

A GEOLOGICAL AND NUMERICAL MODEL OF THE ALID GEOTHERMAL SYSTEM, ERITREA

East Africa region represents one of the major World Geothermal Province as it hosts an important tectonic context: the East African Rift System. This structure is characterized by a thinned continental crust and defines three main arms: the Red Sea Rift, the Gulf of Aden Rift and the East African Rift. As a considerable portion of the State of Eritrea is located within the last one, it is believed that the country is well endowed with geothermal resources.

The awareness of the importance of the Eritrean geothermal potential is demonstrated by the efforts that have been carried out in the past years to assess the resources. Many geological, hydrogeological, geophysical and geochemical studies have been carried out and different sites of the country have been outlined as high potential for geothermal energy production.

The energy supply is one of the main problems of Eritrea, where in the past decade energy consumption increased exponentially. Prevision of future energy demand shows that this trend will prosecute, according to the Eritrean economic development. However, at present, a substantial part of the electric energy consumption is obtained from high-costs imported oil combustion.

The development of geothermal resource to produce electrical energy might represent the best alternative to the exploitation of not-renewable resources. Geothermal energy can be a response to satisfy the increasing energy demand and aid the country development. For this reason, the government has given priority to this sector and investigation is still commencing. The tectonic setting and geological make-up of the southern coastal zone of Eritrea shows that it has good potential for the development of a geothermal power plant.

The need for detailed exploration and the high cost and risk of exploratory drilling have prevented the exploitation of this indigenous and environmentally friendly energy source. In order to overcome the financial and technical risks involved, the proper solution is to elaborate a scientific and complete feasibility study on the resource, based on multidisciplinary approach.

The aims of this project are to develop a specific knowledge of the geothermal reservoir in order to define properly its potential, to assure the sustainability and renewability of the resource and to reduce the mining risks of geothermal exploration.

The first phase of the project plan to process and analyze images collected by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), focusing on the Alid region. Attributes to search for with TIR (Thermal Infrared) remote sensing are related to high heat flow anomalies, excess vertical temperature gradients, and surface thermal manifestations. Some surface features above geothermal reservoirs are obviously hot, such as geysers, hot springs, fumaroles, and mud pools.

After that, an accurate numerical model, based on specific codes, will define the geothermal basins characteristics and exploitation possibilities.

The PhD project foresees the participation in a European project under preparation (Call of September 2014) on the line Geothermal Risk Mitigation Facility for Eastern Africa, in collaboration with the Eritrean government and the CNR-IGG of Florence (Italy), and with the support of the Delegation of the European Union to the State of Eritrea.