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Crustal growth through accretionary orogenesis; examples from Proterozoic SW Fennoscandia

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Debate remains on the timing of the onset of modern-day-like plate-tectonics, on the applicability of describing ancient terranes via modern-day plate-tectonic models, and on the rates of crustal growth and reworking through time. Proterozoic terranes comprise features such as calc-alkaline meta-igneous rocks, HP metamorphic belts, shallow sedimentary basins and continental rifts, that can all be interpreted as manifestations of modern-day plate-tectonic geodynamics.

Southwest Fennocandia comprises a series of 1.9-0.9 Ga terranes that reflect crustal growth and recycling on the edge of the Columbia (Nuna) supercontinent; a model will be presented for the origin and evolution of these terranes. Crustal growth largely occurred by arc magmatism in a dominantly retreating accretionary orogen. Minor phases of advancing mode (craton-ward movement of the trench) led to compression in the over-riding plate, accretion of outboard arcs, and crustal stabilisation. Terranes that are $\sim$1.86 to $\sim$1.46 Ga in age preserve the main continental and outboard arc- fronts, with intercalated back-arc basins. The main arc-front is not preserved from $\sim$1.46 – 1.06 Ga, but inboard expressions of convergent magmatism are recorded.

Phanerozoic accretionary orogens, including the western US Cordillera, Australian Tasmanides, and the proto-Andes, differ in the magmatism, metamorphism and sedimentation they host, which is in response to varying geodynamic regimes. Comparisons between these examples and SW Fennoscandia can be made, which suggests a degree of uniformitarianism can be applied as far back as the Mesoproterozoic. One exception to this is the abundance of anorthosite and rapakivi magmatic provinces preserved in the Mesoproterozoic, indicating that secular changes in heat flow are a possible requirement in past plate-tectonic models.