

## **Chapter 3: Summary of Age Data for the Quartzofeldspathic Rocks of Farm Gotha**

No isotopic age data have been published for the lithologies of the Farm Gotha. Barton et al, 2003, suggest an age of 1.9 Ga for the dolomite sill in the south east of the farm.

Zircon grains were separated from samples of the quartzofeldspathic rock outcrops d201, gr03 and d403 (Figure 3.1 and Chapter 4) and analysed by LA-ICP-MS by Dr. E.S. Barton at the De Beers Geoscience Centre. The analytical and data reduction techniques employed are described in Barton et al (2003; Appendix II). The results are presented in Appendix IV, summarised in Table 3.1 and plotted on concordia diagrams in Figures 3.2, 3.3 and 3.4.

Table 3.1: Summary of chemical analyses of zircons analysed for each of the three field identified quartzofeldspathic rocks (QFG) outcrops d201, d403 and gr03 with the number of spots analysed shown as n.

Outcrop	Ave U (ppm)	StDev U	Ave Th (ppm)	StDev Th
d201 (n=70)	Ave = 6084 Min = 433 Max = 21068	4789	Ave = 883 Min = 46 Max = 8758	1350
d403 (n=32)	Ave = 1656 Min = 234 Max = 6007	1154	Ave = 689 Min = 45 Max = 4595	1008
gr03 (n=25)	Ave = 3232 Min = 158 Max = 8954	2315	Ave = 500 Min = 32 Max = 1613	437

The grains that were analysed are euhedral to subhedral in shape and are assumed to be mostly magmatic because of their shapes. They were not obviously metamict or rounded. Generally cores rather than rims of individual grains were analysed.

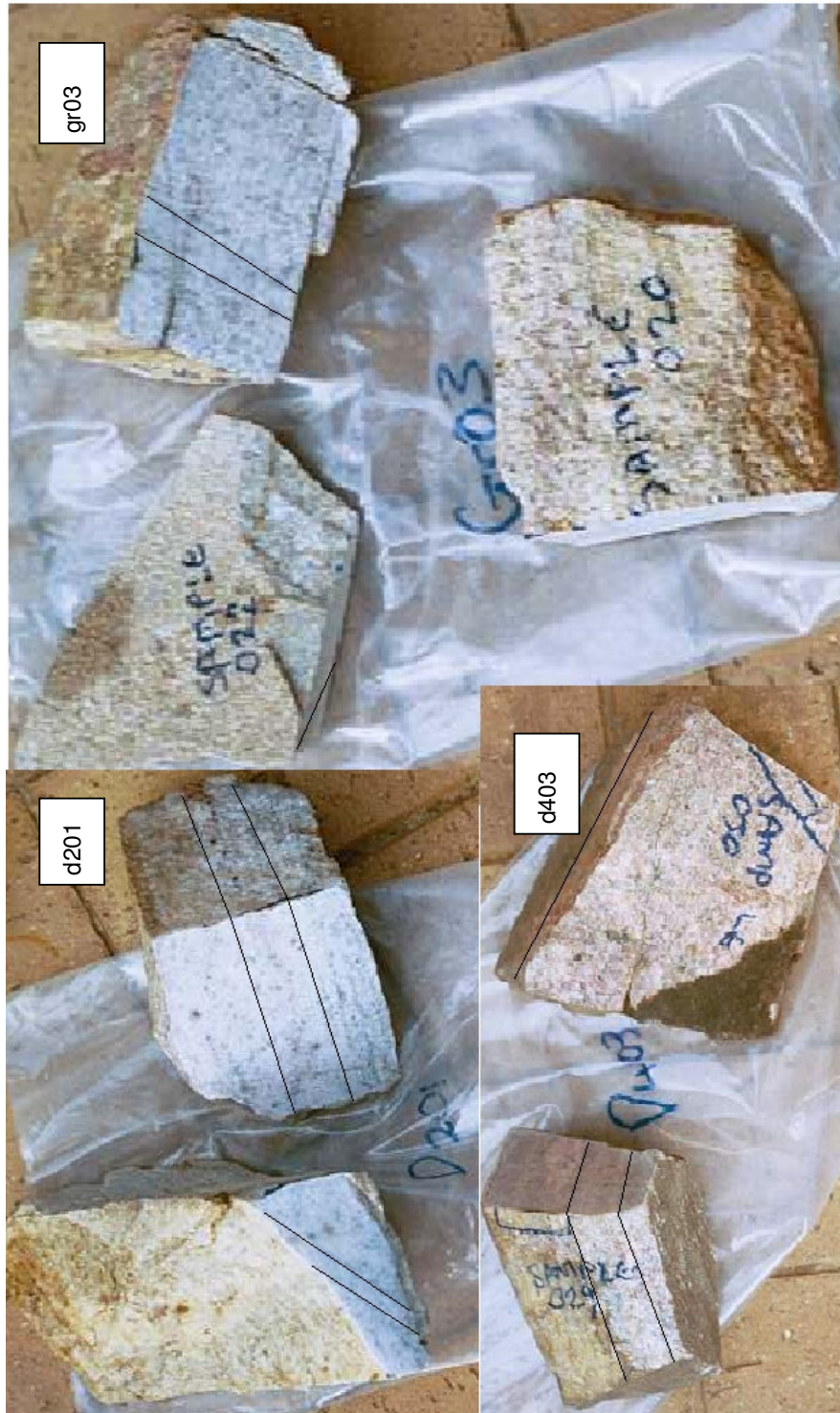


Figure 3.1: The collected samples of outcrops d201, d403 and gr03 sent for zircon extraction and analysis.

Their crystals are remarkable in being extremely enriched in U and Th, up to 21000 and 8700 ppm respectively. Although some of these anomalous U and Th concentrations may be the result of inadvertently analysing inclusions of uraninite, thorite, monazite or allanite within zircon (see Chapter 1; Figure 1.13C), much if not all of the U and Th appears to be in the zircon crystals themselves as indicated by detectable concentrations of these elements by SEM analysis (J.M. Barton, personal communication, 2004).

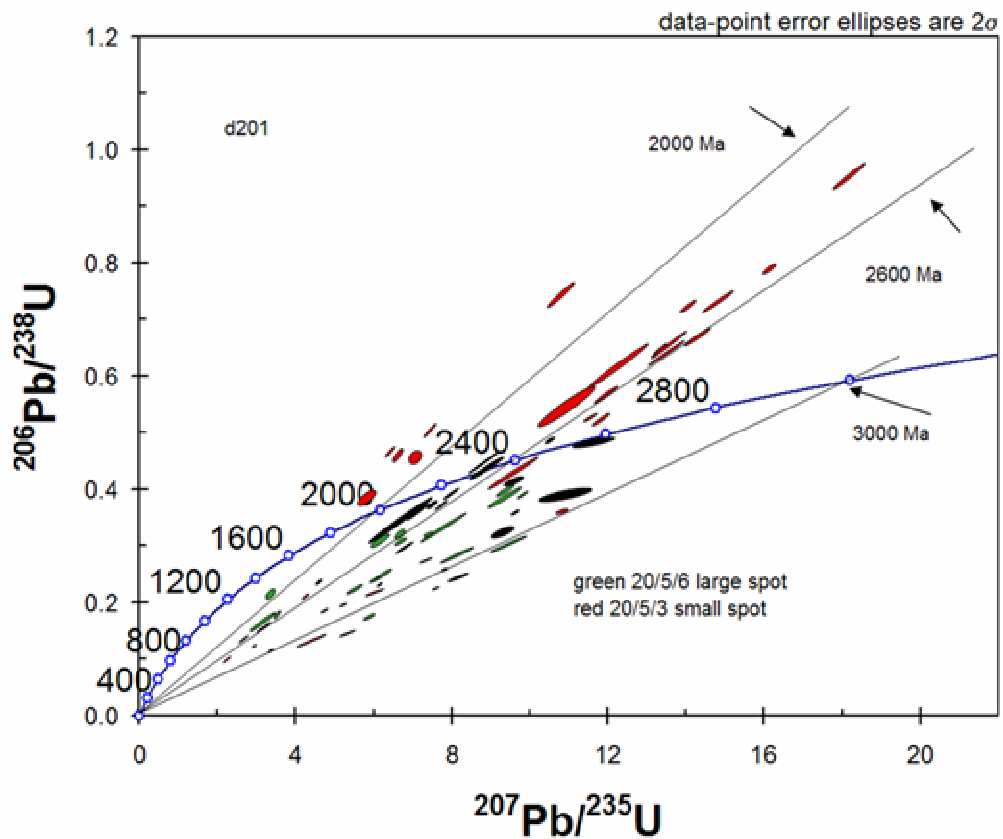


Figure 3.2: Pb-U concordia diagram for zircons from outcrop d201 showing the possible ages for the rocks.

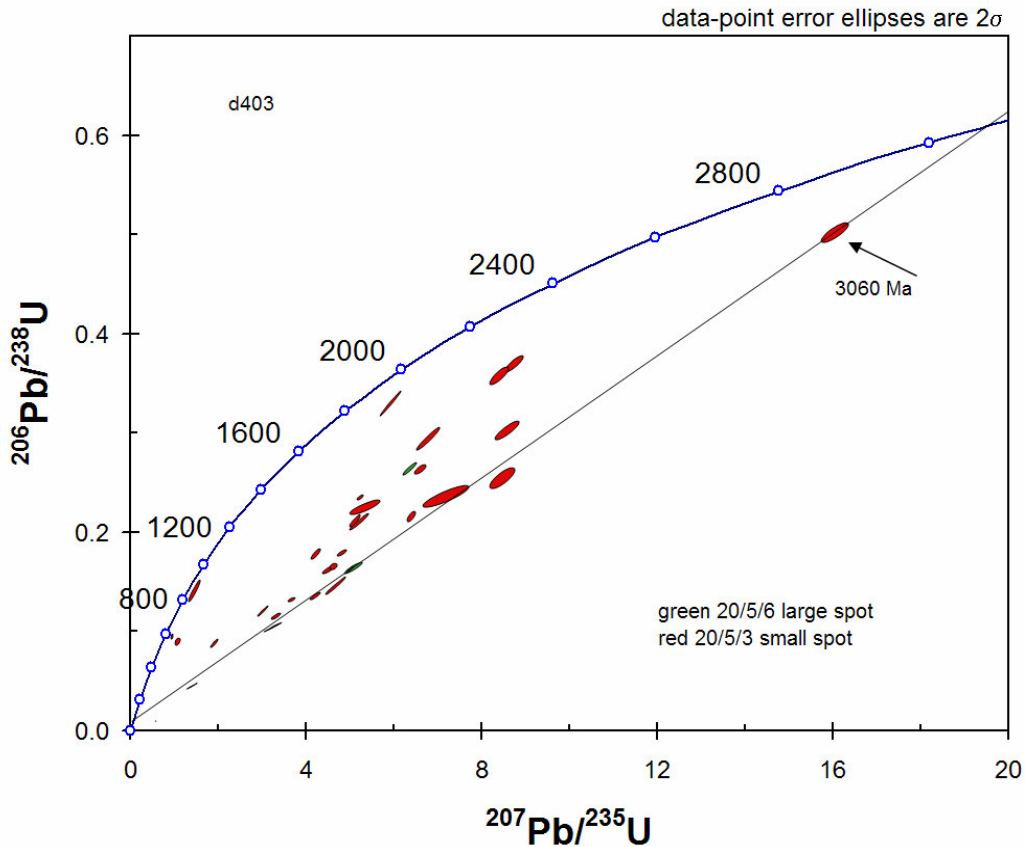


Figure 3.3: Pb-U concordia diagram for the zircons from outcrop d403 showing the possible ages for the rocks.

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As might be expected, the data scatter on concordia diagrams, with some points plotting on the concordia (Figures 3.2, 3.3 and 3.4). These points could represent mixed analyses of zircon with other U and Th bearing phases.

Most of the data are discordant, probably reflecting Pb loss with time as a result of radiation damage to the crystal lattice. Pb-loss has been identified in deep crustal granulites and linked to the length of time these rocks were subjected to high temperature, low pressure granulite facies-type conditions (Ashwal et al, 1999).

The discordant data trend toward 0. Very few analyses plot on concordia and those that do, do not indicate consistent ages. Similarly, no obvious linear discordia are

defined although the general trend of the data suggest ages in the range between ~2.4 and ~2.2 Ga.

A few grains suggest older ages but only some of these are ones with more normal U and Th contents. These with more normal U and Th contents are probably xenocrysts (Figure 3.4).

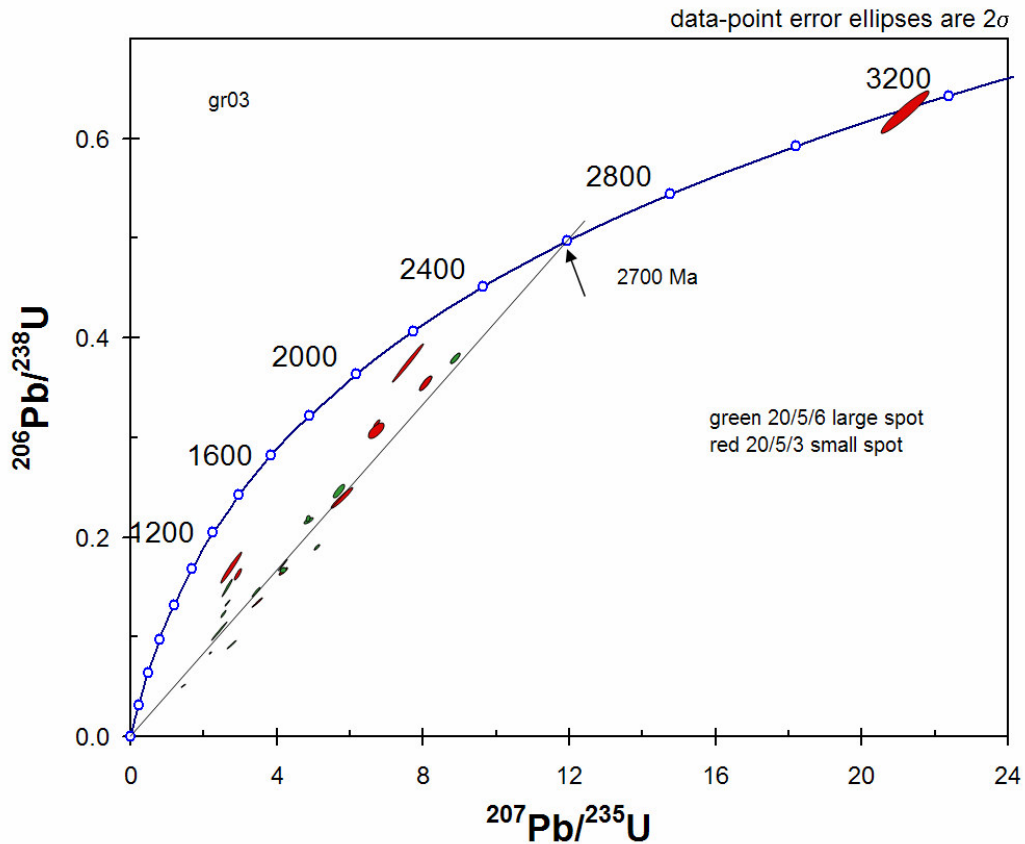


Figure 3.4: Pb-U concordia diagram for the zircons from outcrop gr03 showing the possible ages for the rocks.

In conclusion, while no reliable age data were obtained from these analyses, they suggest that the quartzofeldspathic granitic rocks are between ~2 and ~2.2 Ga old and as such may be coeval with quartzofeldspathic rocks in the core of the Venetia Synform (Unit 4 Barton et al, 2003).