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Short Note

Palynological evidence supporting widespread synchronicity of Early Jurassic silicic volcanism throughout the Transantarctic Basin

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Throughout the Transantarctic Mountains, Early Jurassic silicic magmatism preceding the emplacement of the Ferrar flood-basalt province (Heimann *et al.* 1994) is documented by the increasing input of silicic ash into otherwise epiclastic, fluviolacustrine deposits of the Beacon Supergroup (see Elliot *et al.* 2017). Vertebrate biostratigraphy and radiometric analyses indicate a Sinemurian to Pliensbachian age span for silicic volcaniclastic deposits in the central Transantarctic Mountains (CTMs) (Elliot *et al.* 2017). For northern Victoria Land (NVL), radiometric geochronology and palynostratigraphy revealed that explosive silicic volcanism began with minor pulses during the early Sinemurian (*c.* 195 Ma) and reached a peak phase beginning in the middle Pliensbachian (*c.* 187 Ma) (Bomfleur *et al.* 2014). A basin-wide correlation of these widely separated age frameworks has so far been hampered by the scarcity of data on coeval deposits in southern Victoria Land (SVL). Here, we present new palynostratigraphic data from mixed epiclastic–volcaniclastic deposits in the Prince Albert Mountains that provide supporting evidence for the widespread synchronicity of silicic volcanic episodes preceding Ferrar magmatism.

Samples were collected during the 13th German Antarctic North Victoria Land Expedition (GANOVEX XIII 2018–19) from a raft of sedimentary deposits exposed between Ferrar dolerite sills at the southern tip of McLea Nunatak, Prince Albert Mountains (76.00849°S, 159.61997°E; Fig. 1a & b). The ~40 m-thick sedimentary section consists of trough-cross-bedded, medium- to coarse-grained sandstone, carbonaceous mudstone and coal, with intercalations of up to > 1 m-thick beds of silicic tuff (Fig. 1b & c). Sandstones contain abundant zeolite cement and altered volcanic rock and glass fragments (Bernet & Gaupp 2005). Similar mixed epiclastic and silicic–volcaniclastic deposits in the Convoy Range further south have been informally referred to as 'Jurassic beds' (Elliot & Grimes 2011). Based on lithology and sedimentary features, they can be correlated with the upper Section Peak Formation of NVL (e.g. Schöner *et al.* 2011) and with the lower Hanson Formation of the CTMs (e.g. Elliot *et al.* 2017).

Two palynological samples were taken from the middle and upper parts of a 1 m-thick succession of carbonaceous mudstone, coal and thin beds of tuff near the base of the section. Following standard palynological processing, both samples yielded well-preserved pollen-and-spore assemblages strongly dominated (82% and 85%, respectively) by *Classopollis* grains (Fig. 1d & e), mainly intrastriate forms (Fig. 1d), with subordinate occurrences of bryophyte and lycophyte spores (Fig. 1f) and with consistent occurrences of *Podosporites variabilis* (Fig. 1g; see Supplemental Material).

Compared to the palynostratigraphic framework for eastern Australia, this composition indicates correlation with the *Ischyosporites punctatus* Association Subzone of the Sinemurian–Toarcian *Classopollis* Abundance Zone (de Jersey & McKellar 2013; see Supplemental Material). As additional, younger index taxa (e.g. *Nevesisporites vallatus*) are absent and as the proportion of *Classopollis* is still very high, we suggest an assignment to the basal part of this subzone (see Supplemental Material), equivalent to unit APJ21 of Price, which is late Sinemurian in age (see Bomfleur *et al.* 2014). Beacon Supergroup deposits in the southern Prince Albert Mountains have thus far been considered to range from Permian to Triassic in age, based on finds of typical *Glossopteris* and *Dicroidium* fossils from Beta Peak and Benson Knob, respectively (Capponi *et al.* 2002).

Our results facilitate the correlation of Early Jurassic sedimentary successions that reflect the transition from epiclastic sedimentation and coal formation (typical of the underlying Beacon Supergroup) to silicic–volcaniclastic sedimentation over a distance of > 1200 km across the Transantarctic Basin. Our age assignment also narrows the succeeding time interval for the peak phase of silicic ash input (recorded in SVL so far only in the form of isolated rafts of massive silicic tuff within the overlying

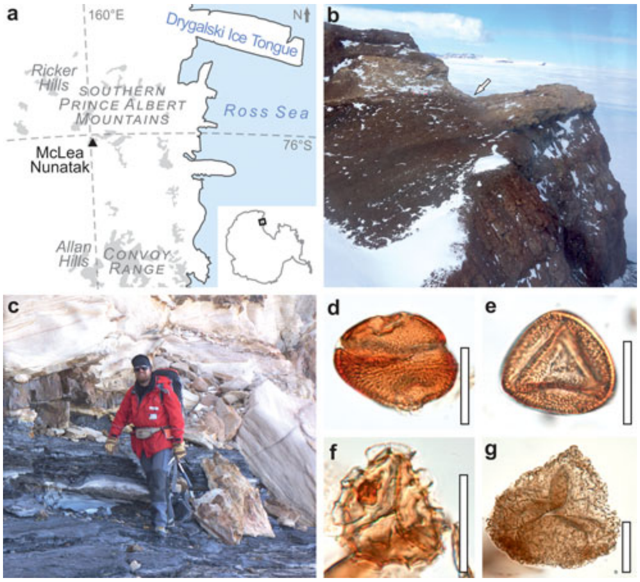

Fig. 1. Field images and selected palynomorph taxa from the sampled section at McLea Nunatak. **a.** Map showing the position of McLea Nunatak in the southern Prince Albert Mountains, East Antarctica. **b.** View east across the southern tip of McLea Nunatak showing the raft of sedimentary deposits between Ferrar sills (arrow indicates the exposed basal part of the section). **c.** Sampled succession of carbonaceous mudstone, coal and tuff bands near the base of the section. **d.** *Classopollis* sp. cf. *C. chateaunovi*; **e.** *Classopollis meyerianus*; **f.** *Retitriletes semimuris*; **g.** *Podosporites variabilis*. Scale bars = 20 µm. Field images by TM.

Mawson Formation; e.g. see Elliot *et al.* 2017) to be essentially Pliensbachian in age. Taken together, there is increasing evidence to suggest that two phases of silicic volcanism are recorded with similar characteristics and synchronous timing throughout the Transantarctic Mountain Range: an early phase characterized by pulsed input of silicic ash lasting at least throughout the Sinemurian, represented by the lower Hanson Formation (see Elliot *et al.* 2017), upper Section Peak Formation (see Schöner *et al.* 2011) and deposits described herein, and a peak phase of activity with massive ash input during the Pliensbachian, represented by the upper Hanson Formation (see Elliot *et al.* 2017), Shafer Peak Formation in NVL (see Bomfleur *et al.* 2014) and clasts of silicic tuff in the Mawson Formation (see Elliot *et al.* 2017).

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Author contributions

JU and TM performed the fieldwork. JU and BB analysed the material. JU processed and photographed the material. All authors discussed the results, wrote the manuscript and provided illustrations.

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Supplemental material

A supplemental table will be found at https://doi.org/10.1017/S0954102020000346.

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