Detrital Zircon U-Pb Geochronologic Data for Selected Cretaceous, Paleogene, Neogene, and Holocene Sandstones and River Sands in Southwest Montana and East-Central Idaho

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1. Introduction

This report contains the data tables for fifteen detrital zircon samples of Tertiary and Quaternary sands and sandstones from southwest Montana and east-central Idaho. These data were used in the Stroup and others (2008) discussion of Oligocene to Holocene tectonics and drainage of southwest Montana. The purpose of this report is to open-file the data used in that paper.

The sample numbers and their ages and GPS locations are shown in table 1, which is the first sheet of the Excel workbook. The subsequent 15 sheets are the U-Pb data. Locations of samples are shown in figure 1. Other details are in Stroup and others (2008).

The data presented here include the standard set of values used in U-Pb geochronologic reports.

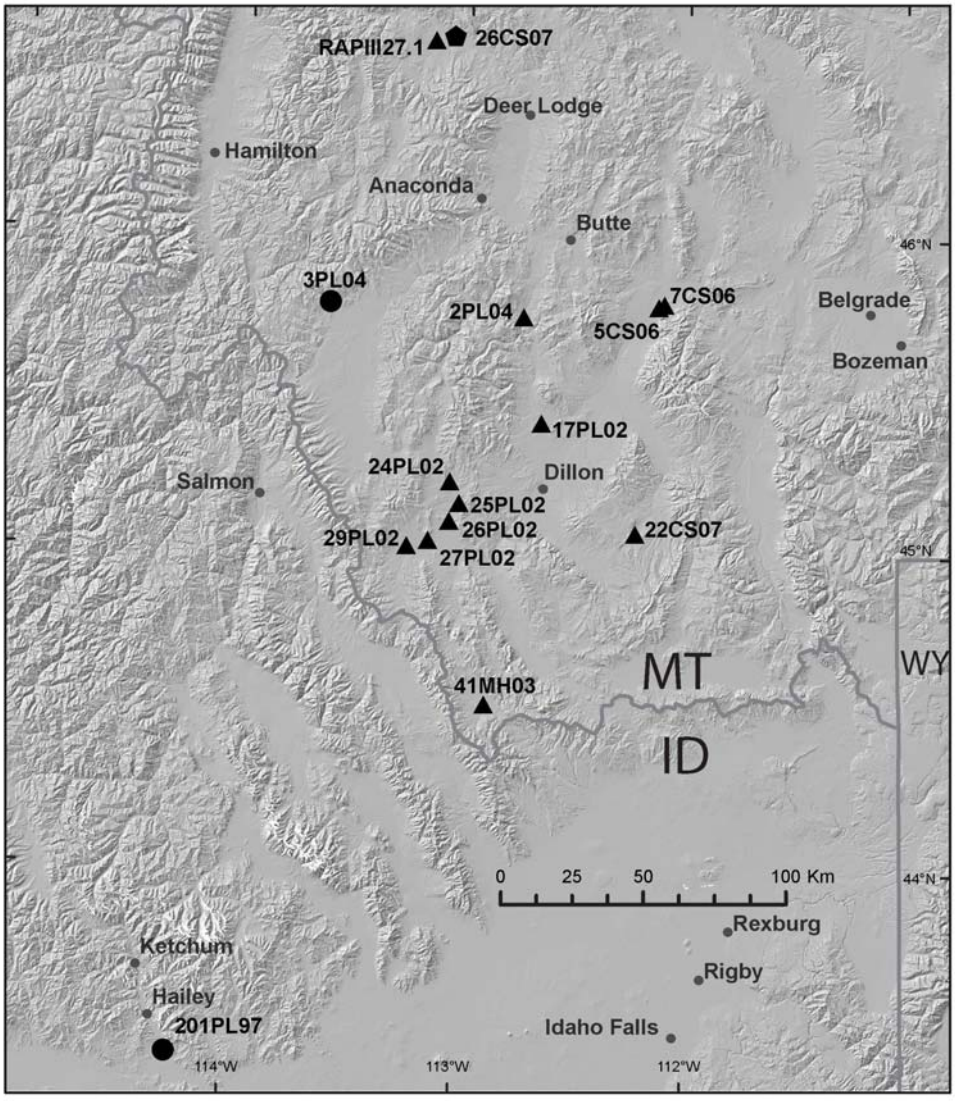
2. Detrital Zircon Geochronology

U-Pb dating of detrital zircon grains has added a new dimension to studies of sedimentary provenance (Williams, 1998; Fedo and others, 2003; Link and others, 2005; Gehrels and others, in press). The use of a Sensitive High Resolution Ion Microprobe (SHRIMP) for such geochronologic analysis (Ireland and Williams, 2003) allows rapid, non-destructive age determination of sectioned individual grains down to 40 μm diameter (the area analyzed is ~20 μm in diameter by ~1 μm in depth).

This study used the SHRIMP facilities at The Australian National University, following techniques developed over the past 20 years (Williams, 1998). Zircons were isolated and sampled at random from 2 kg sand or outcrop grab samples from Idaho and Montana. A heavy mineral concentrate was prepared from the total rock or sediment sample using standard crushing, washing, heavy liquid (Sp. Gr. 2.96 and 3.3), and paramagnetic procedures. The zircons were poured onto double-sided tape, mounted in epoxy together with chips of the reference zircons (SL13 and FC1), sectioned approximately in half, and polished. Reflected and

transmitted light photomicrographs were prepared for all zircons. Cathodoluminescence (CL) Scanning Electron Microscope (SEM) images were taken and used to decipher the internal structures of the sectioned grains.

Figure 1: Sample location map



For each sample, zircons on the mount were analyzed sequentially and randomly. The minimum grain size analyzed was about 40 µm, or coarse silt. A target of 60 grains per sample was applied for most samples (cf. Dodson and others, 1998), but in some cases analysis of new grains was

stopped either because the sample did not show significant variability or because machine time was limited. The probability-frequency plots of Stroup and others (2008) specify how many grains are included in each plot.

Analysis spots were chosen on the margins of hybrid grains to test the youngest phase of zircon growth as determined from the CL images. For some analyzed grains, more than one SHRIMP spot was analyzed. For such grains, only one age, the youngest concordant analysis, is used in the detrital age spectrum.

Each analysis consisted of four scans through the mass range, with a reference zircon analyzed for every five unknown zircon analyses. The data were reduced in a manner similar to that described by Williams (1998, and references therein), using the SQUID Excel Macro of Ludwig (2003). The Pb/U ratios have been normalized relative to a value of 0.0928 for the SL13 reference (equivalent to 572 Ma), or to the value of 0.01859 for the FC1 reference zircon, equivalent to an age of 1099 Ma (see Paces and Miller, 1993), based on replicate isotope dilution analyses of milligram-sized fragments by conventional U-Pb dating. Uncertainties given for individual analyses (ratios and ages) are at the one sigma level; however, the uncertainties in calculated weighted mean ages are reported as 95% confidence limits. The Tera and Wasserburg (1972) concordia plot, relative probability plot with stacked histogram, and weighted mean $^{206}Pb/^{238}U$ age calculations were carried out using ISOPLOT/EX (Ludwig, 2003).

Ages used in the probability-frequency plots of Stroup and others (2008) are the $^{207}Pb/^{206}Pb$ age for grains older than ca. 800 Ma and the $^{206}Pb/^{238}U$ age for grains younger ca. 800 Ma. Analyses of Precambrian zircons that were more than 20% discordant, and Phanerozoic analyses that were not within analytical uncertainty of the Tera-Wasserburg concordia, were discarded. However, these analyses are included in the data table of this report.

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