MODEL OF LOWER CRUSTAL FLOW ALONG THE EASTERN TIBETAN PLATEAU: ANALYSIS OF GEOLOGICAL AND GEOPHYSICAL DATA FROM LONGMEN SHAN AND ADJACENT AREAS, WESTERN SICHUAN BASIN, CHINA

Xiao Xu

An Abstract Presented to the Faculty of the Graduate School
of Saint Louis University in Partial Fulfillment
of the Requirements for the Degree of
Master of Science (Research)
2009

Abstract

A magnitude 7.9 earthquake struck the central Longmenshan Ranges of Sichuan Province, China, on May 12, 2008, killing more than 89,000 people and destroying hundreds of thousands of buildings. One goal of my research is to understand the underlying causes of the earthquake, so this can be translated into a geohazard assessment map to give local people the ability to build communities in safer locations. Therefore, my research focuses on the underlying causes of the earthquake in this area, and whether specific zones of increased risk for future earthquakes can be identified. The first order cause of the earthquake is the uplift of the Tibetan Plateau, but the basic question is how the Tibetan Plateau uplifts, a hotly debated topic. The most important models for this question are the extrusion model and the lower crustal flow model. However, neither of these models can explain all the earthquake-related phenomena by themselves, so a new improved model is needed to solve this problem. I have collected geological and geophysical data about the research area and relate these data to what we observed in the field in the disaster area after the earthquake and to the results of remote sensing data analysis. Supported by NASA, we collected PALSAR data from before and after the earthquake. By comparing all these data, I have built a new model to explain how the Tibetan Plateau uplifts and what could happen in future earthquakes. I suggest that the lower crustal flow model in east Tibetan Plateau best explains the main mechanism which caused the May 12 2008 earthquake, but the specifics of this mechanism determines the different deformations in the Longmen Shan earthquake zone during the same earthquake.

The lower crustal flow in different regions can be represented by the faults' activities. So I can separate the Longmen Shan earthquake zone into several regions by the types, ages and locations of the faults. I present a map based on these data and models showing areas of high risk for the worst damage in future earthquakes.