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Mapping gully-affected areas in the region of Taroudannt, Morocco based on Object-Based Image Analysis (OBIA)

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The need for area-wide landform mapping approaches, especially in terms of land degradation, can be ascribed to the fact that within area-wide landform mapping approaches, the (spatial) context of erosional landforms is considered by providing additional information on the physiography neighboring the distinct landform. This study presents an approach for the detection of gully-affected areas by applying object-based image analysis in the region of Taroudannt, Morocco, which is highly affected by gully erosion while simultaneously representing a major region of agro-industry with a high demand of arable land. Various sensors provide readily available high-resolution optical satellite data with a much better temporal resolution than 3D terrain data which lead to the development of an area-wide mapping approach to extract gully-affected areas using only optical satellite imagery. The classification rule-set was developed with a clear focus on virtual spatial independence within the software environment of eCognition Developer. This allows the incorporation of knowledge about the target objects under investigation. Only optical QuickBird-2 satellite data and freely-available OpenStreetMap (OSM) vector data were used as input data. The OSM vector data were incorporated in order to mask out plantations and residential areas. Optical input data are more readily available for a broad range of users compared to terrain data, which is considered to be a major advantage. The methodology additionally incorporates expert knowledge and freely-available vector data in a cyclic object-based image analysis approach. This connects the two fields of geomorphology and remote sensing.
The classification results allow conclusions on the current distribution of gullies. The results of the classification were checked against manually delineated reference data incorporating expert knowledge based on several field campaigns in the area, resulting in an overall classification accuracy of 62%. The error of omission accounts for 38% and the error of commission for 16%, respectively. Additionally, a manual assessment was carried out to assess the quality of the applied classification algorithm. The limited error of omission contributes with 23% to the overall error of omission and the limited error of commission contributes with 98% to the overall error of commission. This assessment improves the results and confirms the high quality of the developed approach for area-wide mapping of gully-affected areas in larger regions. In the field of landform mapping, the overall quality of the classification results is often assessed with more than one method to incorporate all aspects adequately.