



Workshop IODP-Italia “Lo stato delle proposte di perforazione nell’area mediterranea”
Scientific Drilling in the Mediterranean Sea
Roma, 15-16 gennaio 2018

Abstract

IODP - Lo stato delle proposte di perforazione per l’area del Mediterraneo

Fucino Tephrochronology Unites Quaternary Records (FUTURE)

B. GIACCIO^(*1), G. ZANCHETTA⁽²⁾, B. WAGNER⁽³⁾, S. NOMADE⁽⁴⁾, P.R. RENNE⁽⁵⁾, F. FLORINDO⁽⁶⁾, L. SADORI⁽⁷⁾, P.C. TZEDAKIS⁽⁸⁾, D. ARIZTEGUI⁽⁹⁾, T.A. NEUBAUER⁽¹⁰⁾

(*1) Istituto di Geologia Ambientale e Geoingegneria, Consiglio Nazionale delle Ricerche, Roma, Italy
corresponding author

(2) Dipartimento di Scienze della Terra, Università di Pisa, Italy

(3) Institute of Geology and Mineralogy, University of Cologne, Germany

(4) Laboratoire des Sciences du Climat et de l’Environnement (CEA-CNRS-UVSQ), Gif-sur-Yvette, France

(5) University of California and Berkeley Geochronology Center, Berkeley, California, USA

(6) Dipartimento di Biologia Ambientale, University of Roma “La Sapienza”, Italy

(7) Department of Geography, University College London, UK

(8) Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy

(9) Department of Earth Sciences, University of Geneva, Switzerland

(10) Justus Liebig University Department of Animal Ecology & Systematics, Germany

Abstract

The main target of the FUTURE project is to overcome the current limits of the global Quaternary climate-chronology and magneto-chronology, mostly relying on orbital or physical assumptions. We intend to achieve this aim by building an independent radioisotopic time scale for the last ~1.5 Ma, based on high-precision ⁴⁰Ar/³⁹Ar geochronology directly anchored to high-resolution paleoclimatic and paleomagnetic proxy series from the Fucino Basin, Central Italy. Since many of the paleoclimatic-environmental proxies of the Central Italy lacustrine sediments are unambiguously connected to climatic variability originating in the North Atlantic, the ⁴⁰Ar/³⁹Ar Fucino chronology can be applied to North Atlantic marine reference records spanning the same interval. The FUTURE chronology can be also applied to the eastern Mediterranean marine and terrestrial records by means of direct tephra synchronizations, thus providing a further opportunity of alignments with North Atlantic records via the well-documented intermediate water connectivity between the eastern and western Mediterranean Sea. The long and continuous geological history (Pliocene-Present) coupled with its good range of distance from the peri-Tyrrhenian volcanic sources of ultrapotassic tephra – i.e., prone to be precisely dated by ⁴⁰Ar/³⁹Ar method – and the high climatic sensitivity of its sediments – i.e., prone to provide detailed paleoclimatic-environmental records – make the Fucino Basin the best candidate available in western Eurasia to accomplish such a goal.

Based on these theoretical premises, in order to test its actual potential, in June 2015 a ~82 m-long sediment succession was recovered from the eastern-central area of the Fucino Basin (F1-F3). The lithology of the sediments is rather homogeneous and is dominated by fine-grained lacustrine sediments composed of grey calcareous marl with variable proportions of clay and organic matter. Core F1-F3 contains 23 tephra layers originate from different Italian volcanoes (e.g. Campi Flegrei, Etna, Colli Albani, Ischia, Vico, Sabatini)





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and comprise key Mediterranean marker tephra layers, such as the Neapolitan Yellow Tuff, Y-7, C-22, X-5 and X-6, which constrain the chronology of the core continuously back to 190 ka and provide the basis for the establishment of an independent age model and assembling a high-resolution bio-geochemical record for the F1-F3 succession spanning the last 190 ka.

Based on these promising results, an international consortium of several scientists and institutions, including IGAG-CNR (Italy), IGG-CNR (Italy), INGV (Italy), LIAG (Germany) and the Universities of Pisa (Italy), Rome (Italy), Cologne (Germany), Geneva (Switzerland), and Nottingham (UK) provided funds for a new coring campaign and borehole logging. At the new site, the F4-F5 site, which is characterized by a lower sedimentation rate, two ca. 86 m long cores were recovered in June 2017.

First analyses of the borehole and F4-F5 cores, comprising borehole logging, multi-sensor core logging (MSCL, GEOTEK Co.), line scan imaging, XRF scanning (ITRAX, COX Ltd) and preliminary analyses of tephra sampled in core catchers, allowed to attribute the succession to the last 415 ka. Subsampling of discrete sediment samples and tephra horizons for future paleomagnetic, geochemical, sedimentological, and tephrostratigraphical studies started in autumn 2017 and yielded > 130 tephra. The high number of such horizons forms the backbone to build an independent radioisotopically-based age model and confirm the high potential of the Fucino record for the geochronological purposes of the FUTURE project.

Key words: Fucino paleo lake, Italy, tephrochronology, Quaternary and paleoclimate geochronology.

