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A new type of homoxyloous Mesozoic wood from Asia, with palaeogeographical and palaeoecological implications

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A new type of homoxyloous Mesozoic wood

In 1936, Shimakura reported on a fossil wood taxon named *Dadoxylon* (*Araucarioxylon*) *japonicum* Shimakura, on the basis of what he considered as a typical anatomy for the Araucariaceae. However it has a very unique feature, unlike other araucarian type fossil woods. Usually the radial tracheid pits of araucarian fossil wood are contiguous and alternate when they are bi- to multiseriate (Fig. 1B). However, *D. japonicum* has long chains of opposite to sub-opposite square pits on its tracheid radial walls (Fig. 1C). We named this type of tracheid radial pitting the ‘*japonicum*-type’.

In some cases opposite or sub-opposite radial tracheid pits could be found from araucarian fossil wood, however these are very rare and local. In woods with abietinean radial pitting biseriate pits are usually opposite, but not contiguous and not square in out line (Fig. 1A).

These peculiar woods were previously published as *Dadoxylon* Unger, *Protopodocarpoxylo* Eckhold or *Brachyoxylon* Hollick *et* Jeffrey, however we think it could be established a new genus for these woods with the *japonicum*-type of radial tracheid pitting.

Palaeogeographical distribution

Fossil woods which have the *japonicum*-type of radial tracheid pitting were surveyed bibliographically of hundreds of specimens in several collections were reappraised as well. Interestingly these woods are well constrained in time and space, viz. to eastern Asia, from Thailand to Japan, and to the Middle Jurassic to Early Cretaceous interval (Table 1, Fig. 2). This new type of Mesozoic wood can be considered as an endemic taxon to Eastern Asia. The main distribution of the fossil woods is in Indochina region of SE Asia and partly in Lhasa of Central Tibet and in SW Japan. On a present day Lhasa is far away from Indochina, but it belongs to a block that split relatively late from Gondwanaland and get accreted to Asia Mainland at least during the Late Jurassic. By the Early Cretaceous the palaeolatitudes of Indochina and Lhasa were similar (Metcalf, 2013), and these tectonic units were probably neighbors for a while before to be torn away during the Himalayan collision (Fig. 2).

In Japan the exact origin of the Torinosu Group of the Chichibu Terrane where the *japonicum*-type woods occur is unknown yet. However, by the Palaeozoic the Chichibu Terrane was probably at low latitude (Aitchinson *et al.*, 1991).

From Lhasa through Indochina and to SW Japan, the distribution of the *japonicum*-type woods stretches along what was during the Jurassic–Early Cretaceous a tectonically active margin, probably lined by a system of coastal cordilleras. From various evidences, including palaeofloras, climate on the southern side of these cordilleras was probably warm-temperate to sub-tropical and wet (Oh *et al.*, 2011). So the spatio-temporally limited distribution of the *japonicum*-type wood suggests that this morphogenus might be of palaeogeographical and palaeoclimatological significance.

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Figure 1A–C. The typical abietinean and araucarian types radial pitting compared to the *japonicum*-type. Fig. 1A is *Taxodioxylon pseudoalbertense* from Heilongjiang, China (no. JNU71122). Fig. 1B is *Agathoxylon togeumense* from Gurye, Korea (no. GR007). Fig. 1C is *Dadoxylon japonicum* from Yatsuji, SW Japan (no. 53325).

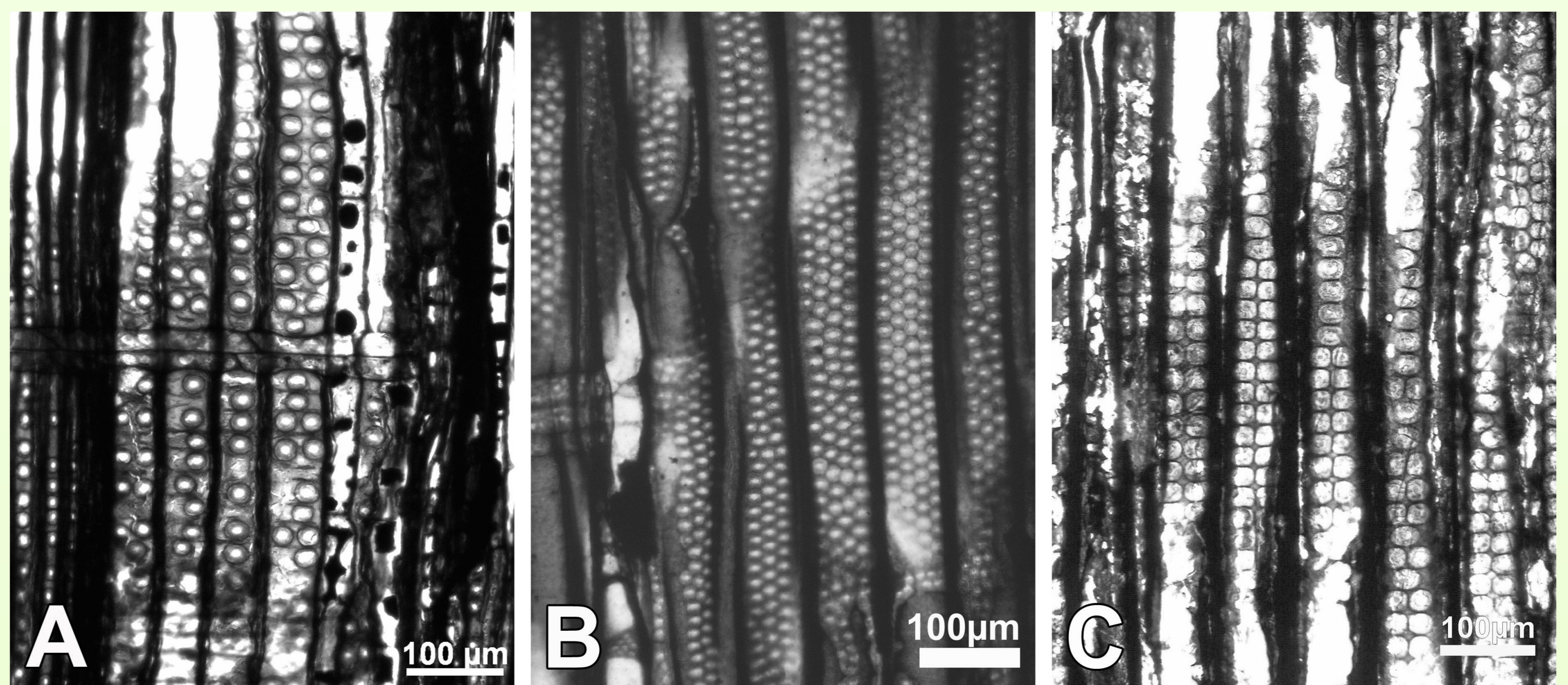


Table 1. Spatio-temporal distribution of the *japonicum*-type fossil woods occurrences.

Age	Locality	Ref.
Jurassic ?	Quang Nam Province, central Vietnam	Colani, 1919
Middle Jurassic	Western Borneo	this study (Natural History Museum London sample)
Tithonian	Kochi Ken, Shikoku, South-western Japan	Shimakura, 1933, 1936; Yamazaki & Tsunada, 1981
Latest Jurassic-Earliest Cretaceous	Treng, Northern Cambodia	Serra, 1966
Latest Jurassic-Earliest Cretaceous	Phu Kradung Fm., Eastern Thailand	Asama, 1982; Philippe <i>et al.</i> , 2004; this study (new material)
Early Cretaceous	Tho-Chau Island, south-western Vietnam	Serra, 1969; this study (new material)
Barremian - Early Aptian	Phu Phan Fm., Eastern Thailand	this study (new material)
Late Barremian - early Aptian	Tano Gun, Gunma Ken, Central Japan	Nishida & Nishida, 1983
unknown age	Gunma Ken, Central Japan	this study (sample 61201 in Shimakura's collection)
Early Aptian	Lhasa, Central Tibet	Vozenin-Serra & Pons, 1990

Figure 2. The distribution of the *japonicum*-type fossil woods at the Early Cretaceous on Indochina region and Lhasa (black dots are the *japonicum*-type fossil wood; modified from Metcalf, 2013). Japanese data not plotted as their position at this time is uncertain.

