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1984/29. A radiometric age for a Triassic tuff from eastern Tasmania

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Abstract

An airfall tuff from the Upper Division of the Parmeener Super-Group cropping out in the Denison Rivulet, eastern Tasmania, has been dated at 214 ± 1 Ma. This date agrees very well with a probable Carnian age derived from palynological data.

GEOLOGY

Airfall tuff occurs as a very minor component in a sedimentary sequence comprised dominantly of lithic sandstone interbedded with mudstone, siltstone and thin coal seams. This sequence is assigned to the Upper Division of the Parmeener Super-Group, which elsewhere in the north-east unconformably overlies a glaciomarine sequence, the Lower Division of the Parmeener Super-Group.

The sedimentary sequence has been extensively intruded by Jurassic dolerite, the dolerite now capping the plateau country of the central Eastern Highlands. The area has also been disrupted by faulting of probable Tertiary age.

Tuffs from a number of outcrops in the Bicheno area have been described in Bacon and Everard (1981). One of these tuffs, cropping out at FP014686, has now been dated by K-Ar geochronology. The sample dated contains about 2 modal% biotite, occurring as fresh flakes up to approximately $30 \times 100 \mu\text{m}$ in size, and aligned in such a way as to suggest compaction of the airfall tuff.

PROCEDURE

A 100 kg sample of the tuff was collected, crushed and the biotite fraction separated by froth flotation at the Department of Mines laboratories in Launceston. The initial concentrate was further purified by heavy liquids (tetrabromoethane) and magnetic separation using the Cook magnetic separator in Hobart.

The biotite concentrate was sent to AMDEL, where the + 100 BSS fraction was sieved from the biotite concentrate and small amounts of glassy(?) impurities removed by further magnetic separation. Standard procedures were used for the determination of potassium content and for the extraction and isotopic analysis of argon. The results are given below:

Table 1. SUMMARY OF RESULTS

% K	$^{40}\text{Ar}^*$ ($\times 10^{-10}$ moles/g)	$^{40}\text{Ar}^*/^{40}\text{Ar}_{\text{total}}$	Age (in Ma)
6.79	26.796	0.97	214 ± 1
6.80			

Constants:

$$^{40}\text{K} = .0001167 \text{ atom } \%$$

$$\lambda_{\beta} = 4.962 \times 10^{-10} \text{ y}^{-1}$$

$$\lambda_{\epsilon} = 0.581 \times 10^{-10} \text{ y}^{-1}$$

Note: error limit in calculated age is given at the 1σ level, based on analytical uncertainty.

AGE

A series of palynomorphs from a sample of siltstone in the bed of the Denison Rivulet, 50 m - 100 m stratigraphically below the tuff outcrop, have been described by S.M. Forsyth, who assigned the microflora to the *Craterisporites rotundus* Zone, and suggested a probable Carnian age for the sample (Appendix 1).

Fragments of *Dicroidium odontopteroides* var. *odontopteroides* occur in one horizon of the ash fall tuff. This species is thought to have an age range of Late Anisian to Norian (Retallack, 1977). Taking the two palynological pieces of evidence together, the outcrop would be of probable Carnian and possible Norian age.

The calculated K-Ar age for the biotite is 214 ± 1 Ma, which is close to the age of 215 Ma proposed by Webb (1981) for the Carnian-Norian boundary. The Triassic has been dated differently by other workers, and an age of 214 Ma falls within the Rhaetian of Armstrong (1978) and the Ladinian of Carr et al. (1982).

The K-Ar age agrees well with the palynological data, indicating a probable Carnian age and is an important contribution to the Mesozoic time scale.

CONCLUSIONS

The outcrop of tuff occurs towards the top of the lithic sandstone sequence which contains all the economically important coal in the East Coast coalfields. Tuff has been found at Bicheno and at Fingal and in a few scattered localities between these two points. With further work, the correlation of coal seams from the Fingal-Denison Rivulet area may be improved and an upper limit for useful coal seam formation possibly identified.

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APPENDIX 1

Palynological report on a Triassic siltstone
underlying pyroclastic rocks, Denison Rivulet

S.M. Forsyth

This is a report on a preliminary palynological analysis made on a *Dicroidium* bearing siltstone collected by C.A. Bacon. The siltstone occurs not more than fifty metres stratigraphically below pyroclastic rocks.

The sample was subjected to standard HF-HCl treatment and 5 minutes oxidation in concentrated nitric acid followed by dilute alkali. Preservation of the palynomorphs is not good, but has generally been suitable for identification of species. The sample was given a processing number P65 and permanent palynological slides 1105 and 1106 were prepared.

Species present include:

- Alisporites australis* De Jersey, 1962.
- Anapiculatisporites pristidentatus* Reiser and Williams, 1969.
- Annulispora folliculosa* (Rogalska) De Jersey, 1959.
- Apiculatisporis globosus* (Leschik) Playford and Dettmann, 1965.
- Aratrisporites* sp. cf. *A. coryliseminus* Klaus. Poor preservation prevents positive identification.
- Dictyophyllidites mortoni* (De Jersey) Playford and Dettmann, 1965.
- Duplexisporites problematicus* (Couper) Playford and Dettmann, 1965.
- Neoraistrickia* sp.
- Stereisporites antiquasporites* (Wilson and Webster) Dettmann, 1963.
- Stereisporites* sp. A. De Jersey, 1970.
- Uvaesporites verrucosus* (De Jersey) Helby comb. nov., De Jersey, 1971. A very poorly preserved specimen could be
- Semiretisporis denmeadi* (De Jersey) De Jersey, 1970.

A. australis, *D. mortoni* and *S. antiquasporites* are long ranging forms common in Triassic assemblages. The oldest occurrences of *U. verrucosus* and *D. problematicus* are in the Middle Triassic Moolayember Formation of Queensland and in the *Aratrisporites parvispinosus* assemblage of the Sydney Basin. In Queensland *A. folliculosa*, *A. pristidentatus* and *A. globosus* appear first in the Ipswich Coal Measures (*Craterisporites rotundus* Zone) (De Jersey, 1975) and range into the Jurassic. *S. sp. A.* has only been recorded from the Blackstone Formation of the Ipswich Coal Measures.

The Ipswich Coal Measures are overlain by the Bundamba Group. However the assemblage listed above contains no species which occur first in the Bundamba Group. Correlation with the Ipswich Coal Measures is therefore suggested. The possible occurrence of *S. denmeadi* (which does not range above the Ipswich Coal Measures) is consistent with such a correlation. A Carnian age has been attributed to the Ipswich Coal Measures (De Jersey, 1971).

In the six Tasmanian samples reported by Playford (1965) *D. mortoni*, *A. globosus*, *D. problematicus* (as *D. gyratus*), *A. folliculosa* and *A. coryliseminis* occurred only in the Brady Formation or its equivalents. *S. denmeadi* ranged down into the top of the Tiers Formation. An undescribed species present in the Denison Rivulet sample also occurs in the lithic sandstone sequence at Spring Hill, which is a lithological and biostrati-

graphic correlate of the Brady Formation. *A. folliculosa* was also reported consistently from coal measures in north-eastern Tasmania by Dettmann (in Threader, 1968) and from coal measures at South Cape Bay (Forsyth, 1977).

In summary the assemblage recorded here is typical of those occurring in the lithic sandstone-coal measure sequence proper of the Triassic elsewhere in Tasmania. The assemblage belongs to the *Craterisporites rotundus* Zone and suggests correlation with the Ipswich Coal Measures, and is therefore probably of Carnian age.

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