Geology and geochemistry of the Lincang superlarge Germanium deposit hosted in coal seams, Yunnan, China

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The Lincang germanium deposit, with ca. 1000 t germanium reserve, is one of the largest Ge deposits hosted in coal seams in the world. The deposit located in the Tertiary fault-controlled Bangmai coal-bearing basin, Lincang county, western Yunnan province of China. Strata in the basin can be divided into three coal-bearing cycles (N_{1b}^{2}, N_{1b}^{4}, N_{1b}^{6}). Coal seams in N_{1b}^{2} are interbeded with siliceous rocks and clastic rocks, while coal seams in N_{1b}^{4} and N_{1b}^{6} are only interlayered with clastic rocks. The rocks in basement of the basin are granite, with average Ge content of 3.9 ppm which is much higher than the Clack value (1.4 ppm) of the equivalent rocks.

The Ge of the deposit occurs in the coal seams interlayered with siliceous rocks in N_{1b}^{2}. Orebodies have equant or elongated configurations and mainly distributed at fault intersections. Ge in mineralized coal seams is mainly combined with and partially absorbed by organic matters, and appears to be concentrated at the top and bottom of coal seams where they mainly contact with siliceous rocks.

In this work, detail geological and geochemical research on the deposit has been done. A new model to link the formation of the deposit to surrounding rocks is proposed. The model suggests that: (1) the siliceous rocks interlayered with mineralized coal seams are hydrothermal in origin, (2) the sites of fault intersections are possibly the access channels of Ge-bearing hydrothermal fluids from which the interlayered siliceous rocks deposits, (3) the Ge in Ge-bearing hydrothermal fluids is derived from the Ge-enriched granite, and (4) the organic matters in coal seams presents an ideal barrier for germanium.

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Radiocarbon during the Younger Dryas from Tasmanian Huon pine

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The Younger Dryas (YD) is the last prolonged cold period (~13,000 to 11,600 cal BP) evident in some parts of the world during the transition from the Last Glacial Maximum to the Holocene. There is immense scientific interest in radiocarbon variations over this period. For the latter part of the YD, atmospheric ^{14}C is relaibly based on an absolute tree-ring chronology from Germany, which now extends back to 12,410 cal BP Friedrich, 2004. For the early part of the episode, ^{14}C values are derived from terrestrial and marine varve samples, and corals. However, these data are subject to uncertainties in varve counting and in the assumption of a constant marine reservoir correction for marine samples, which may not be valid for periods of large climate change such as the onset of the YD.

We are studying four subfossil Huon pine logs from western Tasmania in the time-span 13,000–12,000 cal BP. One log, catalogue SRT-783, containing 413 rings has been used for examining atmospheric ^{14}C during the YD. Forty-two samples, mostly decadal, from SRT-783 were pretreated to alpha-cellulose, then converted to graphite and measured by AMS using the ANTARES facility at ANSTO, with a precision of 0.30–0.35% (equivalent to 25–30 ^{14}C years). The AMS ^{14}C ages were wiggle-matched with the youngest part of a sequence of ^{14}C results from Late Glacial subfossil pine in central Europe Kromer, 2004. It appears that SRT-783 commenced growing about 50 years before the full onset of the YD. It is also evident that SRT-783 data record detailed variations in atmospheric ^{14}C levels more pronounced than those in the Cariaco varve record Hughen, 2004, perhaps implying that the latter are slightly smoothed by air-sea exchange of $^{14}CO_2$ and oceanic circulation.

SRT-783 ends at approximately 12,550 cal BP, just 140 yrs before the point where the absolute tree-ring chronology now begins. Decadal samples from other 3 Huon pine logs (SRT-779, -781 and -782) are being processed for AMS ^{14}C analysis. These data may close that gap and provide a direct test of the theory that a shutdown of the thermohaline circulation was the cause of the YD cold period in the Atlantic region.

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