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Assessing geo-hydrological hazards with Remote sensing data in Antananarivo (Madagascar) historical center

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Landslides represent a major threat in Madagascar, especially in the central and eastern regions during the rainy season (from November thru May), when heavy rains from tropical storms and cyclones saturate the soil making mountains and hillsides more susceptible to slope instability phenomena. The capital Antananarivo has been particularly affected by geo-hydrological risks in the last years, with special regards to the March 2015 event, when cyclones triggered diffuse flooding and landslides causing damages, casualties and over 20000 evacuees. Antananarivo area is characterized by the most important historical and cultural heritages in Madagascar, such as the ancient fortifications and palaces at Ambohimanga (located just 20 km north of the town area), protected as an UNESCO World Heritage site since 2001, and the Rova of Antananarivo royal palace complex. Antananarivo was called Analamanga (the "blue forest"), until 1610, when the merina King Andrianjaka built his palace on the highest hill of the city, and built the first Rova (meaning "fort" in Malagasy) to post a garrison of 1000 man. Antananarivo developed from the site of the first Rova at the top of Analamanga hill at about 1480 m a.s.l., becoming the current historical core (the Upper town or the "Haute Ville"), gradually spreading over the whole Analamanga hill slopes (Middle town or the "Ville Moyen").

In October 2017, a geo-hydrological hazard mapping was performed in the Upper Town by combining field surveys, remote sensing and geomatic data analysis. The output of the performed activities consisted in the creation of a detailed geodatabase, which by means of geomatics methods was integrated with field data, topographic data, high resolution digital terrain models (2 and 1 m spatial resolution), very high resolution optical satellite images (Pleiades-1A with 0.5 m resolution) and homogenized in a Geographic Information System (GIS). This geodatabase represents a fundamental tool for susceptibility, hazard and risk assessment/management activities to be performed in the Antananarivo hill area for a proper management of its cultural and historical heritages.