



## **An integrated assessment of soil erosion dynamics with special emphasis on gully erosion: Case studies from South Africa and Iran**

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Soil erosion by water is a significant problem in arid and semi arid areas of large parts of Iran. Water erosion is one of the most effective phenomena that leads to decreasing soil productivity and pollution of water resources. Especially in semiarid areas like in the Mazayjan watershed in the Southwestern Fars province as well as in the Mkomazi catchment in Kwa Zulu Natal, South Africa, gully erosion contributes to the sediment dynamics in a significant way. Consequently, the intention of this research is to identify the different types of soil erosion processes acting in the area with a stochastic approach and to assess the process dynamics in an integrative way. Therefore, we applied GIS, and satellite image analysis techniques to derive input information for the numeric models. For sheet and rill erosion the Unit Stream Power-based Erosion Deposition Model (USPED) was utilized. The spatial distribution of gully erosion was assessed using a statistical approach which used three variables (stream power index, slope, and flow accumulation) to predict the spatial distribution of gullies in the study area. The eroded gully volumes were estimated for a multiple years period by fieldwork and Google Earth high resolution images as well as with structure for motion algorithm. Finally, the gully retreat rates were integrated into the USPED model. The results show that the integration of the SPI approach to quantify gully erosion with the USPED model is a suitable method to qualitatively and quantitatively assess water erosion processes in data scarce areas. The application of GIS and stochastic model approaches to spatialize the USPED model input yield valuable results for the prediction of soil erosion in the test areas. The results of this research help to develop an appropriate management of soil and water resources in the study areas.