



Indices for daily temperature and precipitation based on quality controlled and homogenized data in Madagascar

Luc Yannick Andréas Randriamarolaza¹, Enric Aguilar¹, and Oleg Skrynyk^{1,2}

¹Universitat Rovira i Virgili, Center for Climate Change (C3), Spain (lucyannickandreas.randriamarolaza@urv.cat)

²Ukrainian Hydrometeorological Institute, Kyiv, Ukraine

Madagascar is an Island in Western Indian Ocean Region. It is mainly exposed to the easterly trade winds and has a rugged topography, which promote different local climates and biodiversity. Climate change inflicts a challenge on Madagascar socio-economic activities. However, Madagascar has low density station and sparse networks on observational weather stations to detect changes in climate. On average, one station covers more than 20 000 km² and closer neighbor stations are less correlated. Previous studies have demonstrated the changes on Madagascar climate, but this paper contributes and enhances the approach to assess the quality control and homogeneity of Madagascar daily climate data before developing climate indices over 1950 – 2018 on 28 synoptic stations. Daily climate data of minimum and maximum temperature and precipitation are exploited.

Firstly, the quality of daily climate data is controlled by INQC developed and maintained by Center for Climate Change (C3) of Rovira i Virgili University, Spain. It ascertains and improves error detections by using six flag categories. Most errors detected are due to digitalization and measurement.

Secondly, daily quality controlled data are homogenized by using CLIMATOL. It uses relative homogenization methods, chooses candidate reference series automatically and infills the missing data in the original data. It has ability to manage low density stations and low inter-station correlations and is tolerable for missing data. Monthly break points are detected by CLIMATOL and used to split daily climate data to be homogenized.

Finally, climate indices are calculated by using CLIMIND package which is developed by INDECIS* project. Compared to previous works done, data period is updated to 10 years before and after and 15 new climate indices mostly related to extremes are computed. On temperature, significant increasing and decreasing decade trends of day-to-day and extreme temperature ranges are important in western and eastern areas respectively. On average decade trends of temperature extremes, significant increasing of daily minimum temperature is greater than daily maximum temperature. Many stations indicate significant decreasing in very cold nights than significant increasing in very warm days. Their trends are almost 1 day per decade over 1950 – 2018. Warming is mainly felt during nighttime and daytime in Oriental and Occidental parts respectively. In contrast, central uplands are warming all the time but tropical nights do not appear yet. On

rainfall, no major significant findings are found but intense precipitation might be possible at central uplands due to shortening of longest wet period and occurrence of heavy precipitation. However, no influence detected on total precipitation which is still decreasing over 1950 - 2018. Future works focus on merging of relative homogenization methodologies to ameliorate the results.

*INDECIS is a part of ERA4CS, an ERA-NET initiated by JPI Climate, and funded by FORMAS (SE), DLR (DE), BMWF (AT), IFD (DK), MINECO (ES), ANR (FR) with co-funding by the European Union (Grant 690462).