

# Mechanisms, Monitoring and Modeling Earth Fissure generation and Fault activation due to subsurface Fluid exploitation (M3EF3): A UNESCO-IGCP project in partnership with the UNESCO-IHP Working Group on Land Subsidence

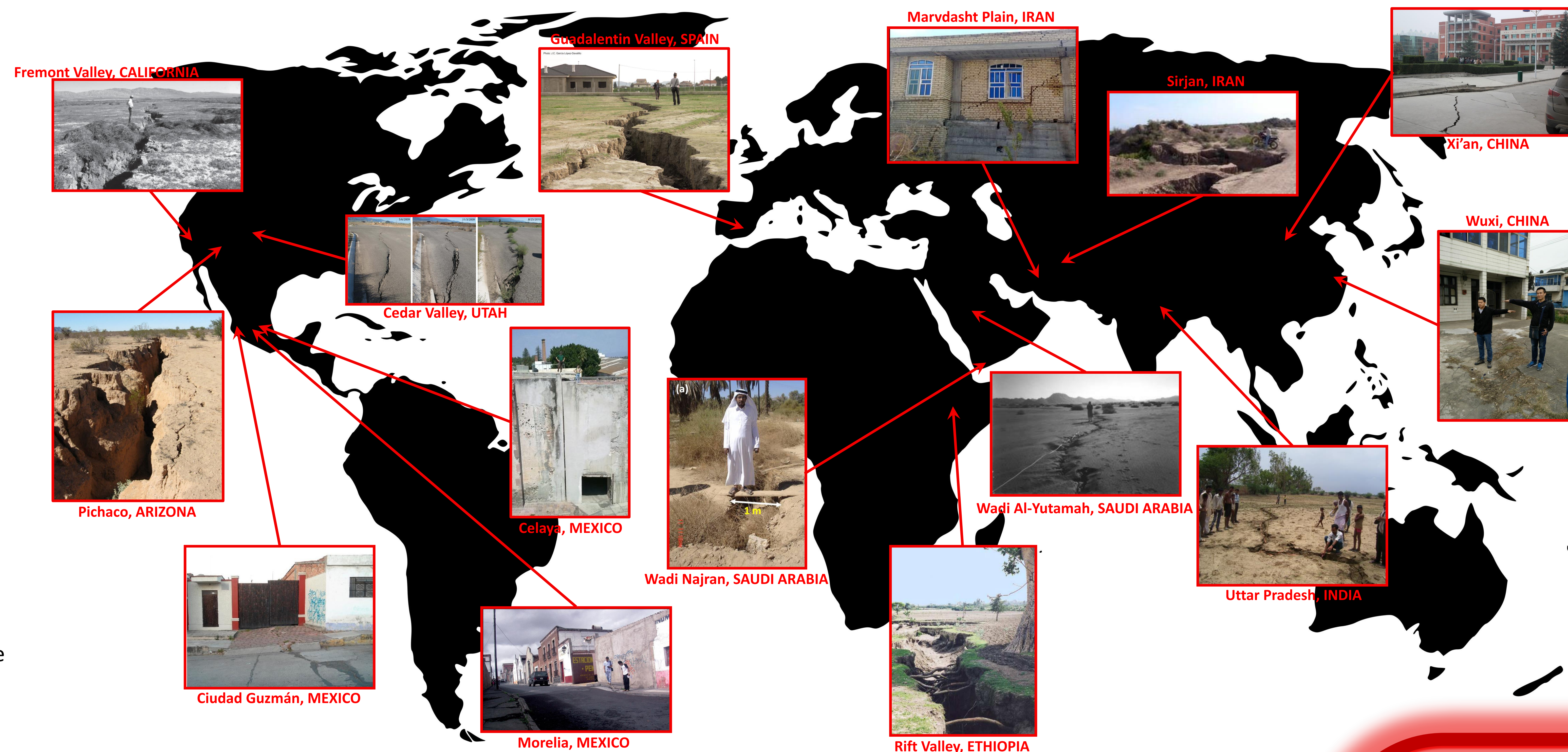
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## ABSTRACT

Ground ruptures (Earth Fissures and reactivation of pre-existing surface Faults) caused by extraction of Fluids from the subsurface (F3) have been observed in hundreds of sedimentary basins worldwide, mainly in USA and in semiarid areas of developing countries such as Mexico, China, India, Libya, Iran, Saudi Arabia. Unexpected fissure generation and fault activation associated with anthropogenic land subsidence strongly impact on the development of urban settlements, industrial centers, agricultural and other economic activities. In this IGCP641 project we propose a scientific cooperative program between institutions and researchers to improve the understanding of the processes involved in ground rupturing. M3EF3 plans to use an integrated approach made by in-situ Monitoring of surface deformation, remote sensing techniques, hydro-Mechanical laboratory characterization, and mathematical Modeling (M3).



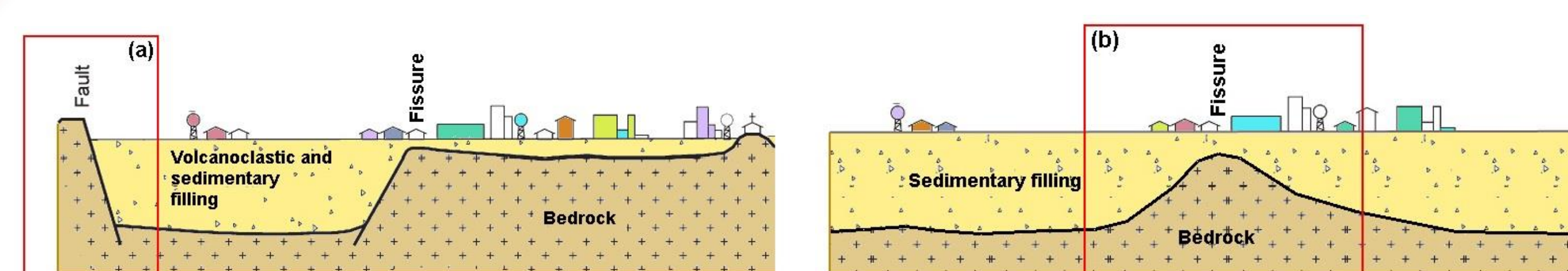
Signs warning motorists of fissure hazard

## HOW TO JOIN

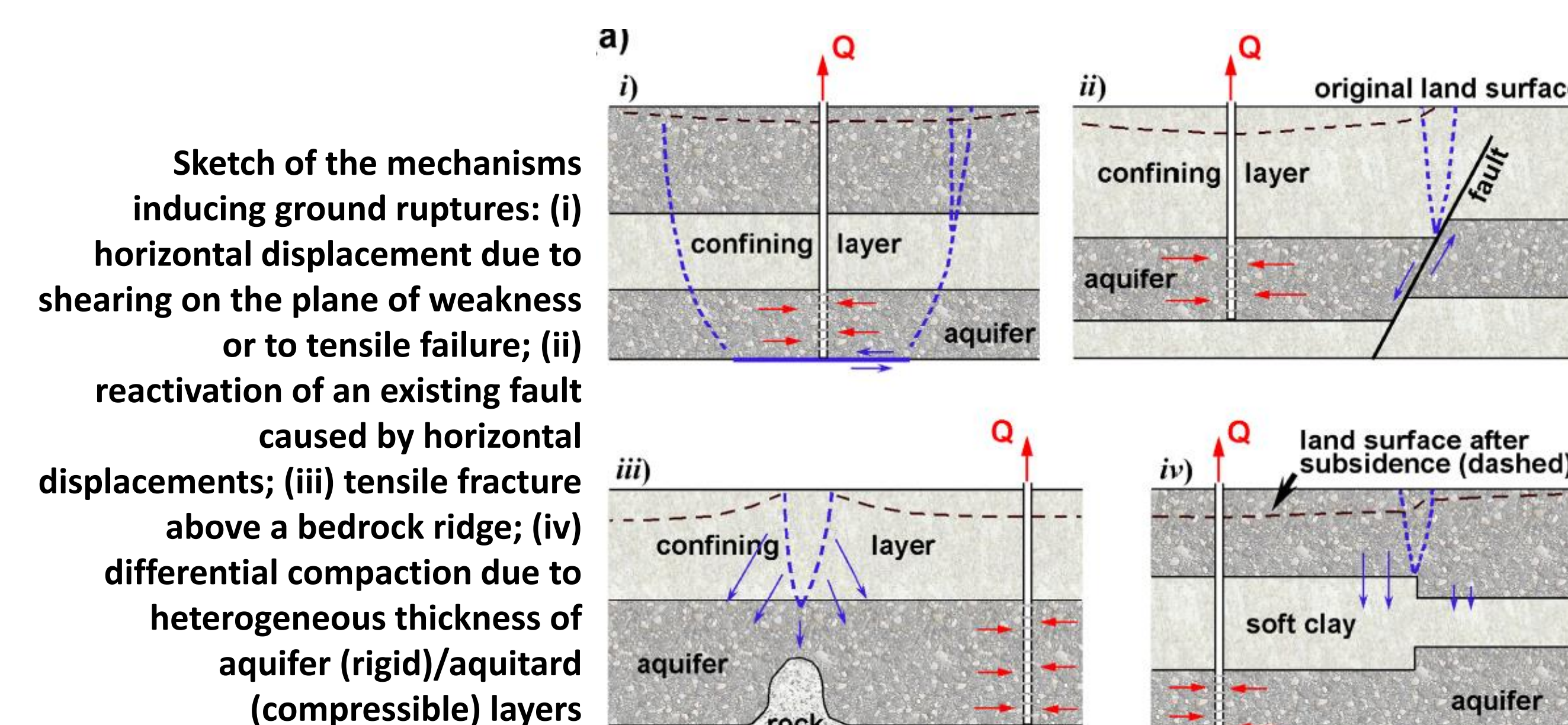


[www.igcp641.org](http://www.igcp641.org)

## MECHANISMS



Sketches of the typical geological setting ground rupture in Queretaro City (a) and Wuxi, China (b).

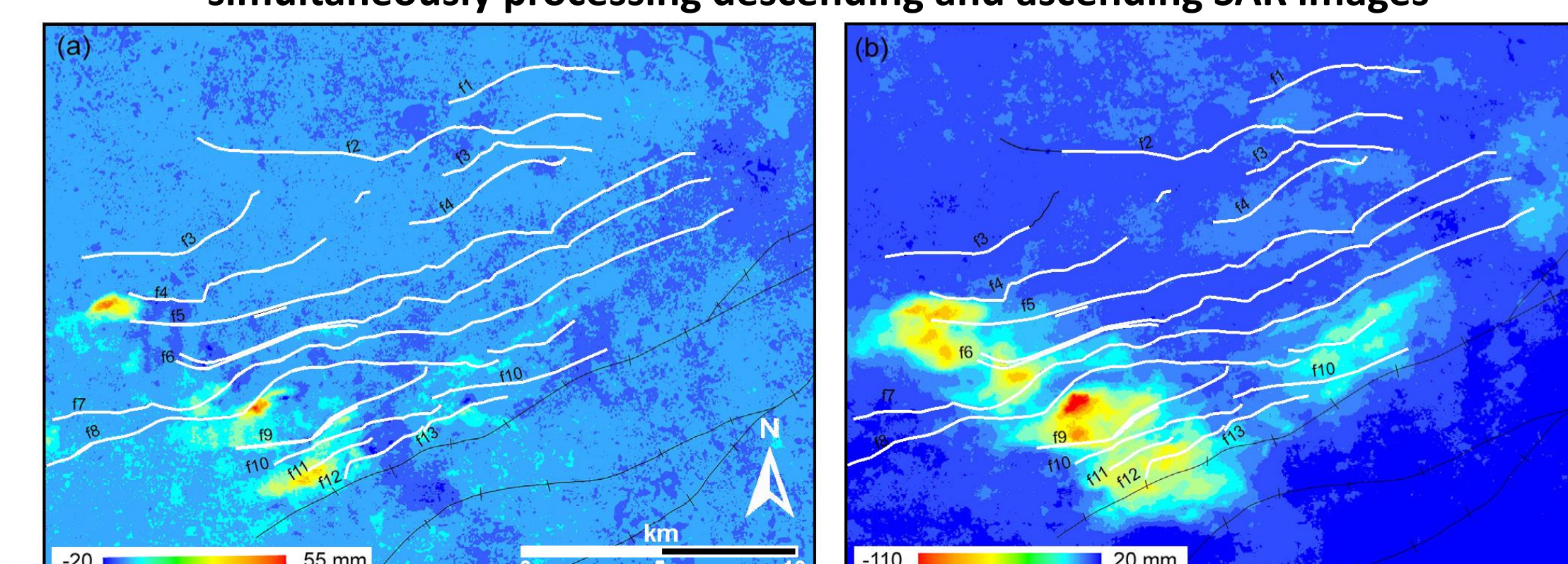


## MONITORING

Examples of ad hoc instrumentation developed to monitor opening and sliding of earth fissures or faults activated by the overdraft of aquifer resources. (left) 3-D instrumentation installed in the northern Beijing plain, China; (right) 1-D apparatus established in Iztapalapa, Mexico City



(a) West-east and (b) vertical displacements (mm) in 2009 at Xi'an, China, obtained by simultaneously processing descending and ascending SAR images



## MODELING

