwide, but analysis is time-consuming and labor-intensive.
- There are clear benefits to revisiting published regional pollen records for data synthesis studies at larger spatial scales. In recent years, improved data accessibility through open science practices and stewardship efforts has been a key factor in innovative research and new discoveries.
- This presentation is part of our ongoing effort to develop a community-driven database to support the FAIR data sharing principles. This database primarily targets datasets published in peer-reviewed journals with author consent.

Approches

- Bibliometric analysis: to understand the development history and major researchers in this study field in South Korea; total 70 articles extracted from the Web of Science and SCOPUS databases by 'korea' AND 'pollen' AND ('paleo*' OR 'palaeo*') in query for title-abstractkeywords (date: 2024-09-26); using R package 'bibliometrix' (Aria & Cuccurullo 2017, Journal of Informetrics 11(4): 959-975).
- Preliminary data compilation: to prepare a comprehensive list of study sites and sediment core metadata based on published papers; filtering of sediment cores with well-established chronology; consider proxies other than pollen to expand the scope of database.

Outcomes

- Bibliometric analysis: identified most productive researchers within the last three decades (Figure 1); (2) title and abstract keyword recognition and relationship analysis to show the conceptual structure of literature collection (Figure 2); half of the articles published in journals such as Quat. Int. (N=13); Palaeogeogr. Palaeoclimatol. Palaeoecol. (N=8), Holocene (N=6), Quat. Sci. Rev. (N=5), and Rev. Palaeobot. Palynol. (N=3) on relevant topics and few papers in multidisciplinary journals.
- Sample metadata: study sites with robust chronology (minimum two AMS ¹⁴C dates; check out PP51C-0572 "Developing prior distributions of sediment accumulation rates for Bayesian agedepth modeling: a case study of Holocene terrestrial sediments in South Korea") are distributed mainly along the coasts and reflect various depositional environments (Figure 3); sedimentbased paleo- reconstruction studies show that while multi-proxy studies have increased in recent years, the number of new pollen cores remains relatively constant (Figure 4).
- Database website launch: encouraged by a recent agreement of data contributions from one of the leading researchers, we started building a web platform that displays data in a custom relational database (Figure 5).

Future work

- Connect with more researchers who are potentially willing to contribute existing data and provide related training and information sessions.
- Promote these efforts to relevant research communities (many studies are conducted) separately in geography, archaeology, and geology), as we aim to expand our data collection to Korean-language papers (e.g., archaeological excavation studies).
- Develop and maintain clear user protocols for data use policies, standardized taxonomy, and other recommendations to facilitate research collaborations.

Acknowledgements: We are grateful to our student researchers, Absur Khan Siam and Rifaka Alim Rashkee (Department of Physics, KAIST) and Yerim Han (School of Transdisciplinary Studies, KAIST) who helped with literature search and data extraction, and Y-J Yoon and J-Y Jeong (Department of Earth System Sciences, Yonsei University) who helped with bibliometric analysis. This work is supported by NRF-2018R1A5A7025409 (Aug 2023 – Feb 2025) and Yonsei University Research Fund of 2024-22-0529 (Nov 2024 – Oct 2025). We also thank our colleagues Dr. Hyeryung Kim and Dr. Jiwoo Han, who recently joined this project, and Prof. Jungjae Park for generously contributing the first pollen dataset to the GEK database.



author role for the given year. TC per Year = total citations divided by years since the article published. YI S, PARK J and JUN CP have expertise in pollen, while LIM J has expertise in geochemical analysis and KIM JC is known for his expertise in OSL dating and geochronology for the late Quaternary sediments in Korea. The inset shows the example of highest impact articles (TC per year > 20) by PARK J with YI S, KIM JC, and other co-authors using pollen records to infer major climate events during the Holocene.



Figure 2 Cconceptual structure of the collected articles by word co-occurrence analysis. The study key words extracted from titles and abstracts. Dimensionality reduction by Multidimensional Scaling (MDS). Five k-means clusters based on distance between co-occurring words. Identified word groups represent major research interests in regional paleoclimate reconstruction (e.g., monsoon), sea level change, and human impacts during the Holocene. Pleistocene studies seem to have broaden scope in terms of study regions, including neighbor countries in key terms.

Figure 4 Sediment records with relatively well-established age controls since 2003 from the widespread introduction of AMS dating in Korea. Over time there is more studies using multi-proxy approaches than pollen or other single-proxy approaches in the sediment-based paleo- studies. Still, the pollen records have relatively large influences in this field of study, few years go by without new pollen records. Note that this only includes studies in paleo- geography and geology discplines mostly and not many new records from archaeological studies often only published in domestic journals and reports.







Figure 5 Screenshot view of the database website (accessible via QR code or https:// geoecokorea.neocities.org). Designed and developed by Soo Hyun Kim.