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Title: LIVING WITH ARCHEAN LITHOSPHERE
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Abstract: The Global Lithospheric Architecture Mapping (GLAM) project integrates geophysical, geological, and geochemical data on the crust and lithospheric mantle. Interpretation of this data over the past 5 years has generated a map of lithospheric composition and architecture that suggests that at least 60% of sub-continental lithospheric mantle (SCLM) may have an Archean parentage. Of particular significance is the inference that most preserved Proterozoic crust overlies Archean SCLM that has been variably refertilised and metasomatised by mantle melts associated with convergent margin, post-collisional, and mantle plume processes. These interpretations suggest that consideration of lithospheric preservation and recycling is crucial to understanding Earth evolution.

In a recycling model, ancient, rigid, bouyant SCLM survives the rifting and accretionary processes of supercontinent cycles, whilst juvenile, fertile, dense SCLM typical of island arcs is destroyed. At least 20% of SCLM may be such fertile SCLM that has yet to be recycled. Such areas have SCLM characterised by lower seismic velocities compared with the more depleted (Fe poor) SCLM that typifies Archean terranes. Although geochronological and isotopic (Hf, Nd) studies indicate that juvenile Proterozoic crust may be less extensive than previously believed, a recycling model must still account for significant amounts of juvenile Proterozoic crust. Only some of this crust can be

attributed to obduction. Rifting and detachment of variable thicknesses of crust, ranging from upper crustal to whole crustal sections, may be a contributing process. If emplacement of new crust occurs under extensional tectonic conditions, then detection of older crust may be difficult. Younger cover sequences exacerbate this problem. Geodynamic reconstructions can be used to aid resolution of conflicting continental growth models. Such models need to recognise that relatively rigid and buoyant depleted SCLM influences plate geodynamics through the transfer of stress and the termination and initiation of subduction. It is possible to reframe our understanding of crustal processes as secondary responses to processes effecting the SCLM from below as well as at plate boundaries.

A whole-lithosphere approach can also help us understand secular and spatial controls on metallogeny. Ore deposits related to high degree mantle melting will be focused by major lithospheric-scale structures. Convergent margin magmatic arc-related deposits (epithermal gold, porphyry copper, VMS base metal) will be easily destroyed, whilst deposits forming in intracratonic environments (e.g. IOCG, diamonds, SEDEX and BHT base metal) will be preferentially preserved.