Geophysical Research Abstracts
Vol. 16, EGU2014-10826, 2014
EGU General Assembly 2014

Geomorphic and palaeoseismic records of historic and prehistoric earthquakes in SE Kazakhstan

Richard Walker (1), Kanatbek Abdrakhmatov (2), Grace Campbell (3), James Hollingsworth (4), Angela Landgraf (5), David Mackenzie (1), Aidyn Mukambayev (6), and Magali Rizza (7)

(1) Department of Earth Sciences, Oxford University, Oxford, UK (richard.walker@earth.ox.ac.uk), (2) Institute of Seismology, Academy of Sciences, Bishkek, Kyrgyz Republic, (3) Bullard Laboratories, Cambridge University, Cambridge, UK, (4) GeoAzur, University Nice-Sophia Antopolis, Nice, France, (5) Institute of Earth and Environmental Science, Potsdam University, Potsdam, Germany, (6) Kazakh National Data Center, Institute of Geophysical Research, Almaty, Kazakhstan, (7) CEREGE, Aix-en-Provence, France

Instrumental catalogues of earthquakes, despite being a vital source of information for understanding active tectonics and seismic hazard, do not fully represent the distribution of seismic sources within slowly straining intra-plate settings where the interval between destructive earthquakes in a given region might be very long. The cold, relatively arid, environment of central Asia causes surface ruptures from large-magnitude earthquakes to be preserved for periods of > 1000 years, providing a more appropriate timescale over which to examine distributions of earthquakes. We identify several ruptures around SE Kazakhstan, each of which would be destructive were they to repeat at the present-day. We survey these ruptures using high-resolution optical satellite imagery and from field-based geodetic and photogrammetric methods, including the production of decimetric digital elevation models from low-altitude aerial photography.

Although it has suffered relatively few damaging earthquakes in the past 100 years Almaty, the largest city in Kazakhstan, was badly damaged by a sequence of earthquakes in 1887 (Mw 7.3), 1889 (Mw 8.3), and 1911 (Mw 8.1). The rupture of the 1911 event was mapped immediately afterwards and is still well-preserved at present. The absence of constraints on the location, size, and slip-direction of the 1889 rupture (which was not mapped following the earthquake) constitutes a fundamental gap in our understanding of the sequence. We show results from palaeoseismic investigation of a large and well-preserved rupture SE of Almaty, which is of a size compatible with it forming in a magnitude 8+ earthquake, and is likely to be from the 1889 Chilik earthquake. Another rupture, sited NE of Almaty, is likely to have formed in an unrecorded event within the last 1000 years. A lack of geomorphic evidence for cumulative displacements along both these ruptures suggests that the repeat time between events on these faults is very long, with implications for mapping sources of future seismic hazard.