Research Project STM

Activity carried out within the short-term mobility program

Holocene evolution, vegetation history and climate change in the Canary Islands. Biostratigraphy and geochemistry of calderas infills and travertines from Gran Canaria

Report for the campaign 22 June to July 7, 2014, and perspectives

Holder: Cesare Ravazzi, Senior Researcher
Institute: C.N.R. - IDPA
Senior Researcher, level II
Details of the official hosting Institution
Island Ecology and Biogeography Research Group, Master in Terrestrial Biodiversity and Conservation on Islands. University of La Laguna, La Laguna, Tenerife, 38206, SPAIN
Co-supporting Institution
Research Group GEOVOL, Dept. of Physics (Geology) Faculty of Marine Sciences, Campus Universitario de Tafira, University of Las Palmas de Gran Canaria http://www.gi.ulpgc.es/geovol/
Holder Institute Department 1 - Terra e Ambiente

Objectives

Developing the potential of stratigraphy, geochronology and palaeoecology of terrestrial ecosystems to assess the Holocene climate change and early human peopling within a classical insular system. Setting up techniques to develop proxies for the biological evolution and the palaeoclimate in relation to the volcanic activity. Evaluating their potential through corings in caldera infills, in travertine deposition triggered by volcanic activity and in the volcanic falls.

Project advancement

The Laboratory of Palynology and Palaeoecology of C.N.R. - IDPA, the IEBR Group at the University of La Laguna and the Departamento de Física (Geología), University of Las Palmas agreed addressing a common cooperation envisaging the potential of the above mentioned project. 2 B.Sc. students (Univ. of Milano) completed their dissertation and defended their thesis on July 24, 2014. 1 PhD student (Univ. La Laguna) and 1 B.Sc. students (Univ. of Milano) are involved at the current advancement stage (July 2014). We plan to involve 2 B.Sc students (Univ. of Milano) and 1 Master student (ULL – La Laguna) in the Academic Year 2014-2015.

Campaign 2014

The following activities were completed during the campaign 2014:

- Elaboration of palaoecological records from the caldera infill “La Calderilla”
- Calibration of fossil data with the modern pollen rain
- Sampling pollen traps in the surroundings of the caldera “La Calderilla”
- Stratigraphic survey and log measurement in the travertines of Azuaje (3000 cal BP)
- Sampling and identification of plant imprints and new paleoecological sampling in the travertines of Azuaje (3000 cal BP)
- Sampling for preliminary palaeoecological study in the travertines “Los Berrazales”

The first two activities were carried out at the University of La Laguna; the activities 3 to 6 were accomplished in the field (Island of Gran Canaria).

Products and perspectives

1. Conference presentations

Michela Mariani, Lea de Nascimento, Cesare Ravazzi, Constantino Criado, Sofia Deleo, Lorena Garozzo, Sandra Nogué, Francisco-Jose Perez Torrado, Roberta Pini, Robert Whittaker, Kathy Willis, José María Fernández-Palacios, 2014. ***First palaeoecological evidence of Holocene vegetation history and human impact in Gran Canaria (Canary Islands).*** 9th European Palaeobotany and Palynology Conference, Padua, August 26-31, 2014 - S33 – Assessing Long-Term Human Impact and Climate Change Through Integrated Palynological, Plant Macroremains, Molecular and Stable Isotope Analyses.

Cesare Ravazzi, Lea de Nascimento, Aguedo Marrero, Alvaro Rodríguez-Berriguete, Pedro Sosa, Maria del Carmen Cabrera, Patrizio Daina; José Maria Fernandes Palacios, Giulia Furlanetto, Francisco-José Perez Torrado, Roberta Pini, Alejandro Rodriguez Gonzalez, Ana M. Alonso-Zarza; Rebeca Martín-García, 2014. ***An exceptional tufa with palm remains from Gran Canaria. Preliminary paleobotanical report.*** 9th European Palaeobotany And Palynology Conference, Padua, August 26-31, 2014. *S6. Exceptional, Three-Dimensionally Preserved Biotas*.

2. Dissertations

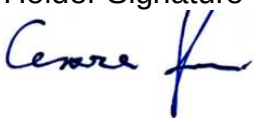
Sofia Deleo (AA 2013-2014) - **Ricostruzione della storia della vegetazione dell'Isola di Gran Canaria - Analisi paleobotanica del riempimento della caldera "La Calderilla.** Relatore: Dottoressa Roberta Pini Correlatore: Dottore Cesare Ravazzi. Relatore esterno: Lea de Nascimento. Matricola: 726559. Università degli Studi di Milano, Corso di Laurea in Scienze Naturali. Anno accademico 2013 – 2014. Tesi presentata il 24.7.2014.

Michela Mariani (AA 2013-2014) - **Storia della vegetazione di Gran Canaria (Isole Canarie) nell'Olocene e relazioni paleoecologiche con l'attivita' vulcanica.** Relatore Interno: Prof. Giovanni Muttoni. Relatore Esterno: Dr. Lea De Nascimento. Correlatori: Dr. Cesare Ravazzi. Dr. Roberta Pini. Prof. José Maria Fernández Palacios. Prof. Francisco Pérez Torrado. Matricola: 825425. Università degli Studi di Milano, Corso di Laurea in Scienze Naturali. Anno accademico 2013 – 2014. Tesi presentata il 24.7.2014

3. Publications

Rodriguez Barriguete A., Ravazzi C., et al., (to be submitted) - Sedimentological and palynological study of the distal Azuaje tufa-like deposit: clues to reconstruct the Gran Canary (Spain) landscape before human occupation. Terra Nova.

Holder Signature - Cesare Ravazzi



Milano, July 25th 2014

Alleg.: abstract presentations

9TH EUROPEAN PALAEOBOTANY AND PALYNOLOGY CONFERENCE, PADUA, AUGUST 26-31, 2014
S6. EXCEPTIONAL, THREE-DIMENSIONALLY PRESERVED BIOTAS

An exceptional tufa with palm remains from Gran Canaria. Preliminary paleobotanical report

Cesare Ravazzi[1], Lea de Nascimento[2], Aguedo Marrero[3], A. Rodríguez-Berriguete[4], Pedro Sosa[5], Maria del Carmen Cabrera[6], Patrizio Daina[1]; José Maria Fernandes Palacios[1], Giulia Furlanetto[1], Francisco-José Perez Torrado[6], Roberta Pini[1], Alejandro Rodriguez Gonzalez[6], Ana M. Alonso-Zarza[4]; Rebeca Martín-García[4]

1 – CNR – Istituto per la Dinamica dei Processi Ambientali, Milano – I; 2 – Island Ecology and Biogeography Group, University of La Laguna - E; 3 – Jardín Botánico Viera y Clavijo, Las Palmas de Gran Canaria - E; 4 - Dept Petrología y Geoquímica Fac. CC Geológicas, IGEO, UCM, CSIC; 5 - Dpto. Biología. ULPGC. Grupo de investigación BIOCONTER - E; 6 – Dpt. Física, GEOVOL. University of Las Palmas de Gran Canaria;

* Work supported by the STM – Short Term Mobility Program 2013-2014, C.N.R.

In the Canary volcanic Islands, plant moulds in pyroclastic and spring deposits are the only terrestrial records so far known preserving abundant biogenic products and so are unique archives of the past environment and terrestrial vegetation that prevailed in these islands during their deposition.
The most extensive travertine and tufa-like deposits in Gran Canaria occur in the Barranco Azuaje. Here, Late Holocene carbonate spring deposits related to hydrothermal circulation formed proximal travertine bodies in the high and medial course of the barranco (Rodríguez-Berriguete et al., 2012) and a distal fluvial carbonatic system downstream at the gorge floor. The latter consist of tufa-like successions, up to 3.5 m thick, rich in plant moulds and imprints. The first identification list of fossil imprints was attempted by Marrero et al. (2002); later on Sosa et al (2010) reported the occurrence of leaf imprints of the Canarian palm (*Phoenix canariensis*). Recently a spectacular exposure was discovered downstream, close to a haven for chalk production (hencefore called Horno outcrop). It consists of a 3 to 6 m-thick succession of framestone, phytoclastic rudstone and stromatolite, covering the basaltic lava flow produced by the Dorama eruption, the latter dated 2420 ± 40 ^{14}C yr BP (2350 – 2700 cal BP).
We present here the preliminary paleobotanical stratigraphy of the site, including first pollen results from thinner facies (mudstone), a preliminary macrofossil list and a first evaluation of the biotic assemblages found in the tufa deposit
It appears that shrubs, bryophytes, monocotyledons (including a reed, but neither *Arundo donax* nor *Phragmites*) and the Canarian palm fossils are found in the tufa. A frame of geotropically negative, dycotomous branching, whose segment connections are marked by boundle holes, recalls the presence of some aerial root system of the Canarian palm (*Phoenix canariensis*) within the framestone. At present there is no growing tufa nor perennial streams in Gran Canary Island. A further evidence of palm presence in the Horno tufa consists of frequent moulds of leaf rachis, leaflet fragments and seeds in the phytoclastic rudstones. The mudstone pollen content, dominated by *Phoenix*, is a nice image of a local palm-willow community, and also documents extralocal pollen originating from trees and shrubs in the termophilous woodland ecoregion.

Marrero et al., 2002. Jornadas de la Sociedad Espanola de Paleontologia
Sosa Henriquez et al., 2010. Fosiles de palmeras en Gran Canaria.
Rodríguez-Berriguete et al., 2012. Sedimentary Geology

9TH EUROPEAN PALAEOBOTANY AND PALYNOLOGY CONFERENCE, PADUA, AUGUST 26-31, 2014
S33 – ASSESSING LONG-TERM HUMAN IMPACT AND CLIMATE CHANGE THROUGH INTEGRATED PALYNOLOGICAL, PLANT MACROREMAINS, MOLECULAR AND STABLE ISOTOPE ANALYSES

First paleoecological evidence of Holocene vegetation history and human impact in Gran Canaria – the palynological record from the caldera infill of La Calderilla

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1 CNR – IDPA, ; Milano - I; 2 – University of Milano - I; 3 – Grupo de Ecología y Biogeografía Insular, University of La Laguna – ES; 4 – Grupo de investigación GEOVOL, University of Las Palmas, ES;

* Work supported by the STM – Short Term Mobility Program 2013, C.N.R.

The history of the recent past landscape and vegetation change in the Canary Islands has been recently afforded by a paleoecological project focusing on wetland sedimentary successions from Tenerife and la Gomera (de Nascimiento et al., 2009; Nogué et al., 2013). These records, spanning the last 5 and 9 ka respectively, highlighted substantial changes occurred in the extent and composition of the laurisilva and thermophilous woodlands as a consequence of climate change and human impact in the last 2 ka. However, strong gradients within islands and major differences in biodiversity and human peopling between islands (Fernandez Palacios et al., 2011) need further work in the archipelago.
Extensive disruption of the forest ecosystems occurred in Gran Canaria at least since the first steps of the Castilian conquest (Santana y Santana, 2001), but possibly much earlier, judging from dense human peopling inferred from the archaeological documentation (Vázquez et al., 2012). Maps of potential vegetation confirm this figure (Sunding, 1972; Del Arco et al., 2006).
We present here one of the first two terrestrial palaeoecological records so far obtained in Gran Canaria. The caldera of La Calderilla (Macizo del Pico de Las Nieves, 1765 m a.s.l.) is located in the hilltop of the island, in the belt of *pinar canario*. Its explosive origin dated back early in the Late Pleistocene, but its sedimentary infill was never prospected. We cored the first 9 m infill and obtained a palynological record from the substantial part of the succession, spanning the last c. 6000 years. Throughout, the pollen record shows the image of a persistent cover by the *pinar canario* in the pollen source area. The persistently high accumulation rate of microcharcoal particles points to the long-term control by fire in the forest dynamics. The record of oaks and of cereal-type pollen will be discussed by comparing to a recent study of modern pollen rain in the Canary Islands (de Nascimiento, in press) and to a second fossil record from Gran Canaria, showing consistencies and differences.

de Nascimiento et al., 2009 – J. Biogeogr., 36, 499-514.; Nogué et al., 2013 – J. Ecol., 101, 368-377. Fernandez Palacios et al., 2011 – J. Biogeogr. 38, 226-246; Santana Santana, 2001 – Cabildo de Gran Canaria; Sunding, 1972 – Universitetsforlaget, Oslo; Del Arco ed., 2006 – Grafcan Ed.; Vázquez et al., 2012 - Cabildo de Gran Canaria; de Nascimiento et al., in press - Rev. Paleobot Palynol.