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GIANLUCA LENTINI (*), PAOLO CRISTOFANELLI (**), ROCCO DUCHI (**), ANGELA MARINONI (**), GIANPIETRO VERZA (*), ELISA VUILLERMOZ (*), ROBERTA TOFFOLON (*) & PAOLO BONASONI (*/**)

MOUNT RWENZORI (4750 M A.S.L., UGANDA): METEOROLOGICAL CHARACTERIZATION AND AIR-MASS TRANSPORT ANALYSIS

ABSTRACT: LENTINI G., CRISTOFANELLI P., DUCHI R., MARINONI A., VERZA G., VUILLERMOZ E., TOFFOLON R. & BONASONI P., *Mount Rwenzori (4750 m a.s.l., Uganda): meteorological characterization and Air-Mass transport analysis.* (IT ISSN 0391-9838, 2011).

The meteorological conditions at Mount Rwenzori (RWZ), in Western Uganda, are explored by analysing meteorological observations carried out during the years 2006-2009 by an Automatic Weather Station (AWS) installed at 4750 m a.s.l. in the eastern part of the Mount Stanley (0° 22' N and 29° 52' E), the most extensive RWZ glacial mass.

The AWS provides hourly measurements of the main meteorological variables: air temperature, rain precipitation, atmospheric pressure, relative humidity, wind speed and direction, and global short-wave irradiance. In this work we described the typical seasonal and diurnal variations of the meteorological parameters recorded during the period October 2006 – August 2007 and July 2008 - June 2009. Throughout these periods, a remarkable low variability of the main meteorological parameters is detected, as expected for an equatorial high-altitude site. Only for the rain precipitation amount a direct influence of the Inter Tropical Convergence Zone (ITCZ) can be detected. As deduced by the analysis of the typical seasonal diurnal variations, the local mountain weather regime is likely to dominate the variability of the meteorological parameters at RWZ. These measurements permitted to characterize for the first time the meteorological conditions of the Rwenzori Mountains. In addition, the Lagrangian model HYSPLIT has been used to calculate a 2-year climatology of three-dimensional air-mass back-trajectories in order to provide a description of the synoptic-scale atmospheric circulation affecting the measurement site, and verify the seasonal influence of the ITCZ on large-scale atmospheric circulation at RWZ.

KEY WORDS: Rwenzori, Meteorology, Air mass transport, ITCZ.

(*) *Ev-K2-CNR Committee, Via S. Bernardino 145, Bergamo, Italy.*

(**) *Consiglio Nazionale delle Ricerche - Istituto di Scienze dell'Atmosfera e del Clima, Via Gobetti 101, Bologna, Italy - P.Cristofanelli@isac.cnr.it*

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INTRODUCTION

Meteorological observations at the Mt. Rwenzori (RWZ) are carried out in the framework of SHARE, Station at High Altitude for Research on the Environment, project, promoted and coordinated by Ev-K2-CNR with the support of Italian National Research Council (CNR). SHARE is an integrated and technological research program devoted to the environmental monitoring and climate studies in high mountain regions of Asia (Himalaya and Karakorum), Africa and Europe (Alps and Apennines). In this framework, continuous measurements of meteorological parameters and detailed analyses of atmospheric processes are supportive for a wide range of research activities carried out in different fields of study (atmospheric and climate science, glaciology, limnology, energy and water cycles, biodiversity and environmental medicine).

A permanent Automatic Weather Station (AWS) has been installed in Uganda at 4750 m a.s.l. in the eastern part of the Mt. Stanley, with the aim of filling the existing gap in meteorological observations in the area of equatorial Eastern Africa. The Rwenzori AWS therefore represents an important source of information for better understand climate variability and possible effects on tropical glaciers in the Eastern African highlands. Research activities on tropical alpine glaciers indicate that these ecosystems are highly sensitive indicators of tropical climate (Wagnon & *alii*, 1999; Francou & *alii*, 2003). In this region, glaciers have been shrinking over much of the 20th century (Hastenrath & Kruss, 1992; Kaser & Noggler, 1996; Kaser & Osmaston, 2002; Thompson & *alii*, 2002). As reported by Kaser & Osmaston (2002), over the Central Rwenzori Range, Mount Stanley could keep 35% of its glacier surface area of 1906, Mount Speke 25%, and Mount Baker only kept 8% until the early 1990s. These