



Employing historical CORONA satellite imagery for monitoring human impact on zones endangered by inundation, muddy floods and landslides

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Nowadays it is possible to define certain landscapes endangered by natural hazards. These areas are often located close to known natural risks, like riparian zones to the rivers or the foreland to cliffs. The observation of recent or historical hazards help to identify these regions. An interesting aspect for studies on natural hazard assessment is the knowledge about human behaviour in endangered zones. Are these zones avoided by settlement? Are settlement activities concentrated on secure sectors? Are natural risks ignored by society? Or are we even able to detect changes in human behaviour over time?

In combination with current high resolution imagery, declassified CORONA images from the early 1960s offer the opportunity to bridge more than 40 years of land cover changes. Investigations on landscape changes based on high resolution images and covering such a long period, allow even the recognition of slow processes or small scale and singular events. The detected changes and even the lack of them are important information layers for spatial planning and sustainable landscape development.

To cover variant types of natural hazard risk areas different test regions in Rhineland-Palatinate and Baden-Württemberg, prone to floods and landslides during the past decades were chosen. As images of preferably high optical and atmospheric quality are needed for this purpose, sets of images taken on September 30th 1962 by the CORONA system KH4 and for partial regions by KH4a (May 1964) set the initial date of the investigation period. Within these missions the regions investigated are

covered with a resolution of approximately 8 meters. At these two days of the years 1962 and 1964, the sight on the landscape was nearly untarnished and shadows are not too intense. Due to an acquisition time of the images from May 1964 in the morning, shadows are more significant for the steep areas of the Reutlingen region. The study was carried out by a comparison between the mentioned CORONA data set and current high-resolution images of SPOT 5 HRG (panchromatic) and ASTER VNIR sensors.

All images were geometrically corrected and geo-referenced. Additionally, the illumination was corrected for all images employing a digital elevation model to reduce the influence of terrain shadows. A standard procedure of contrast enhancement was used in order to reduce influences of terrain and position within the image. Due to the use of only panchromatic images in this study, segmentation and object-orientated methods were used for the classification. However optimal regional recording conditions for both types of images are absolutely necessary to provide satisfactory results.

The observed results show that during the last decades in these endangered zones human acting, nearly ignores the risk of natural hazards.