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Rainfall erosivity in New Zealand

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Rainfall and its kinetic energy expressed by the rainfall erosivity is the main driver of soil erosion processes by water. The Rainfall-Runoff Erosivity Factor (R) of the Revised Universal Soil Loss Equation is one oft he most widely used parameters describing rainfall erosivity. This factor includes the cumulative effects of the many moderate-sized storms as well as the effects oft he occasional severe ones: R quantifies the effect of raindrop impact and reflects the amopunt and rate of runoff associated with the rain.
New Zealand is geologically young and not comparable with any other country in the world. Inordinately high rainfall and strong prevailing winds are New Zealand's dominant climatic features. Annual rainfall up to 15000 mm, steep slopes, small catchments and earthquakes are the perfect basis for a high rate of natural and accelerated erosion. Due to the multifacted landscape of New Zealand its location as island between the Pacific and the Tasmanian Sea there is a high gradient in precipitation between North and South Island as well as between West and East Coast.
The objective of this study was to determine the R-factor for the different climatic regions in New Zealand, in order to create a rainfall erosivity map. We used rainfall data (breakpoint data in 10-min intervals) from 34 gauging stations for the calcuation of the rainfall erosivity. 15 stations were located on the North Island and 19 stations on the South Island. From these stations, a total of 397 station years with 12710 rainstorms were analyzed. The kinetic energy for each rainfall event was calculated based on the equation by Brown and Foster (1987), using the breakpoint precipitation data for each storm.
On average, a mean annual precipitation of 1357 mm was obtained from the 15 observed stations on the North Island. Rainfall distribution throughout the year is relatively even with 22-24% of annual rainfall occurring in spring , fall and winter and 31% in summer. On the South Island the mean annual rainfall amounts to 2027 mm and therefore is higher than on the North Island. A high east-to-west gradient can be seen with the lowest rainfall along the east coast and in Inland and the highest values in the Souther Alps. The temporal variation throughout the year is very low. In each season between 24 (winter) and 26% (summer) of precipitation is observed.
Like the precipitation P the range of rainfall erosivity R varies greatly and is higher on the South Island than on the North Island. The results show that precipitation between 720 (Napier) and 2730 mm.a-1 (Mt. Ruapehu) delivered R-factors between 477 and 3592 MJ.mm.ha-1.h-1. For 14 stations a good regression between rainfall and R was obtained. On the South Island corresponding mean annual rainfall between of 429 and 4300 mm produces erosivities between 252 and 10850 MJ.mm.ha-1.h-1. Again lowest R-factors occur in Inland South Island around Alexandra which is also the driest region of New Zealand. Highest values are found in the Southern Alps and the West Coast between Arthur′s Pass and Fjordland. Based on the erosivity calculations the nine climatic regions can be aggregated into four erosivity regions.