COMPOSITION AND ORIGIN OF SANDSTONES AND TUFFACEOUS SANDSTONES OF THE BEACON SUPERGROUP IN NORTHERN VICTORIA LAND, ANTARCTICA

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An up to 300 m thick succession of clastic and volcaniclastic sediments of the Beacon Supergroup overlying a pre-Devonian crystalline basement crops out in northern Victoria Land below the mafic plateau-lavas of the mid-Jurassic Ferrar Large Igneous Province. These Triassic to Early Jurassic sediments document the period directly preceding the Ferrar Magmatism that was associated with the initial break-up of Gondwana. So far neither provenance of the sediments nor the basin evolution have been investigated in detail.

The sediments of fluvial and minor lacustrine origin are divided into the lower Section Peak Formation (SPF) of approximately 200-250 m thickness, which is dominated by quartzose sandstones, and the upper, informally named Shafer Peak Formation (SHF), consisting almost exclusively of reworked rhyolitic fall-out ashes. A Late Triassic to Early Jurassic biostratigraphic age can be deduced from *Dicroidium*-floras in the SPF and floras dominated by cycadophytes and dipterid ferns (lacking *Dicroidium*) in the SHF. The sedimentary succession is intruded by syn- to postsedimentary mafic sills. Associated with the synsedimentary magmatism are local mafic tuff deposits formed by phreato-magmatic eruptions, the so called Exposure Hill Type Events. The crystalline basement in this area is formed by the early Palaeozoic Ross Orogen, which consists mainly of amphibolite to granulite facies metasedimentary rocks (Rennick and Priestley Shists, Wilson Gneiss) and the granodioritic Granite Harbour Intrusives.

The sandstones of the SPF are predominantly sublitharenites and lithic subarkoses. Sorting and roundness of the grains are generally moderate to poor. Apart from the dominant quartz grains they consist mainly of alkali feldspars, plagioclase, metamorphic lithoclasts and volcanic rock fragments of variable chemistry. The most frequent heavy mineral is garnet, only subordinately occur tourmaline, zircon, green hornblende and epidote.

The textural and compositional immaturity of the sandstones indicates a relatively proximal source area. The sandstone compositions plot in the Q_mFL-provenance diagram in the recycled orogen field, which seems to suggest the underlying Ordovician Ross orogen as source of the sediments. The frequent occurrence of volcanic detritus of varying chemical composition has been interpreted in previous models as indication of an active volcanic arc at the Panthalassan (Proto-Pacific) margin. Another, closer source could be the remnant magmatic arc of the Ross orogen. However, mineral chemistry of garnets from the SPF show obvious differences to published garnet analyses of local basement rocks, so that an additional source area is necessary, possibly the East Antarctic Craton. Microprobe data of feldspar show that Ferrar volcanism was not coeval to deposition of sandstones during the SPF as supposed by previous authors.

Still within the upper parts of the SPF greenish-grey to beige tuffaceous sand- to siltstones are intercalated forming a transition to the overlying, 40-50 m thick SHF. Evidence of fluvial reworking is frequent, whereas true air-fall-deposits have not been identified in the SHF so far. The tuffaceous material is very well sorted with fine sand to coarse silt size consisting predominantly of rhyolitic shards, angular quartz, alkali feldspar, and plagioclase. The shards rarely exhibit bubble wall or bubble junction shape, but are in most cases fragmented due to fluvial reworking. Additionally they are secondarily altered to zeolites (clinoptilolite/heulandite) and sometimes to smectites. While most of the analysed samples show varying cathodoluminescence colours for each mineral species, so far one horizon has been found with mineral fragments nearly exclusively of plagioclase (An_{30}) and magmatic quartz. This is interpreted as juvenile material, thus allowing determination of original magma and phenocryst chemistry.

The SHF can be interpreted as a lithological equivalent of the upper part of the Hanson Formation in the Central Transantarctic Mountains, more than 1000 km away. The occurrence of rhyolitic tuffs over such a range along the Transantarctic Mountains requires a distal, ultra-plinian volcanism of yet unknown source. However, a volcanic province of this age and chemistry can be found in the Mount Poster Formation (Ellsworth Volcanic Group) on the Antarctic Peninsula.