Post-depositional thermal history of the 4364–3060Ma zircon-bearing metasandstones of the Illaara and Maynard Hills granite greenstone belts, Western Australia

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The post-depositional thermal history (spanning 3060Ma to 26Ma) of the ca. 3060Ma Illaara and Maynard Hills granite greenstone belt metastandstones (peak metamorphism of upper greenschist facies) is characterized by a combination of SHRIMP U-Th–Pb, Ar/Ar and (U-Th)/He geochronology.

Ar/Ar multi-grain tourmaline results defining two plateau ages of ~2940Ma on a cross-cutting quartz-tourmaline vein provide a minimum depositional age for the metasandstones. Post depositional stratiform qtz-tourmaline veins are a common occurrence in Archean quartzites, and can be useful in assigning minimum depositional ages and timing of hydrothermal fluids.

SHRIMP U-Th–Pb data of >275 rutile analyses from 8 metasandstone samples reveal a complex history of events between deposition of metasandstones (ca. 3060 Ma) and the subsequent folding, thrusting and granitic intrusions (ca. 2730-2630 Ma, regional D1 to D3 events). Some individual rutile grains yield multiple dates which span from before the maximum depositional age of the quartzite at ca. 3060Ma to the last major metamorphic and granitic event at ca. 2630Ma. These rutiles exhibit weakly defined core-rim younging profiles which represent multiple stages of metamorphic growth or Pb-loss reset events. These results suggest that under protracted greenschist metamorphic conditions rutile can retain signatures of multiple thermal events and even retain some of their original detrital characteristics.

Ar/Ar plateau ages on muscovites from both greenstone belts show that late to post deformation planar-foliation recrystalization at ca. 2605Ma (possibly coeval with the end of D3) marks the end of high-grade tectono-thermal events.

(U-Th)/He on zircon at ca. 230Ma defines exhumation and temperatures <180C for these metasandstones, similar to fission track results throughout the Yilgarn. Goethite (U-Th)/He ages of 26Ma are likely coeval with Fe-rich meteoric fluid influx and associated zero-age Pb-loss and Fe enrichment in metamict zones of both rutile and zircon within the metasandstones.

Past ocean temperatures and coupled U/Th and ^{14}C measurements from deep-sea corals

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Deep-sea corals are a unique archive in paleoceanography. They have large banded skeletons that allow for high resolution records and have a high uranium content allowing for accurate calendar ages independent of radiocarbon age measurements. One problem with using deep-sea corals for long records is that it is difficult to date a large numbers of corals accurately and precisely. Unlike sediment cores, fossil fields of corals have no inherent stratigraphy and each individual coral must be separately dated.

Here we present the results of 'reconnaissance radiocarbon age analyses' made at NOSAMS on 519 *Desmophyllum dianthus* (*D. dianthus*) collected from the New England Seamounts and South of Tasmania. We will also present the results of 80 more deep-sea corals measured on the Gas-Source AMS also at NOSAMS in WHOI. We find that the coral populations respond to rapid climate change events and are sensitive to climatically driven changes in thermohaline circulation, productivity, $[O_2]$ and $[CO_3^{2-}]$.

Once dated however, their use as a paleoceanographic archive is complicated by the isotope and trace-metal disequilibria in their skeletons relative to co-existing seawater. However two tracers that overcome these vital effects are paired U-series and radiocarbon dates and clumped isotope measurements. Here we will present preliminary data of YD and H1 corals from the New England Seamounts collected from 1000-2600m of water depth in the North Atlantic where all three tracers are measured in the same corals.

We find that the temperature profile of the ocean during both the YD and H1 coral population is constant with depth. The average potential temperature of the Younger Dryas profile is 1.6 ± 0.5°C while the average potential temperature of the Heinrich 1 profile is 3.1±0.9°C. If one outlier in the H1 profile is removed the average temperature becomes 2.3±0.5°C. We will discuss implications for salinity gradients in the water column during these time periods as well changes in the circulation of the ocean.