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Stream Power determination along of a basin: First trial in the Chancay-Lambayeque basin.

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The Peruvian coast is one of the driest in the world, but it is continuously affected by extraordinary rains associated with El Niño and/or La Niña phenomenon. During these periods of intense rainfall, high flow rates are registered and gravitational processes are reported along the valleys, such as: landslides, debris flow, rock falls, avalanches, among others.

This work presents the first estimation of the Stream Power, relationship between the energy, the flow, the slope of the channel and the density of the flow of the Chancay - Lambayeque basin, with the objective of determining the energy of the main rivers in the basin and relating with gravitational processes and damage to infrastructures.

We use two softwares: LSDTopoTools and ArcSWAT (version for ArcGIS 10.6). Using high resolution Digital Elevation Models (Alos Palsar, 12.5 m) we delimit the basin, its drainage area, water network and slope using LSDTopoTools. Subsequently, we use the SWAT program.

First, the sub-basins were delimited. Second, the Hydrological Response Units (HRU) were obtained, applying the Land Use data and the FAO base guide on soil types updated by the Ministry of Agriculture and Irrigation of Peru (MINAGRI). Third, we process data on temperature, wind speed, humidity, solar radiation and rainfall from 1970 - 2018 from five meteorological stations distributed in the study basin, whose data were provided by the National Meteorology and Hydrology Service of Peru (SENAMHI). Next, we include in the analyzes the flow data from the Tinajones reservoir (6° 38' S, 79° 29' W). Finally, the annual flow rates (Hm³/s) were simulated and adjusted using SWATCup.

The results show an average flow for the year 2018 that varies from 13 Hm³/s - 49 Hm³/s. This means that the Stream Power varies from 1.3×10^{12} Kw - 4.8×10^{12} Kw, the maximum power coinciding with the location of the Tinajones reservoir in the middle basin.

These results have allowed us to identify that 73% of the critical zones (zones with presence of gravitational processes) are in the sections where the rivers register high Stream Power; and in the same way in these sections geological dangers predominate such as flows and rock falls. In addition, infrastructures were located that may be susceptible to being damaged (e.g. three bridges, where flows range between ~22-35 Hm³/s) and/or may compromise the health of the

inhabitants (e.g. five mining deposits located along the basin, considered high risk).

And to conclude, because the Tinajones reservoir is reaching its maximum capacity, a possible area was identified where a new reservoir can be housed (complying with all technical conditions), whose location would be 20 km to the east, in the province of Chumbil Alto (Cajamarca - Peru).