



Automatic Extraction of High-Resolution Rainfall Series from Rainfall Strip Charts

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Soil erosion is a complex phenomenon involving the detachment and transport of soil particles, storage and runoff of rainwater, and infiltration. The relative magnitude and importance of these processes depends on a host of factors, including climate, soil, topography, cropping and land management practices among others. Most models for soil erosion or hydrological processes need an accurate storm characterization. However, this data are not always available and in some cases indirect models are generated to fill this gap. In Spain, the rain intensity data known for time periods less than 24 hours back to 1924 and many studies are limited by it. In many cases this data is stored in rainfall strip charts in the meteorological stations but haven't been transfer in a numerical form. To overcome this deficiency in the raw data a process of information extraction from large amounts of rainfall strip charts is implemented by means of computer software.

The method has been developed that largely automates the intensive-labour extraction work based on van Piggelen et al. (2011). The method consists of the following five basic steps: 1) scanning the charts to high-resolution digital images, 2) manually and visually registering relevant meta information from charts and pre-processing, 3) applying automatic curve extraction software in a batch process to determine the coordinates of cumulative rainfall lines on the images (main step), 4) post processing the curves that were not correctly determined in step 3, and 5) aggregating the cumulative rainfall in pixel coordinates to the desired time resolution. A colour detection procedure is introduced that automatically separates the background of the charts and rolls from the grid and subsequently the rainfall curve. The rainfall curve is detected by minimization of a cost function.

Some utilities have been added to improve the previous work and automates some auxiliary processes: readjust the bands properly, merge bands when those have been scanned in two parts, detect and cut the borders of bands not used (demanded by the software). Also some variations in which colour system is tried basing in HUE or RGB colour have been included.

Thanks to apply this digitization rainfall strip charts 209 station-years of three locations in the centre of Spain have been transformed to long-term rainfall time series with 5-min resolution.

References

van Piggelen, H.E., T. Brandsma, H. Manders, and J. F. Lichtenauer, 2011: Automatic Curve Extraction for Digitizing Rainfall Strip Charts. *J. Atmos. Oceanic Technol.*, 28, 891–906.

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