Block motion model in Colombia, using GNSS Observation network (GEORED)

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Introduction
Colombia is located at the boundary between South-America plate, Nazca Plate and Caribrian plate. This region is very complexes such as subducting Caribrian plate and Nazca plate, and collision between Panama and northern part of the Andes mountains. Although, the effect of subducted Caribrian plate is not clear, the previous large earthquakes occurred along the subducting boundary of Nazca plate, such as 1906 (M8.8) and 1979 (M8.2). These previous earthquakes caused huge damage to life infrastructure and also lost the life along the subduction zone. And also, earthquakes occurred inland, too. So, it is important to evaluate earthquake potentials for preparing huge damage due to large earthquake in near future.

GNSS observation
In the last decade, the GNSS observation was developed in Columbia. The GNSS observation is called by GEORED, which is operated by servicing Geologico Colomiano. The purpose of GEORED is research of crustal deformation. The number of GNSS site of GEORED is consist of 93 continuous GNSS observation site at 2016. The number of GEORED's GNSS site is increasing now. The sampling interval of almost GNSS site is 30 seconds, a part of GEORED is 1 second of sampling interval. In addition, there are campaign type of GNSS observations around the main active faults. A part of campaign type of GNSS observation was started at 1990's. These GNSS data were processed by PPP processing using GIPSY-OASYS II software. GEORED can obtain the detailed crustal deformation map in whole Colombia.

Method
We developed a crustal block movements model based on crustal deformation derived from GNSS observation. Our model considers to the block motion with pole location and angular velocity and the interplate coupling between each block boundaries, including subduction between the South-American plate and the Nazca plate. And also, our approach of estimation of crustal block motion and coefficient of interplate coupling are based on MCMC method. The estimated each parameter is obtained probably density function (PDF). This definition of crustal block model is evaluated by Akaike's information criteria (AIC).

Result
We tested 11 crustal block models based on geological data, such as active fault trace at surface. The optimal number of crustal blocks is 11 for based on geological and geodetic data. These results obtained rigid block motion model with linear problem. This model selection is based on AIC, which based on the number of parameters and residual between calculation and observation. In this presentation, we will discuss spatial interplate coupling ratio and also earthquake potential at inland faults.

Keywords: crustal block model, GNSS

