HIGH SPATIAL RESOLUTION ATLAS FOR ECOLOGICAL MONITORING IN FRENCH GUIANA

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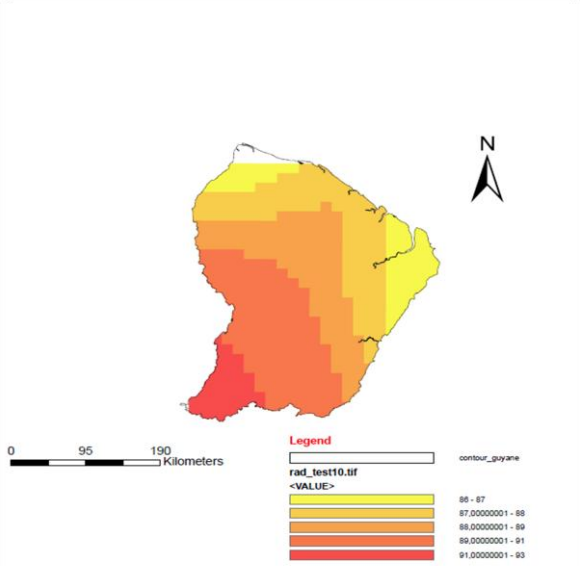
It is generally well accepted that climatic variables dynamics have a significant impact on ecosystems. Variation of temperature, precipitation, downward irradiance, etc… affect tropical ecosystems resulting in changes in forest productivity, water availability, geographic distribution of specific species, proliferation of diseases, etc…
To understand how climatic variables affect tropical ecosystem there is a need to develop ecological monitoring. Ecological monitoring provides the information needed to assess ecosystem changes. This information can be used to develop appropriate strategies to mitigate, adapt and respond to environmental pressures. However these applications require special attention to the climatic variables dynamics at a local level but also at a regional scale.

Among available climatic variables, ground stations offer precise (in time and space) but often scarce and heterogeneous information due to their geographical repartition. Sensor satellite-based data provide information over a large area, but with a limited spatial resolution.

The purpose of this study is to develop a method for creating high spatial resolution atlas of climatic variables by calibrating the satellite-based databases using the available ground stations. The idea is to exploit the advantages of both the satellite-based databases and the in situ ground data.
To achieve this goal, thin plate smoothing spline interpolation as implemented in ANUSPLIN software is used to generate spatial models. Digital elevation model is used as an independent variable and multiple regression analysis are used to add dependent variables.



Map of monthly mean global solar irradiation for October 2010. From in situ ground station data.

The first stage of this project focuses on downward shortwave radiation in French Guiana. A new spatial model of global solar irradiation has been developed for all of French Guiana and used to generate a solar irradiation atlas at spatial resolution of 0.01°. The inclusion of monthly mean precipitation and digital elevation model enhances the model and map quality. The errors of prediction of the model are evaluated using fundamental statistical parameters such as mean absolute error, root mean square error, variance of errors, etc.

The efficiency of this procedure shows the value of using spline interpolation for calibrating satellite-based databases using available ground stations. Further work is underway to improve the knowledge of other climatic variables dynamics in Guianas at a high spatial resolution with this procedure.