



Combining TRMM3B42 database with observations over complex terrain

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1. Introduction

Precipitation description is complicated due to its nature i.e. small scale variability and highly nonnormal statistical behavior (Huffman et al. 2007). Globally there are three methods to attain knowledge about precipitation: observations, indirect estimations, and reanalysis. To use the raingauges it needs to be converted to area means through optimal interpolation methods, the results depend upon the network's density and the gauge representativeness, however over the South American continent the spatial distribution of raingauges is not homogeneous.

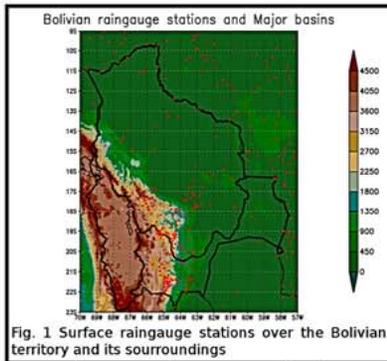


Fig. 1 Surface rain gauge stations over the Bolivian territory and its surroundings

CFSR, on the other hand, depicts the general pattern: large precipitation values along the Andes' northeastern facing slopes, however a maxima is found in front of the mountain range. Precipitation over the Amazon basin is more widespread than

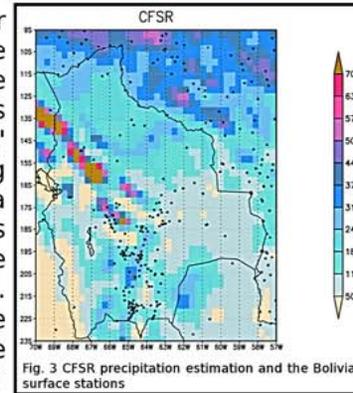


Fig. 3 CFSR precipitation estimation and the Bolivian surface stations

MERRA's description. Also the driest regions (southern Altiplano and the Chaco) are less homogeneous. Moreover, CFSR depicts several dry regions where the steepest gradients are found close to the two mountain ranges (Cordilleras). It is very likely that many of the surface stations are not included neither MERRA nor CFSR reanalysis datasets.

Surface observations lack of representativeness and adequate density, the following approach are the satellite based estimation methods, in this case the TRMM3B42 is used to study

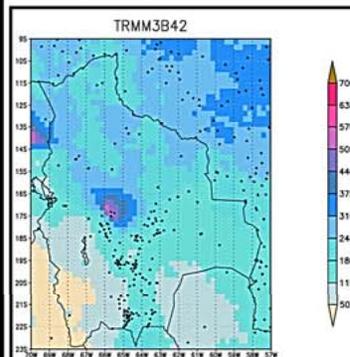


Fig. 4 TRMM3B42 precipitation estimation algorithm

rainfall. A precipitation maxima over the Chapare region, the Pantanal, the southeastern facing slopes, and the northern Altiplano receives the same amounts of precipitation, also there is a north-south precipitation gradient

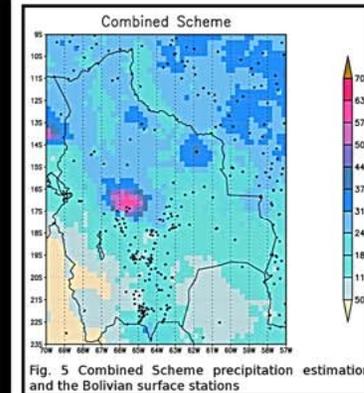


Fig. 5 Combined Scheme precipitation estimation and the Bolivian surface stations

Satellite estimations are known to suffer biases, to remove those biases Vila et al, (2009) developed an scheme to combine raingauges and precipitation estimations. The impact of surface observations is clear, precipitation gradient along the

Altiplano, the maxima over the Chapare region is better depicted, moreover certain stations over northeastern Amazonia help to ameliorate the knowledge of rainfall amounts. Over southern Bolivia it is also clear the improvement of stations to describe better the areas that receive moisture influx and the areas where, due to the topography the moisture influx is blocked.

2. Precipitation Description

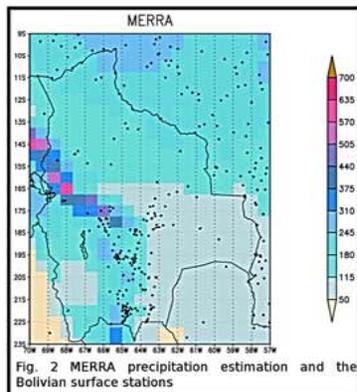


Fig. 2 MERRA precipitation estimation and the Bolivian surface stations

Geomorphology sets precipitation spatial characteristics, the low lands receive more than the highlands, the presence and Andes' orientation generates orographic precipitation. MERRA finds that the highest precipitation values are found along the Andes' northeastern facing

slopes close to the Titicaca lake. The southeastern region (the Chaco) together with Southern Altiplano receives few precipitation

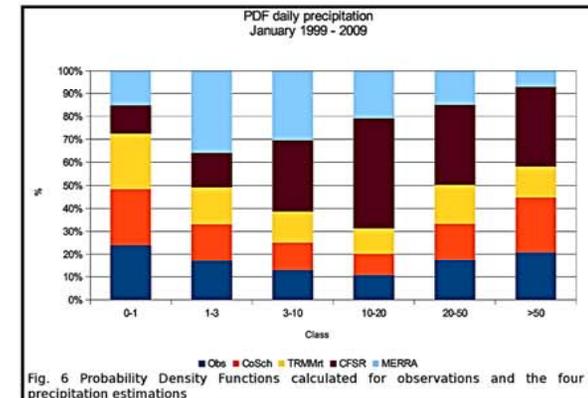


Fig. 6 Probability Density Functions calculated for observations and the four precipitation estimations

Finally, a statistical comparison was performed by dividing in types events. Observations, TRMM3B42, and CoSch present similar behavior, while CFSR and MERRA present strenghts and weaknesses.