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3D TOPOGRAPHIC MAPPING USING TERRASAR-X ELEVATION

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The following paper describes the extraction of 1:25.000/1:50.000 topographic maps based on space borne SAR data derived from the german radar sensor TerraSAR-X. The developed mapping approach can be applied worldwide, even for small scale mapping, due to the high geometric accuracy as well as high reliability and imaging mode flexibility of data acquisition of up-to-date SAR systems. Weather independent SAR imagery for object classification and Digital Surface Models (DSM) for extracting contour lines and for geolocating topographic and man-made objects was tested in the given approach.

In the beginning, the background information for the development of the mapping process is described including a short touch on the current challenge for responsi-ble authorities and institutions all over the world, especially in tropical regions, in closing the gap between non-existing or outdated maps and up-to-date topographic maps. Furthermore, the technical background of the used TerraSAR-X StripMap data, the details of the applied image acquisition scenario as well as the processing steps from raw satellite imagery to a source data set for feature extraction is de-scribed. Here an approach based on one sensor, from the generation of a Digital Surface Model by using radargrammetric techniques, the correction of sensor based errors in the surface data and the following orthorectification of the primary TerraSAR-X StripMap data will be presented. Successionally, the derivation of a radargrammetric Digital Terrain Model (DTM) for generating contour lines that meet the requirements for the target scale of 1:25.000/1:50.000 is given. Follow-ing working steps for extracting topographic features in a combined processing in a 3D stereo working environment and the standard 2D working environment (based on TerraSAR-X StripMap data) are presented. This includes the optional use of ancillary data other than SAR. The necessary QA procedure description contains the presentation of developed tools to verify the image interpretation and technical data set quality. The visual example of a final 1:25.000 map sheet is given presented conclusivly. With a short view from the side, the special applica-tion of change detection analysis based on SAR amplitude imagery for later map updates is described as enhancement of the one sensor approach. Finally, a con-clusion and an outlook are given by presenting the future options of deriving up-to-date topographic maps from space borne SAR earth observation systems.