"Mapping damages on infrastructure and buildings due to earthquakes: A comparison of remote sensing based methods"

Candidate: Dipl.-Ing. (FH) Christian Pauschert

Master Thesis (Jahr: 2009)**:** Mapping damages on infrastructure and buildings due to earthquakes: A comparison of remote sensing based methods

Referee: Prof. Dr.-Ing. Gertrud Schaab, Dr. Konstanze Kleinod (DLR-DFD)

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Summary

In the context of management of humanitarian crisis situations in large disaster areas due to earthquakes, earth observation is of growing importance. Against this background numerous protagonists, among them the German Remote Sensing Data Centre (DFD) within the German Aerospace Centre (DLR) with its Centre for Satellite Based Crisis Information (ZKI), are engaged in national and international project activities such as the International Charter "Space and Major Disasters" and other initiatives of the European Commission and the European Space Agency. Part of the task of the ZKI is the provision and acquisition of satellite based crisis information for example in the form of crisis maps. Users of this information are relief organisations, political decision makers, situation centres and the general public.

This thesis investigated, how remote sensing based change detection can support the mapping of damages on buildings due to earthquakes in a rapid mapping scenario within a disaster response context. The original aim of also mapping damages on infrastructure had to be amended since it turned out that the study areas do not contain enough visible damage on infrastructure to carry out a thorough testing of change detection methods with respect to their sensitivity towards changes on infrastructure. As data source very high resolution optical satellite data (IKONOS) was available in form of pre- and post-event image pairs for two study areas in Pakistan and China. After a thorough literature study that covers numerous change detection methods, focussing here on pixel-based approaches, a decision was made to implement the Hough transform and texture analysis. For implementation IDL was used. All tested approaches lead to a damage classification aggregated to rectangular grid cells. The results were validated against a visual interpretation of the satellite images. It turned out that none of the tested methods produces reliably good results under all conditions. Hence, further investigation is needed to improve the tested methods. However, the best result has been illustrated in form of a crisis map (see figure).
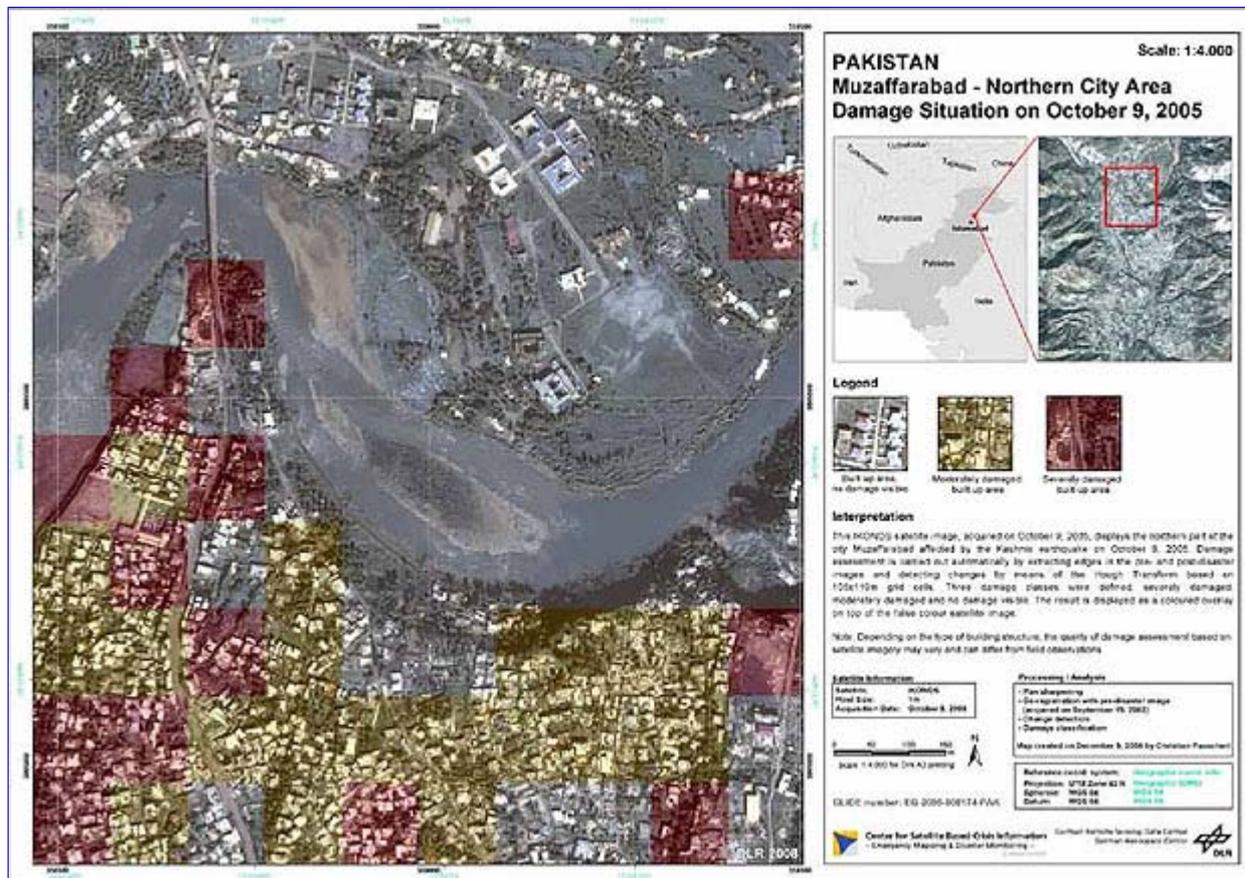
Fig.: Crisis map showing the change detection result for parts of Muzaffarabad (Pakistan) as an overlay on top of a false colour IKONOS satellite image. Severe damage is indicated in red, moderate damage in yellow.