# Importance of recent extreme weather variation in Djibouti and need for impact quantification

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## Introduction

In recent decades, East Africa has suffered from a long and slow rainfall deterioration.

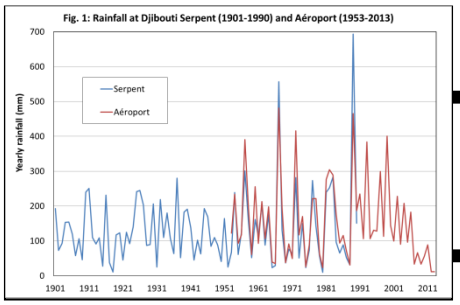
From 2007 to 2011, Djibouti city has registered a deficit of 73% of annual rainfall compared to the 30-year (1981-2010) average [1].

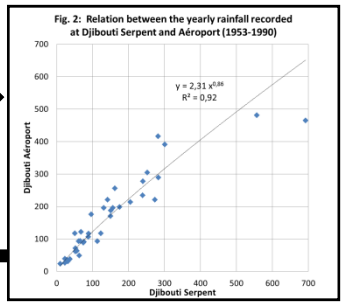
To characterize the current drought, we analyze a reconstructed rainfall series for Djibouti City from 1901 to 2013, field data allows us to illustrate the impact of these rainfall variations.

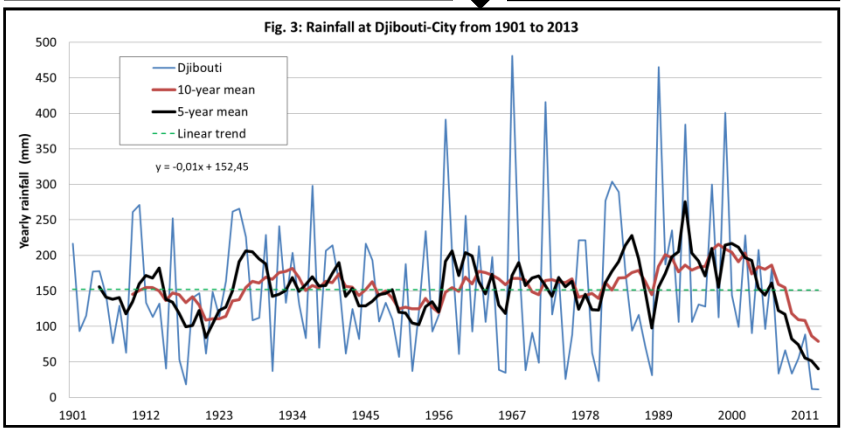
## Data and methods

We have restored two historic rainfall series in Djibouti City: a] Djibouti Serpent (1901-1990) and b] Djibouti Airport (1953-2013) (Fig. 1). The two stations are separated by a distance of 5 km. The common period has established a relationship between the two series (Fig. 2). The simple use of 5-year and 10-year smoothed averages allows us to appreciate the uniqueness of the current drought (Fig. 3).

Exchanges with numerous representatives of local, national, and international agencies have allowed us to develop an initial list of current and future impacts of the rainfall changes. We present here one sole example from the drought impact: the informal settlement of Buldhuqo (Fig. 4).




## Conclusion

**This analysis shows that the current rainfall deficit is exceptional and historically unique. The significant population migration induced by the drought to Djibouti city must be supervised, especially during their spontaneous settling. This presented example confirms that current rainfall shortages and increasing temperature extremes are impacting local people who urgently need adaptation and DRR strategies. It is necessary to reduce exposure to hydrological risks of these affected populations, in order that victims of the drought are not carried away by a rainfall excess.**


**Fig. 4**: Satellite images [*Google Earth*] presenting the city of Djibouti, the neighborhood of Buldhuqo (2004, 2009 et 2012) and field photographs taken at Buldhuqo on January 23, 2014 (P. Ozer).

## Results

Recorded precipitation at Djibouti do not present any specific long term (1901-2013) trend (Fig. 3). However, recent decades show large rainfall variability. Yet the 10-year average rainfall is at its maximum in 1998 (215 mm) and at its minimum in 2013 (79 mm). Since 2007, yearly rainfall are always below 100 mm. It is clearly this succession of (very) dry years that causes problems in terms of adaptation and resilience.

This dramatic drought, a climatically induced environmental disaster, is currently displacing a large number of families from rural zones (from Djibouti, Ethiopia and Somalia) towards the city of Djibouti where new neighborhoods are appearing, such as Buldhuqo (Fig. 4). Totally non-existent in 2004, this area was erected after 2009. Latest arrivals settle in the streambed of the wadi currently dry, but which was flooded in 2004 and 2009 due to short but intense rain. At the next extreme rainfall, the exposure of these precarious populations to hydrological risk will be highest.

**Reference**: [1] Ozer, P, & Mahamoud, A. (2013). Recent extreme precipitation and temperature changes in Djibouti City (1966-2011). *Journal of Climatology*, Article ID 928501, 8 p.