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Pollen and fern spores recorded in recent and late Holocene marine sediments from the Indian Ocean and Java Sea in Indonesia



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ABSTRACT

Fossil pollen and spore diversity in marine sediment cores from the coasts off SW Kalimantan and NE Java (Java Sea) as well as modern pollen assemblages collected off West Java in the SE Indian Ocean in a marine sediment trap are documented in this paper. In total, photographic images of 138 pollen and 41 spores including 14 pollen and 32 unidentified spore types are presented in morphological order. Illustrated pollen and spore taxa list may help pollen and spore identification of future palynological investigations focused on the reconstruction of past vegetation, climate and environment dynamics in SE Asia.

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1. Introduction

With the development of palynology as an applied method in micropalaeontology, palaeoecology and palaeoclimatology and an increased interest in the vegetation–pollen deposition relationship, a number of continental and subcontinental pollen atlases (e.g. list from Hooghiemstra and van Geel, 1998) and databases have been established since the late 1970's (Rowe, 2006): the North American Pollen Database (Grimm, 2000), incorporating the datasets from Canada (Gajewski, 2005), Alaska (Anderson and Brubaker, 1986), eastern North America (Webb and McAndrews, 1976) and the southwestern United States (Davis, 1995); the European Pollen Database (Cheddadi, 2002), PalDat – a palynological dataset based in Austria (Buchner and Weber, 2000), Cambridge University Palynological Online Database (QPG, 2008) and a database for the Northwest European Pollen Flora (Punt et al., 2003); the Africa Pollen Database (Lézine, 2005); the image collections of Latin American Pollen Database (Marchant et al., 2002) and of the Neotropical Pollen Database (Bush and Weng, 2007).

For Southeast (SE) Asia, only a few sources of information on pollen are available, such as the Australasian Pollen and Spore Atlas (APSA, 2007), an online accessible database that contains a large collection of pollen and spores images (details on about 15,000 species) and morphological descriptions from the Australasian

region. The database deals not only with Australia itself, but also provides information on pollen from tropical India, tropical China, New Guinea, New Zealand, the Hawaiian Islands, Oceania and the Southeast Asia (SE), including the continental (Malay Archipelago) and maritime subregions. The last subregion refers to the vast group of islands located between mainland SE Asia and Australia (Rowe, 2006). Collection of Indonesian fossil and modern pollen photos of Department of Palynology and Climate Dynamics is being developed and is also available (Albrecht-von-Haller-Institute for Plant Sciences, the University of Göttingen, Germany: <http://www.gdvh.uni-goettingen.de/>).

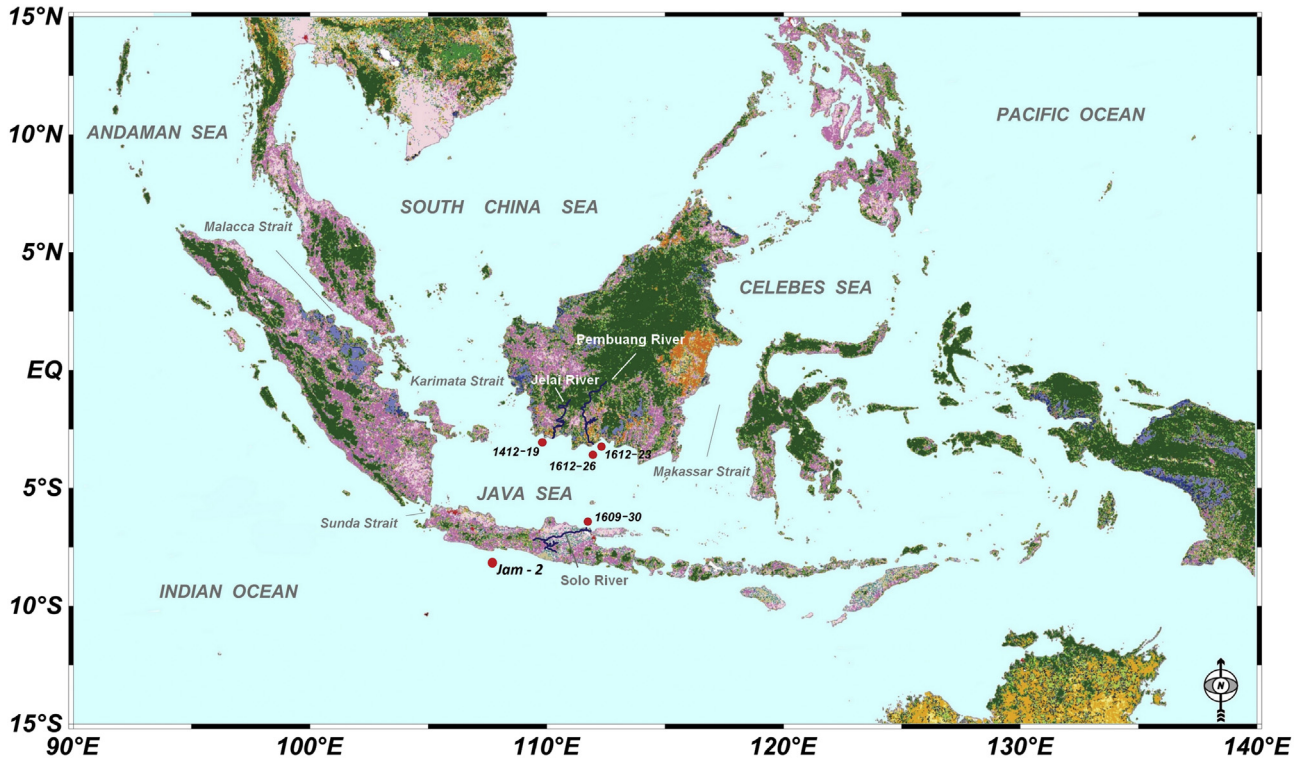
Additionally, a specific GIS atlas provides data on the fossil and modern records of *Ficus* and related species of island SE Asia, Australasia, and the Western Pacific (Jago and Boyd, 2003). The pollen atlas of Malaysia (Kiew and Muid, 1991) describes pollen of 95 species in 84 genera and 43 families with regard of beekeeping. For each species a photograph of the whole plant, the flower, and pollen grain is presented, as well as provided information on pollen size/colour, plant habit (crop, weed or forest taxa) and distribution.

Furthermore, a modern palynoflora of the Philippines (Jagudilla-Bulalacao, 1997) is published. The atlas contains light and SEM microphotographs as well as the morphological key and descriptions of 45 species related to 264 genera and 63 families.

Several papers on pollen morphology are available for Taiwan (Huang, 1972, 1981) and tropical Asia in general (Guinet, 1962; Tilak, 1989). For Malaysian Borneo a paper on the pollen diversity of the Kelabit Highlands (Jones and Pearce, 2015) presenting microphotographs from pollen grains of about 200 species with a

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- Broadleaved evergreen closed forest
- Broadleaved deciduous closed forest
- Broadleaved deciduous open forest
- Closed to open deciduous shrub cover
- Cultivated and managed areas
- Burnt and / or destroyed natural vegetation
- Grass cover
- Mangroves
- Swamp evergreen closed to open forest
- Regularly flooded fresh water vegetation
- Urban and urban-associated areas
- Cropland / tree cover mosaic
- Cropland / shrub / grass cover mosaic
- Other areas

Fig. 1. Schematic map of the study area with distribution patterns of main vegetation types. Marine sediment cores and a sediment trap are shown with red dots. Data on the vegetation distribution are derived from OSGeo website (<http://geonetwork-opensource.org>) and partly from Stibig et al. (2002). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

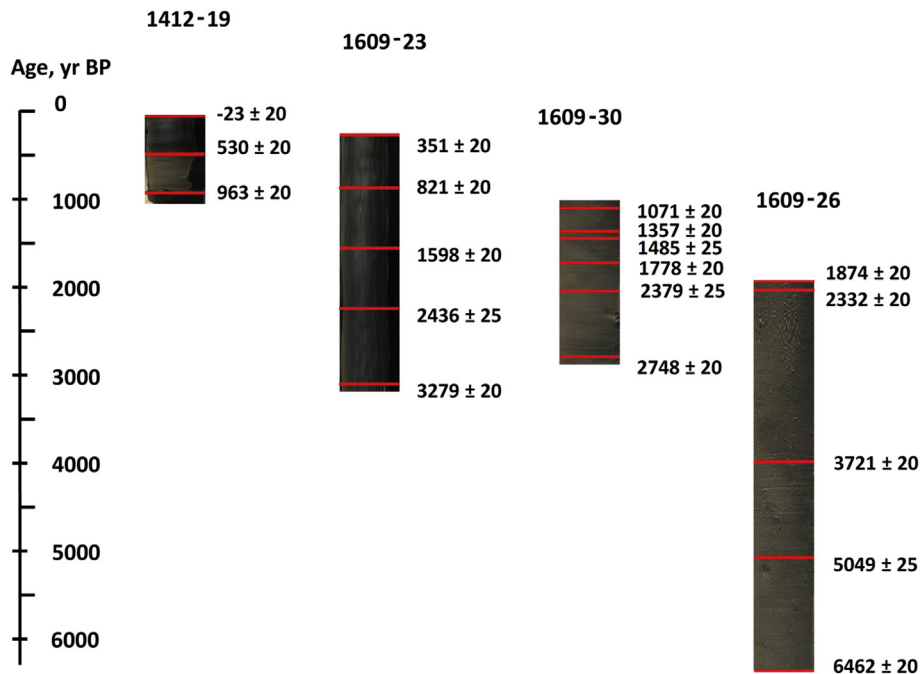


Fig. 2. Age schemes of the marine sediment cores used for the present study. Radiocarbon dating (Stuiver and Polach, 1977) and calibration (CALIB 7, marine 13; Stuiver and Reimer, 1993) considered a reservoir age of 90 y (Southon et al., 2002).

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