Tectonics

Supporting Information for 2019TC005680

Cumulative and coseismic (during the 2016 M_w 6.6 Aketao earthquake) deformation of the dextral-slip Muji Fault, northeastern Pamir orogen

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Additional Supporting Information (Files uploaded separately)

Dataset 1: submitted as a zip file

Introduction

This data set contains Text S1 and Figures S1-S2, which describe details of field sampling, laboratory preparation and measurement, and age calculation of terrestrial cosmogenic nuclide (TCN) ^{10}Be samples collected from fluvial terraces at Akesayi site. ESRI shape files for the mapped surface of the Muji Fault are uploaded separately in Dataset 1 in a zip file.

Text S1. TCN ^{10}Be Dating: Sampling, Preparation, Measurement, and Age Calculation

1.1. Field Samping

Exposure ages of terraces T3 and T2d are dated using TCN ^{10}Be depth profile methods. On each terrace, we dug back >1 m and dug down ~2 m along the terrace edge to expose fresh fluvial deposits. Quartz and granite gravels with diameters of 1-4 cm (>30 clasts per depth) were collected and amalgamated from six layers with regular depth intervals (generally ~40 cm) (Table 1). For the terrace T2d, one pebble sample (>30 clasts) from the terrace surface was collected to date its age. The angle from the sample site to the top of surrounding mountain ridges was measured for the topographic shielding correction.

1.2. Laboratory Preparation and Measurement

Samples were prepared in the Cosmogenic Radionuclide Target Preparation Lab at University of Cincinnati (MJ1 and MJ2) and the Institute of Crustal Dynamics, China Earthquake Administration (MJ3). All rock samples were crushed, sieved and magnetically separated to obtain the nonmagnetic fraction of 250-500 μm size. This fraction was chemically leached using a minimum of six acid leaches: one 20% HCl leach for ~12 hours; four 5% HF/HNO_3 leaches for ~12 hours; and one or more 1% HF/HNO_3 leaches for ~12 hours. A heavy liquid (lithium heteropolytungstate or sodium polytungstate) separation was used after the first 5% HF/HNO_3 leach. The purity of the quartz was tested using infrared stimulated luminescence in a Riso OSL Reader. The purified quartz was spiked with 0.2-0.5 mg ultrapure ^{9}Be carrier, subsequently was dissolved in concentrated HF and then fumed three times with $HClO_4$. The sample was then passed through anion and cation exchange columns to remove iron, aluminum, and other elements. NH3·H_2O was added to the Be fractions to precipitate $Be(OH)_2$ gel. $Be(OH)_2$ was calcined at 920℃ for 10 minutes in muffle furnace. The resultant BeO was mixed with Nb power and loaded in steel targets for the measurement of the ^{10}Be/^{9}Be ratios by accelerator mass spectrometry at PRIME Laboratory in Purdue University. ^{10}Be/^{9}Be ratios were corrected using ^{10}Be laboratory blanks (Table 1).

1.3. Age Calculation

The age and ^{10}Be inheritance of each depth profile (MJ1 and MJ2) were calculated in the Monte Carlo simulator (Figures S1-S2 & 5; Hidy et al., 2010). We used a ^{10}Be half-life of

1.387×10^6 years (Korschinek et al., 2010), a scaled production rate to our sample site using the scaling scheme of Lal (1991) and Stone (2000) and a reference production rate of 4.01 ± 0.39 atoms/g/a (Sea Level High Latitude; Borchers et al., 2016), a density varying between 1.8 and 2.5 g/cm, and an attenuation length of 160 g/cm^2 (Gosse and Phillips, 2001). A maximum surface-erosion depth of 10 cm and a maximum erosion rate of 2 cm/ka of the terrace surface were assigned, given that the terrace surface was quite young (<10 ka) and field observations suggested little erosion at the profile site. The age and inheritance are presented at the 95%-confidence level (Figure 5; Table 1).

For the surface sample MJ3, the age was calculated in the CRONUS-Earth online age calculator version-3.0 (Balco et al., 2008; http://hess.ess.washington.edu/ math/), using the time-dependent scaling model ("Lm"; Lal, 1991; Stone, 2000), a density of 2.0 g/cm^3, and an erosion rate of 0-2 cm/ka, and was corrected by the average ^{10}Be inheritance of depth profiles MJ1 and MJ2 (Table 1).

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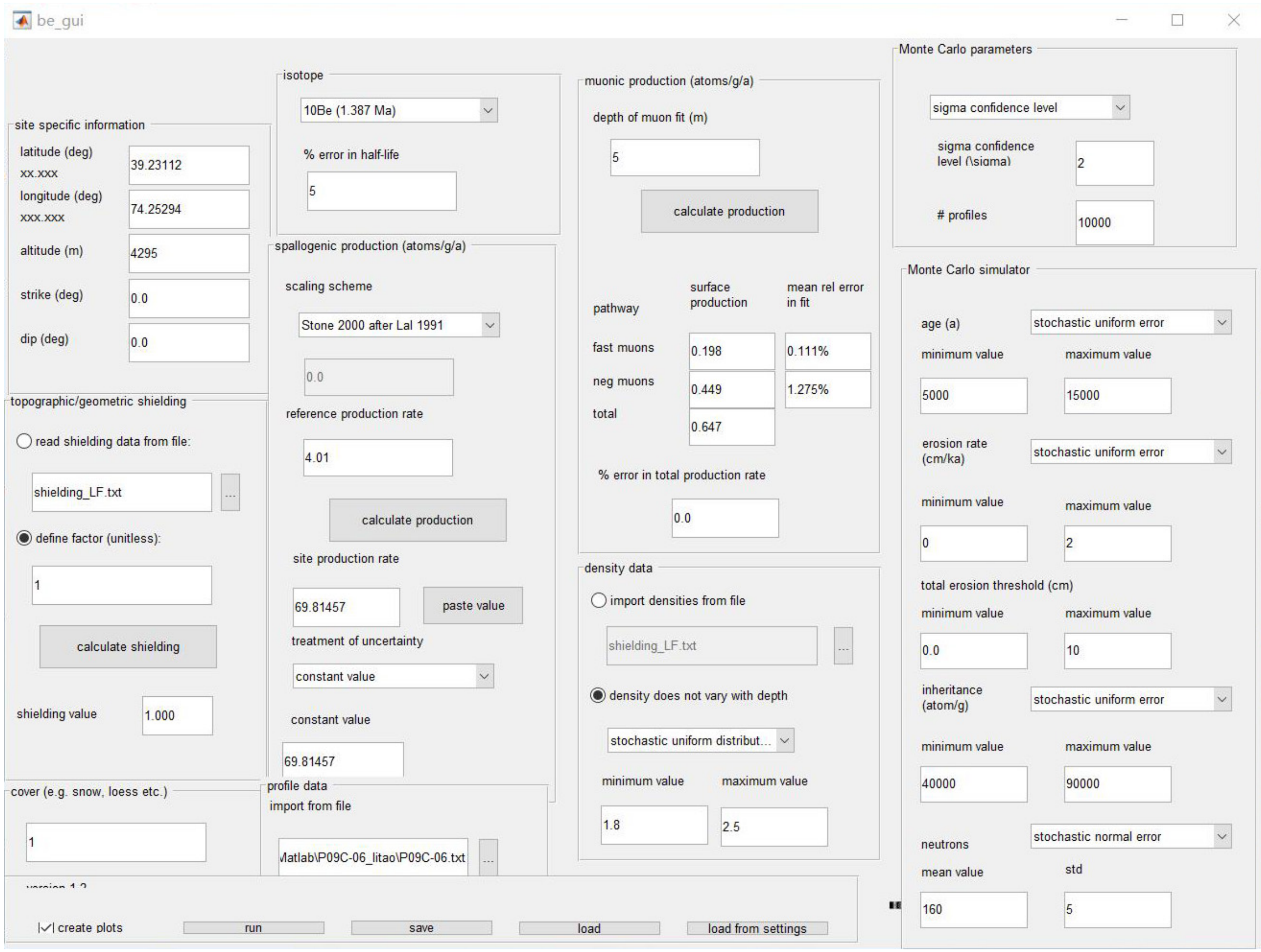

Figure S1. Parameters used in Monte Carlo modeling (Hidy et al., 2010) of depth profile samples MJ1.

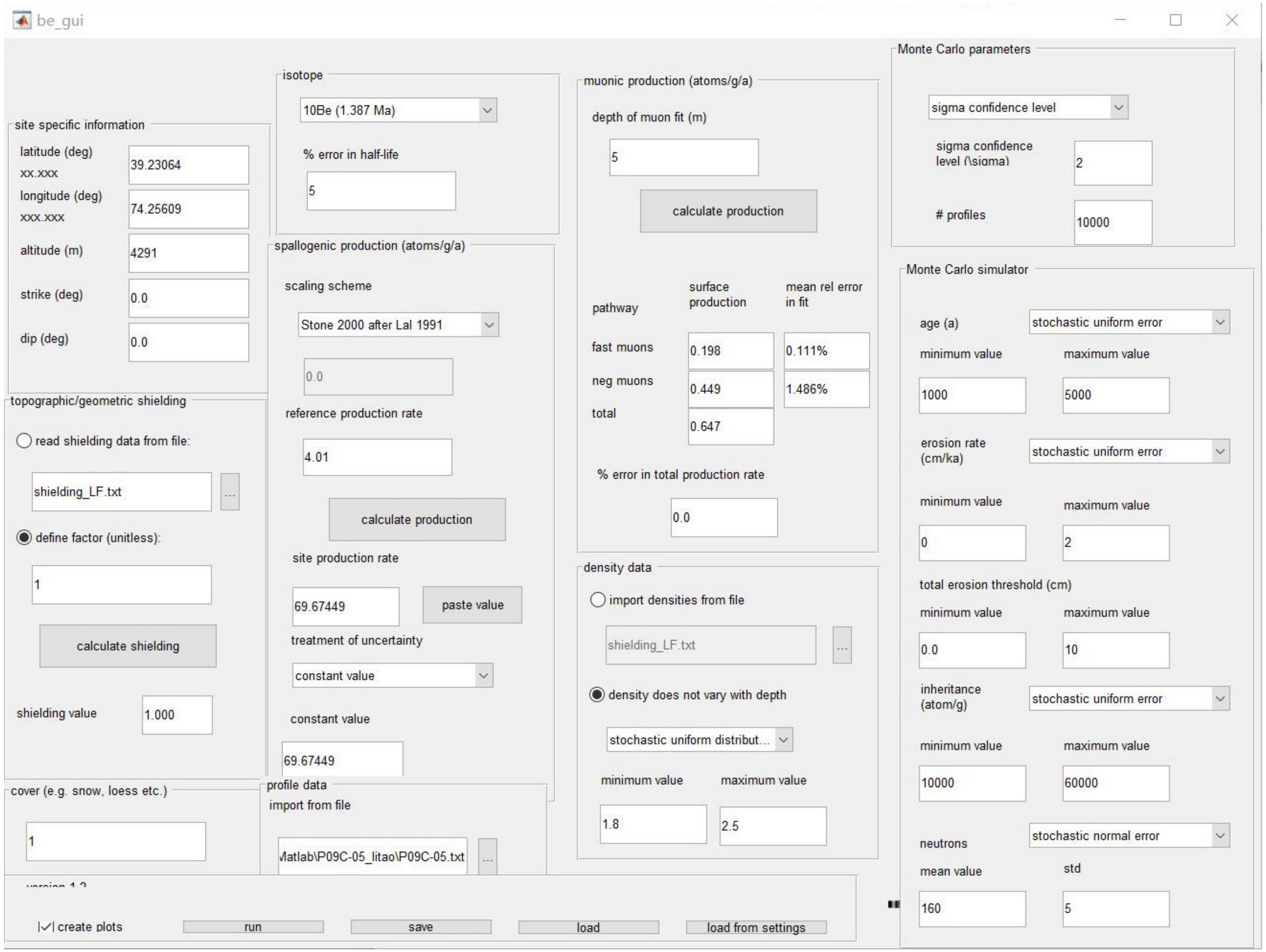

Figure S2. Parameters used in Monte Carlo modeling (Hidy et al., 2010) of depth profile samples MJ2.