Thermometry of quartz from the metaconglomerate of Jack Hills, Western Australia

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The original sample site W74 in the Jack Hills meta-sedimetary belt, Western Australia [1], is well known for containing detrital zircon grains as old as 4.4 Ga [2]. Various geochemical investigations on these detrital zircons and their inclusions have been utilized in trying to establish conditions that existed on the early Earth [3 and ref. therein]. We extended the focus of this research to quartz, the main component of the conglomerate containing old zircons. In a comparative study we determined Ti temperatures of quartz [4] in both the quartzite pebbles and the matrix of the conglomerate, as well as of quartz from inclusions in zircons. The quartz grains of the conglomerate pebble record an average temperature of 437 ± 22°C (2σ, n=21), which is significantly lower than the temperature of 509 ± 80°C (n=15) obtained from the matrix quartz. The temperatures obtained from quartz inclusions in separated zircon grains, on the other hand, are all around 700°C, and are in agreement with Ti-in-zircon temperatures obtained from the host zircons, proving previous assumption that the quartz inclusions were incorporated during zircon growth. We interpret the matrix quartz temperature as recording the late metamorphism of the Jack Hills sedimentary belt at upper greenschist lower amphibolite conditions [5]. The pebble quartz, however, might inherit the temperature of an earlier metamorphic event in the source region. This, in combination with the restriction of the mineral paragenesis to nearly purely quartz, suggests that grains, deposited in the Jack Hill sedimentary belt, are derived from a meta-sedimentary host rock. Zircons, found in the conglomerate, would thus have experienced at least one metamorphic event before being re-deposited in the Jack Hill sedimentary belt.

[1] Compston & Pidgeon (1986) *Nature* **321** 766–769. [2] Wilde *et al*. (2001) *Nature* **409** 175–178. [3] Kemp *et al*. (2010) *EPSL* **296** 45–56. [4] Wark & Watson (2006) Contrib Mineral Petrol **152** 743–754 [5] Rasmussen *et al*. (2010) *Precambrian Research* **180** 26–46.

SoilTrEC: An international consortium to assess soil processes and functions using a global network of Critical Zone Observatories

M. MENON AND SOILTREC RESEARCH TEAM

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Soil Transformation in **E**uropean **C**atchments (SoilTrEC) is an international consortium that aims to develop a comprehensive understanding of soil processes and functions. The project will combine experiments and modelling to describe soil formation and functions using a global network of Critical Zone Observatories (CZOs) that focus multidisciplinary expertise onto the study of soil processes. The specific objectives of the project are the following: (1) describe from 1st principles how soil structure impacts processes and function at soil profile scale, (2) establish 4 EU Critical Zone Observatories to study soil processes at field scale (3) develop a Critical Zone Integrated Model of soil processes and function (4) create a GIS-based modelling framework to delineate soil threats and assess mitigation at EU scale (5) quantify impacts of changing land use, climate and biodiversity on soil function and economic value (6) form with international partners a global network of CZOs for soils research, and (7) deliver a programme of public outreach and research transfer on soil sustainability [1].

Four experimental CZOs are chosen for this study [1]; the Damma Glacier CZO (Switzerland) allows the study of incipient soil formation in the glacial forefield as the glacier retreats, to study earliest stages of soil formation. Lysina CZO (Czech Republic) and Fuchsenbigl CZO (Austria) are included to study soil processes under well managed forest and arable landscapes, respectively. The Koiliaris CZO (Greece) represents highly degraded soils after millennia of intensive agricultural land use, including grazing, and is under additional threat from desertification due to modern climate change. These CZOs provide field data and new measurements which will be used for the modelling of water flow, reactive transport, biogeochemical processes and nutrient cycles. Finally, an intergrated regional scale model will be developed for soil ecosystem services and threats in Europe, which will be further validated with other CZOs in Europe, USA and China. Soil profile sampling from the CZOs was completed in 2010 and preliminary data will be presented.

[1] Banwart *et al*. *Vadose Zone Journal* (in review).