

For earthquakes 'speed kills'



A box canyon on the San Andreas fault: High speed ruptures travelling along the straight section of the fault could see Santa Barbara and Los Angeles worst hit in future earthquakes. Credit: iStockphoto/William Royer.

High-speed ruptures travelling along straight fault lines could explain why some earthquakes are more destructive than others, according to an Oxford University scientist.

In this week's *Science*, Professor Shamita Das suggests that ruptures in the Earth's surface moving at 6km per second could make future earthquakes along California's San Andreas fault much more destructive than current models predict.

Professor Das compared data from the 1906 California earthquake with data from a similar earthquake that occurred in 2001 in Kunlunshan, Tibet. The comparison suggests that, in both, the long straight portions of the fault enabled ruptures to travel twice as fast as the original 'shear' wave travelling through the rock. Such 'super-shear' waves were once thought to be impossible but could now explain why similar magnitudes of earthquake can cause much greater devastation in some areas than others.

'Long straight faults are more likely to reach high rupture speeds,' said Professor Das of the Department of Earth Sciences. 'The fault starts from rest, then accelerates to the maximum permissible speed and continues at this speed until it reaches an obstacle such as a large 'bend'. If the next earthquake in southern California follows the same pattern as the ones in California in 1857 and 1906, and in Tibet in 2001, a super-shear rupture travelling southward would strongly focus shock waves on Santa Barbara and Los Angeles.'

The 2001 Kunlunshan earthquake is of particular interest to scientists because it was so well preserved owing to its remote location and dry desert environment. Studies of the earthquake revealed telltale off-fault open cracks only at the portions where it was found to have a very high rupture speed. 'These cracks confirm that the earthquake reached super-shear speeds on the long, straight section of the fault. This is the first earthquake where such direct evidence is available and it is exactly the kind of evidence that we do not have for the similar earthquake in California 1906, due to the heavy rains and rapid rebuilding that occurred there immediately afterwards.'

Professor Das believes that future research into rupture speeds could take scientists one step closer to predicting the potential impact of earthquakes in particular regions.

She commented: 'It appears that the 1857 and 1906 California earthquakes may have propagated faster than was previously thought. If this is the case then we need to apply the same analysis to other similar faults around the world. By developing a measure of the 'straightness' of faults and finding and recording evidence such as off-fault open cracks we hope to better understand these potentially devastating phenomena.' The full article, entitled 'The Need to Study Speed', is published in *Science* on 17 August 2007.

Source: University of Oxford

This document is subject to copyright. Apart from any fair dealing for the purpose of private study, research, no part may be reproduced without the written permission. The content is provided for information purposes only.