

Correlation between temperature and streamflow of the Mameyes River (1994 and 2015)



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Abstract

There are many factors affecting a river's streamflow, mainly the precipitation, but can it be the same with the temperature? Throughout the comparison of databases (recollected from the Mameyes River, El Yunque, by the Luquillo Critical Zone Observatory in 1994 and 2015) it could be established that there exists no correlation between temperature and the streamflow.

Introduction

The Luquillo LTER/CZO Schoolyard Data Jam is an accessible database that provides information from the El Yunque National Forest. The ecological data collected by the Luquillo Critical Zone Observatory, in the 1994 and 2015, is going to be used as the principal source for the following investigation. El Yunque is a tropical forest with an average temperature of 73° F (USDA). It plays an important role as the source for many rivers from which is founded the Mameyes River. The Mameyes River covers a total of 15.6 square miles, and a 10.4% (6.88mi²) of the forest. It presents a subtropical and very humid climate having an annual average rainfall of 125 inches that have reached 175 inches per year, in the highest point of the El Yunque.

Patterns

- The temperature in 1994 and 2015 prevailed constant, almost equal in both years.
- The Mameyes River Streamflow was very similar in the different years, having its higher peaks within the months of February and March.
- In 2015, the streamflow's pattern varied from the one of 1994 by presenting higher values in January, and also from September to November.
- In 1994, the streamflow's pattern in December reached a value of 297 CFS, while in 2015 it reached a top of 113 CFS.

Problem and Hypothesis

Streamflow is defined as the volume of water flowing past a given point in the stream in a given period of time (USGS). The streamflow is constantly changing because of many factors such as weather, seasonal changes, the structure of the river bank, and the human itself, among others, but the main influence is the precipitation.

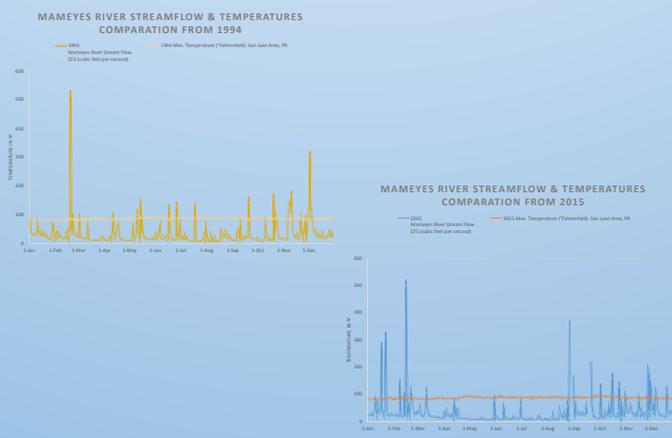
Temperature is defined as the movement of the particles, with a tendency of faster movements with higher temperatures, and moderate movements at lower temperatures. It is known that there exists a direct relation between the amount of precipitation and the measurements of streamflow, but the question is: does there exist a correlation between temperature and the streamflow?

Hypothesis: The temperature and the streamflow will show a pattern of correlation, as the temperature increase, the volume of water in the stream will be higher.

Interpretation of the Data

The streamflow measurements present that the values prevailed throughout the years, but in comparison with the temperature, they experimented more changes. The months of higher temperatures in both years were February and March (with 509 and 495 CFS). In the streamflow, the most notorious difference between the years is found in the month of January of 2015, with a value of 305 CFS, while in 1994 the highest value was of 73 CFS. If it is observed more closely, in both years, in the months of September to November exists a relation of opposition; in 1994, the numbers increase while in 2015 decrease. These findings match with the ones of many other investigations concluding that the feedback of climate change and variability on the hydrological cycle is highly nonlinear, which means that temperature and the streamflow's measurements aren't correlated.

Graphics



Dissemination Plan

Art occupies a great part of my life being writing one of its principal aspects. For such reason, I decided to write a story for kids, but not any kind of it, one that involved our roots and origins. "Aquionex y la diosa del Yuqué" is a short story that narrates the magical encounter between Aquionex, a taíno warrior, and the goddess of water, the streamflow. When interacting, Aquionex gets to know who is she, what factors affects her, and the values of their habitat, El Yunque.

More than being an entertaining piece, it has an educational value, introducing scientific and cultural themes that are explained in such way that allows an easy understanding for the public. The story's purpose? To inform the non-scientific community and to create awareness of the importance of preserving El Yunque National Forest.

Reflection

During this short but hard process, I can finally say that it is a really gratifying experience. Personally, I have a great problem in achieving to synthesize an idea or an answer. For such reason, I say that the project itself was a huge challenge.

The funniest part was all that time spent in the library, with my classmates and teacher, in which everyone kept telling me: "Come on, you can do it! You have to, unless you want to receive an F in class!" And so on...

More than a good grade or maybe acknowledgments, I gained so many other beautiful things: skills, scientific knowledge, sensitivity and sympathy toward the topic, the ability to manage databases, and many experiences with the group where love, unity and fellowship were always present, and increased.

Projections

- Search how is it that, having a difference of 21 years between 1994 and 2015, the values and measurements of temperature and streamflow remained alike. What causes this?
- Look for the point in which temperature and the measurements of the streamflow collides

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